EPA Region 1 RAC2 Contract No. EP-S1-06-03

July 19, 2011
Nobis Project No. 80024

Via Electronic Submittal

U.S. Environmental Protection Agency, Region 1
Attention: Mr. Ed Hathaway, Task Order Project Officer
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3919

Subject: Transmittal of the Final Terrestrial Ecological Risk Assessment
Ely Copper Mine Superfund Site, Vershire, Vermont
Remedial Investigation / Feasibility Study
Task Order Number 0024-RI-CO-017L

Dear Mr. Hathaway:

Attached with this correspondence is the Final Terrestrial Ecological Risk Assessment report for the Remedial Investigation / Feasibility Study at the Ely Copper Mine Superfund Site located in Vershire, Vermont.

Should you have any questions or comments, please contact me at (603) 724-6224, or by email at aboeckeler@nobisengineering.com.

Sincerely,

NOBIS ENGINEERING, INC.

Andrew J. Boeckeler

Andrew J. Boeckeler, P.G.
Senior Project Manager

Enclosure

c: File 80024/NH

Final Terrestrial Ecological Risk Assessment

Ely Copper Mine Superfund Site
Vershire, Vermont

Remedial Investigation/Feasibility Study
EPA Task Order No. 0024-RI-CO-017L

REMEDIAL ACTION CONTRACT
No. EP-S1-06-03

FOR

U.S. Environmental Protection Agency
Region 1

BY

Nobis Engineering, Inc.

Nobis Project No. 80024

July 2011

U.S. Environmental Protection Agency
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Final Terrestrial Ecological Risk Assessment

Ely Copper Mine Superfund Site
Vershire, Vermont
Remedial Investigation/Feasibility Study
EPA Task Order No. 0024-RI-CO-017L

REMEDIAL ACTION CONTRACT
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APPENDICES

ACRONYMS

ABA	Acid-base Accounting
AE	Assimilation Efficiency
AF	Adjustment Factor
AMD	Acid Mine Drainage
ARAR	Applicable or Relevant and Appropriate Requirements
ARD	Acid Rock Drainage
AWQC	Ambient Water Quality Criteria
BCF	Bio-concentration Factor
BERA	Baseline Ecological Risk Assessment
BGS	Below Ground Surfaces
Br	Bioaccumulation value for reproductive parts of plants
BSAF	Biota-to-Sediment Bioaccumulation Factor
BW	Body Weight
CBRs	Critical Body Residues
CCC	Criteria – Continuous Concentration
CEC	Cation Exchange Capacity
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
CMC	Criteria – Maximum Concentration
COPEC	Chemical of Potential Ecological Concern
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
Cu	Copper
Cy	Cubic yard
DAS	Delivery of Analytical Services
DBH	Diameter at breast height
DQO	Data Quality Objective
DO	Dissolved Oxygen
DW	Dry Weight
EBOR	East Brach of the Ompompanoosuc River
EC20	20% Effective Concentration
EC50	50% Effective Concentration
Eco SSL	Ecological Soil Screening Level
EEL	Estimated Exposure Level
EPA	Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESAT	Environmental Services Assistance Team
ESL	Ecological Screening Level
FIR	Food Intake Rate
FMR	Field Metabolic Rate
FS	Feasibility Study
Ft	Feet
G	Gram
GE	Gross Energy
HHRA	Human Health Risk Assessment

ACRONYMS (cont.)

HM	Heavy Metals
HQ	Hazard Quotient
IR	Incremental Risk
J	Data qualifier, meaning estimated
OM	Organic Matter
Kcal	kilocalorie
Kg	Kilogram
KM	Kaplan-Meier
LC50	Lethal Concentration – 50%
LD50	Lethal Dose – 50%
LOAEL	Lowest Observed Adverse Effect Level
LOEC	Lowest Observed Effect Concentration
LOE	Lowest Observed Effect
LWA	Lower Waste Area
M	meter
MATC	Maximum Acceptable Toxicant Concentration
Mg	Milligram
Mg/kg	milligrams per kilogram
Mg/L	milligrams per liter
Mi	Mile
NCP	National Contingency Plan
ND	Non-detect
NOAEL	No Observed Adverse Effect Level
NOEL	No Observed Effect Level
NPL	National Priorities List
OEME	Office of Environmental Measurement and Evaluation
ORB	Ore Roast Bed
OM	Organic Matter
PRG	Preliminary Remediation Goal
QC	Quality Control
RAC 2	Remedial Action Contract 2
RAGS	Risk Assessment Guidance for Superfund
RATL	Reptile and Amphibian Toxicity Literature database
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
SARA	Superfund Amendments and Reauthorization Act
SAV	Secondary Acute Value
SCV	Secondary Chronic Value
SHB	Schoolhouse Brook
SI	Site Investigation
SIR	Soil Ingestion Rate
SLERA	Screening-level Ecological Risk Assessment
SMDP	Scientific/Management Decision Points
SPLP	Synthetic Precipitate Leaching Procedure
SQL	Sample Quantitation Limit
TAC	Test Acceptability Criteria
TAL	Target Analyte List
TDI	Total Daily Intake

ACRONYMS (cont.)

TOC	Total Organic Carbon
TRV	Toxicity Reference Value
U	Data qualifier, meaning non-detected
UCL	Upper Confidence Limit
UF	Uncertainty Factor
µg/L	micrograms per liter
URS	URS Corporation
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UWA	Upper Waste Area
VCMC	Vermont Copper Mining Company
VT DEC	Vermont Department of Environmental Conservation
VTNNHP	Vermont Nongame and Natural Heritage Program
WOE	Weight-of-Evidence
WQC	Water Quality Criteria
WW	Wet Weight
XRF	X-ray Fluorescence

ES EXECUTIVE SUMMARY

ES.1 Introduction

This report presents the baseline ecological risk assessment (BERA) for terrestrial habitats potentially affected by contaminants associated with historical mining operations at the Ely Mine Superfund Site (the Site) in Vershire, Vermont. This work was performed in accordance with the United States Environmental Protection Agency (EPA) Region I Remedial Action Contract 2 (RAC 2) No. EP-S1-06-03, Task Order No. 0024-RI-CO-017L. The objective of this BERA was to describe the likelihood, nature, and severity of observed or potential adverse effects to ecological receptors resulting from their exposure to mining-related contaminants currently present at the Site. In addition to evaluating terrestrial risk, this assessment looks at potential risk to four vernal pools identified within the study area that were not assessed as part of the Aquatic BERA (EPA, 2010a).

This BERA supports the Ely Mine Remedial Investigation/Feasibility Study (RI/FS) being conducted under the regulatory framework of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. 9601, et seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.

As requested by EPA, this Executive Summary includes a brief overview of the findings and recommendations provided in the Aquatic BERA.

ES.2 Terrestrial Risk Assessment

During the planning stages of this terrestrial BERA, it was agreed by all the ecological assessment team members, that the barren locations throughout the study area (i.e., waste rock piles, roast beds, smelter area and slag piles) were severely impacted by the presence of acid rock drainage (ARD) and metal contamination. It was assumed that these impacted areas would be addressed in the feasibility study (FS) and that they did not warrant further assessment in the terrestrial BERA. Sampling and subsequent ecological risk analysis focused on determining the potential for significant adverse ecological effects in the transition zones that border these barren areas and any vernal pools located therein. The target communities and receptors selected to evaluate potential ecological impacts include: terrestrial plants, soil invertebrates, herbivorous birds and mammals, invertiverous birds and mammals, carnivorous birds and mammals, and the aquatic and amphibian communities associated with the on-site vernal pools. Ecological risks were assessed by comparing media concentrations to benchmark values and modeled exposure concentrations to toxicity reference values (TRV). The following table summarizes the findings of this risk analysis.

Receptor Group	Overall Risk Conclusion/Chemicals of Concern	
	Possible	**Not Expected**
Terrestrial Plants	Copper and to a lesser extent, zinc (however endpoint confidence is low)	
Soil Invertebrates	Copper and to a lesser extent, zinc (however endpoint confidence is low)	
Herbivorous Birds	-	√
Invertiverous Birds	-	√
Carnivorous Birds	-	√
Herbivorous Mammals	-	√
Invertiverous Mammals	-	√
Carnivorous Mammals	-	√
Aquatic Community	VP-1 only from cadmium and copper	-
Amphibian Populations	VP-1 only from cadmium, copper, and manganese	-

When evaluating whether significant ecological risk has occurred, risk managers need to consider whether the observed or predicted adverse effects were likely caused by site-related stressors; are the impacts to local populations or communities sufficient in magnitude, severity, areal extent and duration such that they will not be able to recover and maintain themselves in a healthy state; and whether effects appear to exceed the natural changes in the components typical of similar non-site-impacted habitats (EPA, 1999b). Although all the conditions associated with significant ecological risk are present in the on-site transition zones, the magnitude and severity of risks are not high (with the exception of VP-1) and signs of recovery (i.e., the establishment of early successional vegetative communities) are present in the on-site vegetative communities.

It is also important to note that metal bioavailability in site-related soils appears to be minimal (i.e., <10% total concentration) based on sequential analysis conducted by USGS (Piatak, et al., 2007). These findings were supported by the earthworm toxicity pilot study and indicated that copper (Cu) concentrations in soil >1,300 milligram per kilogram (mg/kg) (well above the soil invertebrate Ecological Soil Screening Level (Eco SSL) of 80 mg/kg; EPA, 2007b) did not impact earthworm survival. If metals bioavailability is as low as indicated; that lack of biota associated with disturbed areas is likely attributable to the low pH frequently present.

ES.3 Aquatic Risk Assessment

The final Aquatic BERA (EPA, 2010a) for the Site was completed in June 2010. This BERA evaluated risks to several receptor groups: benthic invertebrate communities; water column invertebrate communities; fish, amphibians; insectivorous birds and mammals; and piscivorous birds and mammals. Where appropriate, risks were assessed by aquatic locations potentially impacted by acid mine drainage (AMD). Specific locations evaluated for one or more receptor groups included: ponds on the east branch of Ely Brook; the main stem of Ely Brook; Schoolhouse Brook (SHB); and the east branch of the Ompompanoosuc River (EBOR). The following table provides a brief summary of the risk results for each receptor group by location, and the associated reliability as presented in the aquatic BERA.

Receptor Group	Location	Risks	Reliability
1) Benthic invertebrates	Ponds	Severe risk to Pond 5 based on high Cu conc.	Low reliability due to single semi-qualitative LOE
	Ely Brook (mainstem)	Severe risk throughout	Reliability high based on 6 concurring measurement endpoints
	Schoolhouse Brook	Severe impairment	Reliability high based on multiple LOEs
	EBOR	No significant risk	Reliability high based on multiple LOEs
2) Water invertebrates	Ponds	High risk in Pond 5, low risk in Ponds 2 and 3	Reliability high based on multiple LOEs
3) Fish	Ely Brook (mainstem)	Severe impairment	Reliability high based on multiple LOEs
	Schoolhouse Brook	Severe impairment	Reliability high based on multiple LOEs
	EBOR	No significant risk	Moderate to low reliability: chemical LOE indicates risk potential, fish community evaluation give opposite results
4) Amphibians	Ponds	Low risks in Ponds 2 and 3, high risks in Ponds 4 and 5 for aquatic life stages	Medium because tadpole exposure in the field only showed partial results
5) Insectivorous birds and mammals	Schoolhouse Brook	Strong potential for risks to mammals (bats) and limited risk to birds, both driven by Cu exposure	Low reliability due to use of BSAFs
	EBOR	Limited risks to birds and mammals (bats) driven by Cu exposure	Low reliability due to use of BSAFs

Receptor Group	Location	Risks	Reliability
6) Piscivorous birds and mammals	Schoolhouse Brook	No significant risk	Moderate because real fish tissue data available for exposure modeling
	EBOR	No significant risk	Moderate because real fish tissue data available for exposure modeling

LOE=Line of Evidence

BSAFs=Biota-to-Sediment Accumulation Factor

The aquatic BERA concluded that substantial ecological risks were identified in Ponds 4 and 5, the main stem of Ely Brook, and much of SHB. Based on the concurrence of potential effects for multiple lines of evidence and the associated reliability of these measurement endpoints, risk management decisions need to focus on these three areas.

ES.4 Recommendations

Based on the findings presented in this terrestrial risk assessment and the results summarized above for the Aquatic BERA it appears that the ecological risk remediation activities need to focus on the mine waste (barren) areas, portions of the east branch of Ely Brook (including Ponds 4 and 5), the mainstem of Ely Brook, and portions of SHB downstream of the confluence with Ely Brook. Although significant adverse effects were identified in VP-1, it is believed that remedial activities that would limit AMD/ARD (and associated contaminant release) in the proposed areas will eventually allow VP-1 recover to a healthy condition.

1.0 INTRODUCTION

1.1 Purpose and Approach

Nobis Engineering, Inc. (Nobis), and its Team Subcontractor, Avatar Environmental, LLC (Avatar) have prepared this Baseline Ecological Risk Assessment (BERA) for the terrestrial habitats at the Ely Mine Superfund Site (the Site). This work was performed in accordance with the United States Environmental Protection Agency (EPA) Region I Remedial Action Contract 2 (RAC 2) No. EP-S1-06-03, Task Order No. 0024-RI-CO-017L. The BERA documents the potential exposure and consequent risk to ecological receptors exposed to metals contamination. This BERA represents the completion of the ecological risk assessment (ERA) process for the Site. Previously, EPA's Region 1 Environmental Services Assistance Team (ESAT) contractor, i.e., Techlaw, Inc., developed an Aquatic BERA (EPA, 2010a).

This BERA was conducted based on the general approach outlined in the *Final Conceptual Site Model Technical Memorandum for Ely Mine Superfund Site* (Nobis, 2009).

1.2 Ecological Risk Assessment Guidance

The Site was placed on the National Priorities List (NPL) in 2001; therefore, this investigation is being performed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 under the authority of EPA Region 1.

The objective of the ERA is to characterize and quantify, where appropriate, the current impact and the potential ecological risks that would occur should no further remedial action be taken. This BERA does not recommend remedial alternatives; rather, it provides one of the bases for risk management decisions for the Site. The decisions regarding which remedial alternatives (if any) are appropriate to address the baseline risk will be made in the Feasibility Study (FS) process.

EPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (hereafter, referred to as the Guidance) (EPA, 1997) will serve as the primary source of guidance in developing this BERA. This Guidance describes a progressive and iterative process that is consistent with and incorporates the basic and fundamental approach to performing ERAs outlined by EPA's Risk Assessment Forum in its

Framework for Ecological Risk Assessment (Framework) (EPA, 1992a) and *Guidelines for Ecological Risk Assessment* (Guidelines) (EPA, 1998). This Guidance outlines an 8-step process and several scientific/management decision points (SMDPs). An SMDP represents a significant communication point in the conduct of the ERA requiring the interaction of the risk manager and the risk assessment team. The purpose of the SMDP is to evaluate the relevant information and to re-evaluate the scope, focus, and direction of the ERA.

Although this BERA does not explicitly require the six SMDPs outlined in the Guidance, meetings between EPA's risk managers and the risk assessment team have occurred and will continue to occur formally and informally on a regular basis to evaluate and approve or redirect the work up to that point (analogous to the SMDPs).

In addition to and incorporated within the framework of the guidance discussed previously, the following documents also were used in the development of this BERA:

- *Guidelines for Ecological Risk Assessment* (EPA, 1998).
- *Framework for Ecological Risk Assessment* (EPA, 1992a).
- *Wildlife Exposure Factors Handbook, Volumes I and II* (EPA 600R-93/187a and 187b) (EPA, 1993b).
- *Risk Assessment Guidance for Superfund (RAGS), Volume II: Environmental Evaluation Manual (EPA 540/1-89/001)* (EPA, 1989).
- *Ecological Assessment of Hazardous Waste Sites: A Field and Laboratory Reference Document (EPA 600/3-89/013)* (Suter, 1989).
- *Ecological Risk Assessment Issue Papers (EPA/630R-94/009)* (Suter, et al., 1994b).
- ECO Updates, Volumes 1-4 (EPA Office of Solid Waste and Emergency Response) (EPA, 1991-1994).
- *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA 530-D-99-001A) (EPA, 1999a).

1.3 Report Overview

The remainder of this report describes the comprehensive ERA process, which includes a number of technical components. A summary of each key component is provided below:

- Problem Formulation (Section 2)—This subsection describes ecosystems potentially at risk, assessment and measurement endpoint selection, the approach used for the weight-of-evidence (WOE), conceptual model development, as well as an analysis plan.

- Analysis Phase (Section 3)—This subsection is based on the conceptual model developed during the Problem Formulation and consists of two primary components: 1) Characterization of Exposure and 2) Characterization of Ecological Effects.

- Risk Characterization (Section 4)—This subsection is divided into two stages: risk estimation and risk description. The risk estimation integrates exposure and toxicity information from the Analysis Phase; estimates the likelihood of adverse effects on the assessment endpoint of concern; and addresses the uncertainty, assumptions, and limitations. The risk description provides a complete and informative synthesis of the overall conclusions regarding risk estimates; and can be used to make risk management decisions.

2.0 PROBLEM FORMULATION

2.1 Project Scope and Introduction

As previously mentioned (see Section 1.2), the primary guidance used to perform ERAs is the U.S. Environmental Protection Agency's (EPA's) interim final document entitled *Ecological Risk Assessment Guidance for Superfund (ERAGS): Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997). This guidance outlines an 8-step process intended to ensure that the "risk assessment is proceeding in a direction that is acceptable to the risk assessor and the risk manager." Figure 2-1 describes the 8-step ecological risk assessment process and indicates the SMDPs in that process and includes:

Step:

1) Screening-level problem formulation and ecological effects evaluation.
2) Screening-level preliminary exposure estimates and risk calculation.
3) Baseline risk assessment problem formulation.
4) Study design and data quality objectives (DQOs).
5) Field verification of sampling design.
6) Site investigation (SI) and analysis of exposure and effects.
7) Risk characterization.
8) Risk management.

This deliverable encompasses Steps 1 through 3 that together are considered the “Problem Formulation Phase” of an ERA. The problem formulation phase is the first stage in the development of an ERA and is a systematic process that identifies key factors to be addressed in the ERA. The first 2 steps are essentially a screening-level ecological risk assessment (SLERA). In Step 1 (Screening-Level Problem Formulation and Ecological Effects Evaluation), the following information is provided:

1) a description of habitats potentially affected;
2) a list of flora and fauna present or potential for these habitats;
3) the preliminary conceptual site model (CSM) (e.g., pathways by which the receptors may be exposed);
4) the preliminary assessment and measurement endpoints;
5) the data available to evaluate the Site; and
6) the screening benchmarks appropriate to use to screen for ecological risk.

In Step 2 (Screening-level Preliminary Exposure Estimates and Risk Calculation), site-specific concentration data are compared with benchmarks to determine if the potential for ecological risk exists; and, if so, the chemicals of potential ecological concern (COPECs) for each exposure medium are defined.

As a result of the potential ecological effects noted in Step 2, the BERA process continues to Step 3 – Baseline Problem Formulation. Step 3 includes the final CSM, the final assessment and measurement endpoints, and a discussion of WOE approach to be used in the risk characterization.

Altogether, in the problem formulation phase, the risk assessment objectives are stated, the problem is defined in the form of a CSM, and the approach for analyzing and characterizing the ecological risk(s) is determined. The problem formulation typically results in several primary products that include:

1) COPECs that will be evaluated for potential ecological risk;
2) complete exposure pathways that integrate fate and transport information with potential ecological receptor occurrence;
3) assessment endpoints that adequately reflect the risk management goals and the ecosystems under investigation;

4) a CSM that describes key relationships between the contaminant(s) and assessment endpoints; and
5) risk questions that the SI will address.

The remainder of this section presents Site history and Site description.

2.1.1 Site Description and History

A detailed account of the Site history and detailed documentation of industrial archaeological features on the Site and surrounding areas is presented in a report by the Public Archaeology Laboratory (PAL, 2005).

The Vermont Copper Belt, also known as the Orange County copper district lies within the Connecticut River watershed in Orange County, Vermont. It is reported to have supplied the largest historic metal production in New England from the late 1700s to 1958 derived primarily from the Elizabeth, Ely, and Pike Hill Mines within a 20 mile (mi) long area from south to north in the belt. Other smaller deposits known as the Cookeville, Orange and Gove Deposits also occur within this belt. Early production at the Elizabeth Mine was focused on copper as (iron sulfate), followed later by copper production at all three mines.

The ore bodies are stratiform massive sulfide deposits similar to those of the Besshi deposits in Japan and are believed to have formed as syngenetic-exhalative processes on the sea floor during the Silurian-Devonian age. The primary ore minerals include pyrrhotite, chalcopyrite with minor sphalerite and pyrite (Slack, et al., 2001). Note that wastes from the Ely Mine are known to have been transported to the Elizabeth Mine area.

Details specific to the Site are provided below.

2.1.1.1 Site Description

The Site is an abandoned copper mine located on Beanville Road, approximately 4 mi southeast of the Village of Vershire Center and approximately five mi northwest of the village of West Fairlee in Vershire, Orange County, Vermont. The Site encompasses approximately 350 acres along the south slope of Dwight Hill, to the north of Schoolhouse Brook (SHB) and South Vershire Road (see Figure 2-2). The mine area includes features such as intact and collapsed adits, shafts, reservoirs, over 3,000 linear feet (ft) of underground workings (largely flooded), and remnant foundations of former mine operation buildings. Waste areas are sparsely vegetated and include former ore roast beds, waste rock and tailings piles, a former smelter area, and a slag pile.

In the late 1800s (c. 1870s-1880s), a mining village with was located at the mine. Mine operations experienced a boom between 1872 and 1880 when the Ely Village expanded to include homes, hotel, bank stores, and supporting industries with the Town of Vershire growing to a population of about 1,900. It is difficult to determine the number of workers at the Ely Mine during its peak, but there were approximately 1,000 workers combined at Ely and Corinth (i.e., Pike Hill) c. 1879.

Now, no buildings exist on the Site. The locations of the former Main Shaft Hoist, the Westinghouse Hoist House, smelter buildings, a World War I-era ore flotation separation plant and other structures associated with historic mining operations have been documented at the Site (PAL, 2005). Estimated wastes remaining at the Site are noted below.

Location	Area (acres)	Volume (cy)
Upper Waste Area (UWA)	7.8	69,400
Lower Waste Area (LWA)	5.9	26,000
Tailings Area	0.7	3,600
Ore Roast Bed (ORB)	2.2	10,330
Development Rock within the UWA	1.05	12,141

The Site landscape is a combination of barren open areas and patches of primarily birch (*Betula spp*.) and evergreen trees (*Lycopodium spp.)*. The south slope of Dwight Hill, which contains most of the waste rock associated with the mines, lies within the watershed of a small stream, Ely Brook, which flows south to join SHB on the south side of South Vershire Road. SB borders the southern margin of the Site and flows eastward approximately 1.75 mi to its confluence with the east branch of the Ompompanoosuc River. SHB and the East Branch of the Ompompanoosuc River (EBOR) are used for recreational purposes and contain fisheries.

Site topography is dominated by the peak and steep south slope of Dwight Hill extending from an elevation of approximately 1,600 ft above mean sea level down to SHB at an elevation of approximately 940 ft, some 660 ft of relief. The main shaft and several adits leading to the underground workings are located along the steep, upper portion of this slope at the head of the valley. Most of the mine wastes lie within the more gently sloping, lower portions of this valley. The crest of Dwight Hill occurs along a northwest trending ridge which forms the northern boundary of the Ely Brook watershed. Underground workings extend approximately 3,000 ft to the northeast of the mine openings beneath and beyond the top of the ridge. North-south trending ridges to the west and east of the mine areas define two smaller upland valleys that merge into an open U-shaped valley facing south-southwest which define the Ely Brook watershed. The headwaters of Ely Brook are located in the western tributary valley, northwest of the mine areas. A tributary to Ely Brook drains the eastern tributary valley which contains a former reservoir and a series of beaver ponds located east of the Site. The northeast slope of Dwight Hill is moderately steep with an elevation drop of approximately 800 ft down to Route 113 to the east.

2.1.1.2 History of Operations

The Ely Cooper Mine ore body was discovered in 1813 and explored in the 1830s. Significant mine activities began in 1853 by the Vermont Copper Mining Company (VCMC) led by Thomas Pollard and lasted until 1905. In 1864, after a period of sporadic output of the mine due to the segmented and overlapping lens-like nature of the ore body, Smith Ely collaborated with Mr. Pollard to relocate the ore body and successfully boost production. In 1866, Tramway roads were built to carry ore down the valley, the main alignment of which is still apparent today. The Tram construction immediately preceded the development of the ore roast beds and the initial construction of the smelter in 1867. The roast bed area extended 900 ft bounded by a stone wall on the west and serviced by an elevated trestle. Roasting the ore reduced the sulfur content prior to smelting. By 1868, four smelter furnaces were in operation.

By 1876, sulfur fumes from the roast beds and smelter had eliminated the vegetation in the valley, and ore roasting kilns were added to the smelter facility. In an attempt to mitigate the smelter fumes, a stone slab flue approximately ¼ mi long was built from the smelter up the eastern side of the valley, but reportedly never functioned effectively in transporting fumes away from the village. By 1877, the smelter building was 300 ft long with 14 furnaces, and was expanded in 1879 to 24 furnaces and a length of 700 ft to accommodate ore from the Pike Hill Mines. During this time the smelter slag pile was expanding south of the building toward SHB. Political events and falling copper prices in the early 1880s led to a worker revolt known as the Ely War in 1883 and collapse of the VCMC. Between 1883 and the close of the mine in 1905, ownership changed hands several times and production was sporadic. Mining operations stopped in 1920, except for the removal of “dump-ore,” which occurred between 1949 and 1950.

Ely Copper Mine was among the top ten copper producing operations for a period of its history, with an average annual production of 1 million pounds of ingot copper and an estimated total copper production of 20,000 tons. It was the only copper mine in Vermont that successfully produced refined ingot copper on a large scale (Kierstead, 2001).

The Site is currently privately owned by Ely Mine Forest, Inc. and Green Crow Corporation. The land is undeveloped and generally undisturbed since cessation of mining activities. The current land use of the Site is reportedly limited to management for commercial timber harvest. There are no residents or buildings on the Site. The Site is frequented for recreational use by individuals driving off-road vehicles, hunters, hikers, and spelunkers.

2.1.1.3 History of Site Investigations

The Site has been investigated by state and federal agencies and private contractors over the past 20 years. Numerous samples of mine tailings, slag, surface water, porewater, soil, sediment, groundwater, fish, soil invertebrates, and small mammals have been collected and chemically analyzed. The results show high levels of metals relative to background concentrations. Metals known to leach from the waste materials and to be found in the Site media are copper, cadmium, cobalt, nickel, and zinc.

The Vermont Department of Environmental Conservation (VT DEC) collected water samples and inventoried fish species in SHB in 1988. The VT DEC also concluded in 1991 that copper affected the macroinvertebrate community of SHB, downstream of the confluence with Ely Brook. A second macroinvertebrate survey on SHB was conducted by the Bureau of Mines in 1995 to determine the impact of Site discharge. The study concluded that mine drainage had "slightly" impacted the water quality of SHB as noted by physical and biological factors.

From 1998 through 2002, several studies by USGS (Hammarstrom, et al., 2001; Piatak, et al., 2003, and Piatak, et al., 2004) were conducted to characterize the geochemistry of the mine waste present at Ely Mine. Specifically, these studies focused on the mineralogy and acid-producing potential of the waste.

More studies in support of the Aquatic BERA were performed between 2003 and 2007 on Ely Brook, SHB, and the EBOR. These studies consisted of additional sampling (surface water, sediment, and porewater), habitat quality surveys, community surveys (benthic invertebrates and fish), tissue residue analysis (fish), and laboratory and field toxicity testing (invertebrates, fish, and amphibians).

Studies in support of the Terrestrial BERA were performed between 2009 and 2010 in on-site terrestrial habitats and in on-site vernal pools. These studies consisted of additional soil sampling, vernal pool surveys and sampling, and tissue residue analysis (soil invertebrates and small mammals).

2.2 Screening-level Problem Formulation and Ecological Effects Evaluation (Step 1)

The components of Step 1 in the ERA process are as follows:

- Ecological Setting
- Preliminary CSM
- Preliminary Endpoints
- Site Studies and Available Data
- Data Evaluation and Reduction
- Data Summary
- Development of Screening-Level Benchmarks

2.2.1 Ecological Setting

Part of the problem formulation is to assess whether the COPECs and ecological receptors co-occur, resulting in exposure and the potential for adverse effects. A principal component in making this determination is the evaluation of the ecological setting.

The purpose of this ecological setting subsection is to present the key findings of previous biological assessments at the Site. This information, in conjunction with information provided in the Site contaminant characterization, is integrated so that the reader can follow the problem formulation development process that ultimately results in the selection of assessment endpoints. The ecological setting description has been divided into the following subsections: general habitat description; common wildlife; and threatened and endangered species and species and habitats of special concern.

2.2.1.1 General Habitat Description

In November 2004, URS Corporation (URS) ecologists conducted an extensive characterization of terrestrial habitat at the Site and surrounding areas; wetlands and aquatic habitats were characterized qualitatively. The results of the terrestrial habitat characterization indicate that forests are the predominant covertype in the Ely Mine study area. These forests provide the greatest foraging, nesting, and cover habitat for potential receptors inhabiting the Site. Various types of insects, birds, mammals, amphibians, and reptiles that represent multiple trophic levels of the terrestrial food chain likely utilize these forested areas. Areas that have been disturbed by mining operations, particularly areas containing waste rock and mine tailings provide minimal habitat value for wildlife receptors.

Four major terrestrial cover types and two variant cover types were identified and are discussed in more detail below. Unless otherwise noted, the following habitat and common wildlife descriptions are essentially verbatim from the April 2005 URS *Habitat Characterization Report* for Ely Mine (URS, 2005). A habitat map is presented as Figure 2-3. Lists of species observed or potentially present at the Site based on professional judgment and known habitat associations are provided in Tables 2-1 and 2-2.

In addition, this section presents information about the four vernal pools identified in the 2009 Site visit.

Northern Hardwood Forest

The Northern Hardwood Forest is the predominant covertype in the study area, providing the matrix for all other communities. The Northern Hardwood Forest is described as a variable community that is generally dominated by American beech (*Fagus grandifolia*), yellowbirch (*Betula alleghaniensis*), and sugar maple (*Acer saccharum*); red maple (*Acer rubrum*) is also a major component of the community (Thompson and Sorenson, 2000). The canopy within the Northern Hardwood Forest covertype is predominantly comprised of these species, although, relative abundances of these species vary by location. Other common canopy species include northern red oak (*Quercus rubra*), white birch (*Betula alba*), and gray birch (*Betula populifolia*). In general, the predominance of oak in the canopy increases with increasing elevation. Canopy species were generally 60 to 70 ft tall, with a diameter breast height (DBH) of about 10 inches. Common understory species of the Northern Hardwood Forest include striped maple (*Acer* *pensylvanicum*), fern species, trailing ground pine (*Lycopodium digitatum*), princess pine (*Lycopodium obscurum*), and saplings of dominant canopy species. Two variants of the Northern Hardwood Forest covertype were also observed within the study area and are described below.

> Northern Hardwood Forest – Poplar: A narrow band of poplar-dominated hardwood forest is present to the west of Ely Brook. This covertype is dominated by quaking aspen (*Populus tremuloides*) and big-toothed aspen (*Populus grandidentata*).
>
> Northern Hardwood Forest – American Beech/Eastern Hop Hornbeam: The composition of the Northern Hardwood Forest changes at the top of the northwest-southeast trending ridge that separates the northern portion of the study area. On the south face of the ridge, the forest composition was similar to the composition of the Northern Hardwood Forest observed in the southern portion of the study area, with an abundance of white and gray birch. On the north face of the ridge, white and gray birch were largely absent, having been replaced with greater cover of American beech and eastern hop hornbeam (*Ostrya virginiana*).

Red Spruce Northern Hardwood

Lower elevations in the Ely Brook valley were characterized as Red Spruce Northern Hardwood Forest. This covertype is related to the Northern Hardwood community, but contains a greater abundance of softwood species including red spruce (*Picea rubens*), eastern hemlock (*Tsuga canadensis*), and balsam fir (*Abies balsamea*) (Thompson and Sorenson, 2000). In the study area, the Red Spruce Northern Hardwood covertype is associated with the riparian corridors of Ely Brook and SHB; it is also predominant at the bottom of the valley outside of the riparian corridor.

Disturbed/Transitional Areas

Vegetation in some portions of the study area is sparse or dominated by pioneering or early successional species, indicating prior disturbance of the landscape. Disturbance of terrestrial areas within the study area is primarily associated with mine tailings deposition and mining operations activities. Major types of terrestrial disturbance are summarized in the following sections.

Mine Tailing and Waste Rock Areas: The former Bureau of Mines (aka U.S. Department of Energy) estimated that mining production generated approximately 100,000 tons of tailings and slag on the Ely Mine property. Dump piles of tailings and development rock were placed on the southern face of the northwest-southeast trending ridge and near Ely Brook at the bottom of the valley. An area containing roast beds was situated east of Ely Brook. At the southern edge of the Site, a smelter area and a slag pile are situated on either side of Beanville Road. All totaled, waste rock areas cover approximately 16.8 acres of the property. Areas disturbed by mining operations are generally characterized by sparsely vegetated reddish brown tailings and slag material. Species occurring in mine tailings areas include birches, particularly gray birch, white pine (*Pinus strobus*), red spruce, and aspen species. Growth of these species is generally stunted, with an average DBH of approximately one to two inches.

Other Mine-Associated Disturbance: Mining and associated activities have resulted in additional disturbance of terrestrial habitat within the study area. Mine features located on the south face of the northwest-southwest trending ridge include several adits and a large mine entrance. In the southeast corner of the study area, a stone smoke flue was constructed from the bottom of the valley near the smelter to the top of the ridge. The remnants of numerous structures associated with mining operations are also found throughout the study area.

Upland Meadow

An upland meadow community exists in the southwest portion of the study area. This area is characterized by pioneering or early successional species including goldenrod (*Solidago spp.*) and blackberry (*Rubus spp.*); scattered apple trees (*Malus sylvestris*) and poplars were also observed in the area. Historic foundations and the presence of apple trees suggest that this area was once associated with a homestead or series of homesteads.

Vernal Pools

In May 2009, a Site visit was conducted by Avatar, Nobis, and USFWS in order to identify potential vernal pool locations within the Site study area. The definition of what constitutes a vernal pool varies from state to state. Although a regulatory definition of a vernal pool for the

State of Vermont was not identified, the Vermont Fish and Wildlife Department webpage (VTFW, 2009) provides a very general definition based primarily on hydrology. For the purposes of this assessment, vernal pools are being defined as “small depressions” that appear to hold water for at least 2-3 months, that lack breeding fish populations and which support breeding of wood frogs or mole salamanders or contain fairy shrimp.

Four potential vernal pools/complexes were identified as follows:

Vernal Pool 1 Complex (VP-1) – Located in the southeast end of the smelter area. The large pool was irregular in shape and approximately 45 meters (m) x 20 m with a heavy iron floc present throughout. Egg masses in the large pool appeared to be suffering a high mortality rate; neighboring small pools did not contain any egg masses, but a dead bullfrog was observed. (Appendix A, Photo 1)

Vernal Pool 2 – This ditch/swale is located in a mature conifer forest and was approximately 200 m long. It contained 4 wood frog egg masses, 2 gray tree frog egg masses and 2 spotted salamander egg masses. It is connected to an emergent wetland just north of it which contained 5 wood frog egg masses. (Appendix A, Photo 2)

Vernal Pool 3 – This short narrow ditch is located in an open canopy deciduous forest and could be considered part of a small wetland complex. The ditch is approximately 5 m x 2 m and appears to be an old excavated pit. It contained 2 wood frog egg masses. Water flows in and out of the pool, in which numerous mosquito larvae and midge larvae were observed. (Appendix A, Photo 3)

Vernal Pool 4 – This pool is located in a mature deciduous forest stand with almost 100% crown cover. The pool is adjacent to an extensive emergent wetland area (in which several wood frog egg masses were observed) that appears to be part of the Ely Brook headwaters and is probably not impacted by mine-related activities. It is an oblong pool approximately 5 m x 2 m that contained 2 wood frog egg masses, 1 gray tree frog egg mass, and 2 spotted salamander egg masses. (Appendix A, Photo 4)

2.2.1.2 Common Wildlife

In addition to individual species or signs observed during numerous Site visits, potential receptors were identified for each covertype based on species lists provided in Thompson and Sorenson (2000). A list of potential wildlife receptors associated with each covertype is presented in Table 2-2 and discussed in the following sections.

Northern Hardwood and Red Spruce Northern Hardwood Forests

The Northern Hardwood and Red Spruce Northern Hardwood Forests likely provide the greatest habitat value for ecological receptors within the study area. The Red Spruce Northern Hardwood Forest is often surrounded by Northern Hardwood Forest, so it is probable that similar receptors utilize both covertypes (Thompson and Sorenson, 2000). The forests provide an abundance of seeds and nuts to support granivorous birds including grosbeaks, finches, ruffed grouse, and sparrows; and herbivorous mammals including squirrels, chipmunks, voles, mice, and porcupine. Large herbivores potentially occurring in the forests include white-tailed deer and moose. The development of a thick mat of leaf litter material on the forest floor likely supports a diverse community of litter invertebrates. This litter invertebrate community provides food to insectivorous birds including robins, thrushes, and woodcock; other insectivores include shrews, moles, snakes, and frogs. Top predators in the forest covertypes likely include red fox, coyote, bobcat, fisher, owls, and hawks. Black bear are large omnivorous mammals that also potentially occur in forests in this area. Wetland and aquatic habitats located within the forest matrix likely support amphibians and aquatic-foraging birds and mammals (such as mink). Wetlands and aquatic habitats likely provide habitat for salamanders and frogs.

Disturbed/Transitional Areas

Disturbed/transitional areas, particularly those containing waste rock or mine tailings, provide less habitat value to wildlife than forested habitats. Sparse and stunted vegetation on the mine tailings areas provide limited cover and forage for wildlife. Wildlife observed in the mine disturbed areas included passerine birds and several small mammal species captured during the small mammal trapping effort. Wild turkey have been seen nesting (with eggs) in the transitional area adjacent to the roast beds, in a stand of sweet fern. Tracks of moose (*Alces alces*) and white-tailed deer (*Odocoileus virginiana*) were observed in the floodplain of Ely Brook. For the most part, these receptors do not appear to be utilizing mine-disturbed areas for cover or foraging, but rather for movement to and from adjacent forested habitats. The presence of bat populations in the mine workings area has been confirmed in previous surveys at Ely Mine. These investigations indicate that the mine is considered a historic hibernaculum for Indiana bat (*Myotis sodalis*) and that there is a consistent record of state threatened Eastern small-footed bat (*Myotis leibii*) using Ely Mine since 1937 (Scott Darling, VTF&W, pers. comm.). In addition to these species, the following species of bats have been documented in the mine workings: big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and eastern pipistrelle (*Pipistrellus subflavus*).

Upland Meadow

The upland meadow covertype provides limited habitat value relative to the adjacent forested habitats. No wildlife was observed in the upland meadow during the field survey. However, this area likely provides limited foraging, nesting, and cover resources to small mammals and passerine birds. White-tailed deer, raptors (red-tailed hawk), and possibly black bear may potentially utilize this habitat for foraging, but likely seek cover in more densely vegetated habitats.

2.2.1.3 Threatened and Endangered Species, and Species and Habitats of Special Concern

For the Habitat Characterization (URS, 2005), inquiry was made to the Vermont Nongame and Natural Heritage Program (VTNNHP) as well as the USFWS New England Field Office to determine whether state- or federally- listed species had been documented in the Site area. A response from the Vermont Department of Fish and Wildlife, dated November 4, 2002, indicated that Ely Mine was considered a historic hibernaculum for Indiana bat (*Myotis sodalis*) and that there is a consistent record of state-threatened Eastern small-footed bats using Ely Mine since 1937. Further discussions with Scott Darling, Vermont Fish and Wildlife Department biologist indicated there was no documentation of other state- or federally-listed species in the Site area. However, the State of Vermont is currently evaluating the possibility of adding the northern long-eared and little brown bats to the state's threatened and endangered species list.

Correspondence from Scott Darling dated November 1, 2010 and information provided by Scott Darling at the Ely Mine Ecological Team Meeting (December 13, 2010) indicated that there may be increasing numbers of small-footed bats in the mine chambers at Ely Mine. A 2010 survey of the Ely Mine bat population identified the following numbers of bats/species: 35 little brown; 230 small-footed; 219 big brown; and 5 tri-colored. Northern long-eared bats have essentially disappeared from Ely Mine based on this most recent survey. The white nose syndrome appears to be impacting the small-footed and big brown bats the least. However, USFWS considers all northeast cave-dwelling bats in danger of extirpation if white nose syndrome continues to spread unchecked.

A response from the USFWS, dated March 18, 2003 also mentioned the confirmed presence of small-footed bats on the Site as well as the possibility of the federally-listed endangered Indiana bat. The USFWS also indicated the potential for transient bald eagles (*Haliaeetus leucocephalus*), which are afforded protection under the Bald and Golden Eagle Protection Act, to be found on the Site.

Additional inquiries were made to the VTNNHP and USFWS in July 2004 to update previous inquiries of special status species potentially utilizing the Site. The responses indicated that no additional special status species had been identified at Ely Mine.

The most current lists of endangered and threatened plants and animals of Vermont are provided in Appendix B and C, respectively. Changes from the previous reports are:

- the removal of the many-leaved sedge (*Scipus polyphyllus*), peregrine falcon (*Falco peregrines*), and osprey (*Pandion haliaetus*) as state endangered species; and
- the addition of the dwarf chinkapin oak (*Quercus prinoides*), pygmy water-lily (*Nymphaea liebergii*), eastern racer (*Coluber constrictor*), and eastern ratsnake (*Pantherophis alleghaniensis*) as state endangered species.

It is doubtful that the water-lily is on the Site as it has been found in only one location in Vermont – a eutrophic lake (Hellquist, 2003). The only confirmed state sighting of the eastern ratsnake was in western Vermont and the eastern racer's presence at the Site is doubtful due to its preference for open pastures and meadows. As there are oaks on the Site, the presence of the dwarf chinkapin oak is possible.

2.2.2 Preliminary Conceptual Site Model

Based on the habitat types and potential contaminant migration, a preliminary CSM was developed for the terrestrial and vernal pool habitats. Together with Figure 2-4, the CSM narrative presented herein outlines the exposure pathways and routes, exposure media and routes of exposure, ecological receptors for each potentially affected habitats, and exposure areas.

Potential ecological exposure pathways illustrate ways in which stressors (e.g., contaminants) are transferred from a contaminated medium to ecological receptors. The following is a list of exposure pathways by which terrestrial receptors and vernal pool occupants may be exposed to chemical contamination at the Site:

- Vascular plants – direct contact with soil.
- Soil invertebrate community – ingestion and direct contact with soil.
- Birds and mammals – direct and indirect ingestion of soil contaminants (i.e., incidental ingestion of surface soil while foraging and consumption of plants, insects, and small mammals that may have taken up Site contaminants).
- Vernal pool biota – direct contact and ingestion of surface water and sediment.

These potential exposure pathways are illustrated in the ecological CSM (Figure 2-4). Although the inhalation of contaminants associated with fugitive dust is a potential exposure pathway for birds and mammals, the pathway is expected to be a relatively minor source of exposure; and, therefore is not included.

In addition to the direct or indirect ingestion of contaminated soil, the potential for food chain impacts of bioaccumulative chemicals (e.g., metals) in terrestrial systems is well recognized. Because of the significant bioaccumulation potential associated with copper and several other metals present at the Site, and the potential risk to terminal receptors in the food chain (i.e., species that have no predators of their own), representative upper trophic level receptors are evaluated as part of the BERA. Because carnivores and omnivores generally represent the terminal receptors in terrestrial systems, avian and mammalian species foraging upon resident biota may be at substantially higher risk than those receptors at a lower trophic level.

2.2.2.1 Potentially Exposed Populations

The Terrestrial BERA cannot evaluate potential adverse effects to every plant, animal or community present and potentially exposed at the Site. Therefore, receptors that are ecologically significant, of high societal value, highly susceptible, and/or representative of broader groups are typically selected for inclusion in the BERA. The following is a list of receptors and communities to be evaluated in the BERA. Specific exposure pathways for each receptor are provided in Figure 2-4.

Terrestrial Habitat

- Vascular plants
- Soil invertebrates/microbes
- Herbivorous birds/mammals (song sparrow – *Melospiza melodia* and deer mouse – *Peromyscus maniculatus)*
- Invertivorous bird/mammals (American robin – *Turdus migratorius* and short-tailed shrew – *Blarina brevicauda*)
- Carnivorous birds/mammals (American kestrel – *Falco sparverius* and mink – *Mustela vison*)

Vernal Pools

- Aquatic community
- Amphibian populations

Note that these receptors differ slightly from what was presented in the *Conceptual Site Model – Technical Memorandum* (Nobis, 2009). The vernal pool habitats were added to the terrestrial evaluation after the release of that memorandum. In addition, the omnivorous birds/mammals were removed from the evaluation as it is anticipated that the evaluation of herbivorous birds/mammals and carnivorous birds/mammals would bracket risk. Lastly, the herbivorous mammal was changed from the meadow vole to the deer mouse as the deer mouse (not the meadow vole) was found to be more abundant in on-site habitats.

2.2.2.2 Exposure Areas

Two categories of terrestrial exposure areas were considered:

1) “Barren Areas” – That is the source areas, or the existing waste piles, roast beds, slag piles, etc. that have little or no vegetation, are acid-generating with low pH, and are known to contain contaminant levels and environmental conditions resulting in adverse ecological impacts. The barren areas comprise approximately 17.7 acres of the 350 acre Site. Although impacts to the plant and animal communities at these areas are obvious, population-level impacts to the terrestrial communities are localized. It is also important to note that low pH associated with waste material is a significant contributor to the impacts that are observed (see earthworm discussion). Low pH, by itself, would not drive a CERCLA remedy and; therefore, question exists as to the need to further evaluate these areas as part of the terrestrial ERA. (Note: Metals and leaching from these areas and the impacts are assessed in the aquatic ERA.)

2) “Transition Zone” – That is areas of the Site that were considered “transition zones” adjacent to and downgradient of the source areas that, although vegetated, may have the potential to cause ecological harm. Vegetated areas were initially divided into three exposure areas (i.e., those associated with the upper waste pile; lower waste pile and roast bed; and smelter, slag, and flue areas). After discussions with EPA, it was determined that habitat conditions in these three areas were relatively homogeneous; and; therefore, they were combined into one Site-wide exposure (i.e., “Transition Zone”) to simplify risk estimation.

As previously mentioned, one aquatic exposure type was considered – i.e., vernal pools.

The barren areas are not evaluated quantitatively in this Terrestrial BERA, but will be discussed in the Uncertainty Analysis. It is assumed that, due to the barren nature of these areas, that unacceptable ecological impacts are demonstrated and that these primary source areas will be addressed during subsequent remediation activities. As such, the areas to be evaluated in this risk assessment are as follows:

- Transition zones bordering the source areas – Biological and surface soil sampling for the Terrestrial BERA focused on transitions zones adjacent to and down-gradient from the source areas; sampling in these areas occurred along a contaminant gradient when present.

- Vernal pools – Each vernal pool will be considered individually.

2.2.3 Preliminary Endpoints

A critical early step when conducting an ERA is deciding which aspects of the environment will be selected for evaluation, because not all organisms or ecosystem features can be studied (EPA, 2003a). Endpoints are defined as ecological characteristics (e.g., invertebrate survival) that may be adversely affected by site contaminants (EPA, 1992a). In the ERA process, two distinct types of endpoints are identified: assessment endpoints and measurement endpoints.

Assessment endpoints are "explicit expressions of environmental values to be protected, operationally defined as an ecological entity and its attributes" (EPA, 1998).

A measurement endpoint is defined as "a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint." Measurement endpoints link the conditions existing on-site to the goals established by the assessment endpoints through the integration of modeled, literature, field, or laboratory data (Maughan, 1993).

It is desirable to have more than one measurement endpoint for each assessment endpoint (if the assessment cannot be measured directly), thereby providing multiple lines of evidence for the evaluation. However, in Steps 1 and 2 of the ERA process, known as the screening-level ERA that is often used as the COPEC selection process, it is important to quickly determine what contaminants, if any, have the potential to cause harm to the ecological receptors on-site. As such, the preliminary measurement endpoints are medium-specific benchmarks that are used as conservative screening levels to determine COPECs as noted below.

Receptor	Assessment Endpoint	Measurement Endpoint
Terrestrial Plants	Plant growth, yield, or germination	Ecological effects quotient based on COPEC soil concentration comparison with the most sensitive soil-based ecological benchmark.
Invertebrates	Growth, reproduction, or activity	
Herbivorous Mammals	Survival, growth, or reproduction	
Invertivorous Mammals	Survival, growth, or reproduction	
Carnivorous Mammals	Survival, growth, or reproduction	
Herbivorous Birds	Survival, growth, or reproduction	
Invertivorous Birds	Survival, growth, or reproduction	
Carnivorous Birds	Survival, growth, or reproduction	

Receptor	Assessment Endpoint	Measurement Endpoint
Vernal Pool Aquatic Life	Survival, growth, or reproduction	Comparison of surface water chemistry with freshwater benchmark values.
Vernal Pool Amphibians	Survival, growth, or reproduction	

Specific benchmarks to be used are presented in Section 2.3.1.

2.2.4 Site Studies and Available Data

As noted in Section 2.1.1.3 – History of Site Investigations, investigations have been ongoing for 20 years. The available data from each source was reviewed and a determination was made as to its usability for ERA purposes. The approach followed to determine the datasets for the ERA was to ensure suitable spatial coverage, to utilize relatively recent data, and to provide adequate sample size. The sections below discuss chemistry, toxicity test results, and bioavailability data relevant to the Terrestrial BERA.

2.2.4.1 Chemistry Data

2.2.4.1.1 URS Data

From 2004 through 2007, URS, in conjunction with the United States Army Corps of Engineers (USACE) and EPA, completed preliminary field sampling investigations at the Site. These completed field sampling investigations included test pits and borings in waste areas, monitor well installation, and collection of surface and subsurface soil samples from the Site. All of the URS collected data were analyzed for Target Analyte List (TAL) metals and most samples received Tier II validation (URS, 2004). A summary of URS data is presented in the Remedial Investigation Data Report (URS, 2008).

2.2.4.1.2 Nobis Data

Nobis conducted extensive field sampling investigations in 2009 in support of the current Remedial Investigation/Feasibility Study (RI/FS). Soil sampling was conducted during several phases of Site investigation activities including surface soil transects for x-ray fluorescence (XRF) field screening and laboratory analysis to assess the limits of waste areas. Additional surface soil samples were collected from selected locations within the transitional zones bordering unvegetated waste areas to assess the potential impact beyond the waste area footprints. Surface and subsurface soil samples were also collected from soil boring and monitoring well locations to assess the characteristics of waste materials and underlying natural soils. Although useful for characterizing the extent of Site-related contamination, the XRF data were not used quantitatively to estimate risk in the ERA; however, XRF data are assessed qualitatively in the Risk Characterization (Section 4).

Surface soil samples (including duplicates) were collected from 39 locations throughout the Site. Sample intervals ranged from 0 to 0.2 ft below ground surface (bgs) to 0 to 2 ft bgs. In several locations, multiple samples were collected at consecutive depths. With the exception of two samples, all surface soil samples were submitted for Contract Laboratory Program (CLP) laboratory analysis of TAL metals. Select samples were also submitted for Delivery of Analytical Services (DAS) laboratory analysis of acid-base accounting (ABA), paste pH, paste conductivity, total organic carbon (TOC), synthetic precipitate leaching procedure (SPLP) metals, and cation exchange capacity (CEC).

Soil borings were advanced at 8 locations. Seven of the soil borings were completed as overburden well installations and one soil boring was completed without a well installation. During boring advancement, multiple soil samples were collected at discrete intervals in each location. A total of 25 samples were collected (approximately 3 from each boring) and submitted for CLP and DAS laboratory analysis of TAL metals, ABA, paste pH, and paste conductivity. In addition, 6 samples were submitted for SPLP metals analysis.

Over 250 surface soil samples (including duplicates) were collected along 25 transects. The sample intervals ranged from 0 to 0.5 ft bgs to 2.5 to 4 ft bgs. The samples were submitted to the EPA's Office of Environmental Measurement and Evaluation (OEME) on-site mobile laboratory and screened for select metals using XRF. Based on the results of the XRF screening, 32 of the samples were submitted for CLP laboratory analysis of TAL metals. Select samples were also submitted for DAS analysis of ABA, paste pH, and paste conductivity.

Five vernal pool samples (including duplicates) were collected from 4 locations (see Figure 2-5). Surface water samples were collected at each location and submitted for laboratory analysis of TAL metals (total and dissolved), pH, conductivity, alkalinity, sulfate, chloride, and nitrate.

In September 2009, 30 small mammal and 7 soil invertebrate samples were collected in support of the ERA. Small mammals were collected along transects, located throughout the study and background areas (see Figure 2-5).

Transects were positioned with the aid of USFWS and EPA personnel in an effort to evaluate small mammal presence and subsequent whole body chemistry. Specifically, transects were located in areas adjacent to well-established waste piles and contaminated areas (i.e., upper and lower waste pile areas; roasting bed; and smelter/slag area). Most transects consisted of ten trapping stations with two baited traps at each location.

A summary of all small mammals captured using previously established exposure area designations, of all mammals captured is presented below. (Note: Small mammal samples were combined for subsequent analyses.)

Small Mammal Capture Summary

	Species						
Location	**Deer Mouse**	**Short-tailed Shrew**	**Red-backed Vole**	**Woodland Jumping Mouse**	**House Mouse**	**Masked Shrew**	**Meadow Jumping Mouse**
Exposure Area 1	16	3	12	1			
Exposure Area 2	8		7	4	1		
Exposure Area 3	11	6	6	2		2	
Background	3	9		13			1

Each small mammal collected was identified to species and several metrics (total length, tail length, hind food length, weight, sex, and reproductive condition) were collected. Species collected and analyzed as whole-body samples were the deer mouse, short-tailed shrew, and woodland jumping mouse (*Napaeozapus insignis*). These species were the most frequently captured, included omnivores and carnivores, and allowed for comparison to background individuals.

The seven soil invertebrate samples (five on-site and two reference area samples) were collected. Most samples were collected by hand and with nets and the composition was dominated by grasshoppers, crickets, ground beetles, and spiders. Only 3 individual earthworms were observed and collected during this sampling event. All biological tissue data collected was subsequently used as input values for appropriate avian and mammalian food chain models.

General chemistry tests were validated to Tier I. For metals analysis of soil, biota, and surface water, 90% of the data were validated to Tier II and the remaining 10% were validated to Tier III.

2.2.4.2 Toxicity Tests

2.2.4.2.1 Earthworm Bioaccumulation and Toxicity

Chronic 14-day (2009) and 28-day (2010) earthworm (*Eisenia fetida*) bioaccumulation and toxicity tests were conducted by EPA using three pH-adjusted soils collected at the Site (TechLaw, 2011). The objective of this study was to determine if the survival or growth of worms exposed to Site soil differed significantly when compared to reference area soil and to derive Site-specific soil-to-invertebrate bioaccumulation factors. Any bioaccumulation factors derived potentially would be used in any remediation calculations, but not in the BERA as the use of the Site-specific soil invertebrate calculations are inherently less uncertain. The results of this study are presented in Subsection 4.2.2.1.

2.2.4.2.2 Amphibian Toxicity Study

In May 2007, EPA conducted an *in situ* amphibian toxicity study in the pond area of the east branch of Ely Brook. This study evaluated hatching and survival of wood frog (*Rana sylvatica*) eggs and tadpoles exposed to on-site reference conditions (Pond 1) and two ponds (Ponds 4 and 5) that receive contaminant runoff/discharge from existing waste material piles. The results of this study are presented in the *Aquatic Baseline Ecological Risk Assessment* for the Site (EPA, 2010a). The amphibian toxicity study was developed in response to the presence of large numbers of amphibian egg masses and individuals observed in the east branch of Ely Brook. The findings of this study can be used to assess potential risks present in the four vernal pools identified (see Figure 2-5) during a Site-wide survey conducted in May of 2009 because all four of these on-site pools contained amphibian egg masses (Avatar, 2009).

Although the findings of the amphibian toxicity study did not result in the development of a Site-specific, effects-based benchmark; the results did mimic findings observed in a prior fathead minnow study (*Pimephales promelas*) conducted as part of the Aquatic BERA (EPA, 2010a). It was, therefore, recommended by EPA that aquatic toxicity information for the fathead minnow, of which there is an extensive literature database available, could be used as a surrogate for assessing potential effects to amphibians present in the vernal pools identified on-site. A comparison of surface water chemistry results from the on-site vernal pools to appropriate benchmarks (both AWQC and fathead minnow toxicity information) is provided in Section 4 (Risk Characterization) of this report.

2.2.4.3 Bioavailability Data

In addition to bulk chemistry and amphibian toxicity information, several parameters related to metal fate and transport and bioavailability were collected as part of the soil and waste material characterization activities. In a risk assessment context, bioavailability of metals is the extent to which bioaccessible metals adsorb onto or absorb into and across biological membranes of organisms, expressed as a fraction of the total amount of metal the organism is proximately exposed to (at the sorption surface) during a given time and under defined conditions. To better characterize the risk presented by metals in the environment to ecological receptors, the processes that affect metal speciation (chemical form in the environment) and the effects of speciation on metal bioavailability must be understood (McGreer, et al., 2004).

Specifically, it is important to understand the influence of environmental characteristics on metal speciation as well as the speciation of metals within an organism. A central underlying premise in evaluating the impacts of metals to ecological receptors is that they must be accumulated above, or in rare cases of deficiencies, depleted below normally regulated levels by the receptor in order for an effect to be elicited. The bioaccessibility, bioavailability, and bioaccumulation properties of metals in soil, sediments and aquatic systems are complex (McGreer, et al., 2004).

Site-specific metal bioavailability is influenced by three primary factors (McGreer, et al., 2004):

1) exposure route (oral route dominates for terrestrial vertebrates);

2) metal type (metals cannot be easily lumped together, because their salts or forms vary substantially); and

3) receptor (type and condition of the receptor(s) substantially effect bioavailability).

To better characterize the risks presented by metals in the environment to ecological receptors, the processes that affect metal speciation and the effects of speciation on metals bioavailability should (whenever possible) be addressed through the collection of relevant Site-specific data or, at a minimum, acknowledged in the Uncertainty Analysis when evaluating ecological risks at sites where metals are the primary COPECs.

Although metal-specific speciation evaluations were not conducted for this assessment, numerous environmental parameters (e.g., ABA, acid generation and neutralization potential, CEC, saturated paste conductivity, sulfur parameters, and TOC) that can be used to estimate potential metal availability were collected for a subset of the surficial soils data. These additional parameters are summarized in Table 2-3.

In addition to the Site-specific parameters noted above that can be used to estimate potential metal availability, United States Geological Survey (USGS) (Piatak, et al., 2007) performed a sequential extraction study on soils from several mining sites in the Northeast, including Ely and Pike Hill Mines. Sequential extraction is an analytical process that chemically leaches metals out of soil, sediment, or sludge samples. The purpose of which is to mimic the release of the selective metals into solution under various environmental conditions (Divvela, 2010).

A 1.0 gram (g) soil sample was subjected to progressively more aggressive extractions, starting with step 1 which released soluble, absorbed and exchangeable metals, and ending with step 7 which uses concentrated acids to complete the digestion (Figure 5 in Piatak, et al., 2007). The concentration of a metal released by each sequential extraction was then summed to obtain a total concentration for that metal. In theory, the sum of the concentrations from each sequential extraction should equal the original total element concentration of the solid sample (bulk total).

It is not known which combination of the seven extraction steps most closely mimics a stomach environment. Robert Seal (USGS, pers. comm.) was of the opinion that the sum of the concentrations obtained from serial extraction steps 1 through 4 might provide a reasonable approximation. The first three steps used relatively mild acid extractions at room temperature to obtain the soluble, adsorbed and exchangeable fraction (step 1), the carbonate fraction (step 2), and the organic fraction (step 3). The fourth sequential extraction used hydrochloric acid (typical of stomach environments) at 50°C for 30 minutes to release the fraction represented by amorphous iron and aluminum hydroxides plus amorphous and crystalline manganese oxides. The remaining three steps used increasingly more aggressive acids at higher temperatures (90°C) to continue the extractions, until the original sample was completely digested down to silicate residuals.

An analysis of the ratios of metal concentrations, following extraction steps 1-4 to total metal concentrations per sample as provided by USGS (Piatak, et al., 2007) were presented in TechLaw (2011; Appendix D). The following conclusions were drawn from this analysis:

- With only a few exceptions, the sums of the concentrations of the seven extraction steps exceeded their corresponding bulk concentrations. This trend suggested that the sequential extractions released more metals from the mine soils compared to the "one time" aggressive acid extraction used in routine soil analyses.

- The data for extraction steps 1 through 4 ("bioavailable fraction") showed that the vast majority of a metal was released only under the highly aggressive methods used in steps 5 through 7. Serial extraction steps 1 through 4 made up less than 10% of the total concentrations; i.e., 2.9% and 3.5% for copper, and 1.7% and 3.0% for zinc, respectively. These values showed that only a small fraction of the total metals in Site wastes may actually be released in a stomach environment.

This information will be used in the Uncertainty Analysis to further assess potential ecological exposure and associated effects that may be present on-site.

2.2.5 Data Evaluation and Reduction

The following narrative provides a discussion of the data evaluation and data reduction procedures that were used to summarize media-specific data.

The objectives of the data evaluation and reduction are as follows:

- Discuss the quality of the data that are incorporated into the ERA.
- Provide a discussion of data treatment as it pertains to qualified data, duplicate samples, and multiple sampling rounds.
- Summarize data statistically so that appropriate exposure information is readily available and in a form that permits effective comparisons between data groups.

2.2.5.1 Data Usability and Data Validation

EPA Region 1 discusses data usability issues that should be considered in the risk assessment process in its Risk Update 3 (EPA, 1995a). Data usability is defined as the process of ensuring that the quality of the data meets the intended uses and satisfies the DQOs established for sampling and analysis. Data usability involves assessing both the analytical quality, sampling methodology, and field errors that may be inherent in the data. Factors evaluated include the level of validation (data validation tier) and data quality indicators such as completeness, comparability, precision and accuracy, and analytical detection limits.

EPA Region 1 recommends that all data used in the risk assessment process be validated using Tier II or Tier III validation procedures. In a Tier II validation, quality control (QC) checks are conducted, analytical procedures are assessed, and data are qualified accordingly. In a Tier III validation, in addition to meeting the Tier II requirements, the raw laboratory data are examined to check for calculation errors, compound misidentification, and transcription errors. A Data Validation report is produced for both Tier II and Tier III validations. All soil, biota, and surface water chemistry data used in the ERA were validated to at least Tier II.

The available analytical data for surface soil (0-1 ft bgs; see list in Appendix E), soil invertebrates, small mammals, and vernal pool surface water collected between 2006 and 2009 by URS and Nobis were used in the ERA. These sample locations are depicted in Figure 2-5. For surface water, both dissolved and total metals results were used. The data selection criteria resulted in datasets that are both spatially representative and sufficiently robust for the BERA. Raw data used in this BERA are presented in Appendix F.

2.2.5.2 Data Reduction

Data reduction involves the evaluation of data qualifiers and their potential use in the BERA process and describes the treatment of field duplicate samples. The following guidelines were used in developing the data sets to evaluate risk:

- All “U” qualified data represent samples for which the analyte was not present or was below the sample quantitation limit (SQL) and reported as a non-detect (ND).

- o If an analyte was not detected in any sample (U-qualified) from a given medium, it was not considered quantitatively for that medium. Potential effects of this decision are discussed in the uncertainty analysis.

- o If an analyte was detected within a medium, but not within a specific sample, the full SQL value was used for ND results when calculating summary statistics.

- Estimated values (J-qualified) were used at the reported value.

When field duplicate samples were collected, the following approach was used to calculate the concentrations to be evaluated in the ERA:

- If the analyte was detected in either the primary or duplicate sample and was ND in the other sample, the detected concentration was used.

- If the analyte was either detected or ND in both the original (primary) sample and the field duplicate, the average concentration was used in the ERA unless there was a 50 percent or greater relative percent difference in solid media or a 30 percent or greater relative percent difference in aqueous media, in which case the higher of the two concentrations was used.

2.2.6 Data Summary

Tables 2-3 through 2-11 present the data summaries for the Site media. (Note that the raw data are presented in Appendix F.) The surface soil data were broken out as vegetated, XRF-based vegetated, barren, or background. (As previously noted, the XRF data were not used quantitatively to estimate risk in the ERA, but are assessed qualitatively in the Risk Characterization). Biota samples were broken out as Site or background. Vernal pool sample data are presented on a sample by sample basis for each pool (Table 2-11).

2.2.7 Development of Screening-Level Benchmarks

Based primarily on the preliminary CSM and the available screening-level ecological toxicity values or “benchmarks” for receptors in various media, preliminary assessment and measurement endpoints were selected for this SLERA.

Ecological benchmarks represent medium-specific contaminant concentrations considered protective of biota inhabiting that medium. Ecological benchmarks were obtained from a variety of sources including federal and state regulatory values, EPA, and other agency reports, and scientific literature. At the Site, the potential direct exposure media include soils and vernal pool surface water. As such, the following ecological benchmarks were compiled.

2.2.7.1 Soil Benchmarks

The following hierarchy of sources was used to obtain soil benchmarks:

- *Ecological Soil Screening Levels* (Eco SSLs) (EPA, 2003b and c; 2005a through i; 2006; and 2007b through f)—The EPA has developed Eco-SSLs for seventeen of the inorganics detected on-site: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc. The lowest (i.e., most conservative) Eco-SSL for a specific chemical was selected for use in the COPEC screening.

- *Preliminary Remediation Goals for Ecological Endpoints* (Efroymson et al., 1997a)—Wildlife preliminary remediation goals (PRGs) for soil were derived by iteratively calculating exposure estimates using different soil concentrations and soil-to-biota contaminant uptake models. Uptake models for plants, earthworms, and small mammals were derived from various sources. Because diets dramatically influence exposures and sensitivity to contaminants varies among species, PRGs were developed for six species: short-tail shrew, white-footed mouse, red fox, white-tailed deer, American woodcock, and red-tailed hawk. In this SLERA, the avian or mammalian species that provided the most conservative estimate of exposure were used. Remediation goals based on wildlife exposure are derived from lowest observed adverse effect level (LOAEL) values. To convert these LOAEL-based values to no observed adverse effect levels (NOAEL), a conversion factor of 10 was applied to all values (i.e., the wildlife PRGs were divided by 10 prior to inclusion in the SLERA).

2.2.7.2 Surface Water Benchmarks

The following hierarchy of sources was used to obtain surface-water benchmarks.

- *Federal Ambient Water Quality Criteria (AWQC) for the Protection of Aquatic Life* (EPA, 2009)—This document provides a compilation of the national recommended water quality criteria (WQC) for a wide variety of pollutants, predominantly metals and pesticides, in freshwater and marine. Two sets of criteria for each environment are provided in this guidance, i.e., criteria maximum concentrations (CMCs), and criteria continuous concentrations (CCCs). CMCs represent acute criteria applied as 1-hour average concentrations not to be exceeded more than once in any 3-year period. CCCs represent chronic criteria applied as 4-day average concentrations not to be exceeded more than once in any 3-year period. As the CCC is the more conservative, it was used in this SLERA. Note that several of the metals criteria are hardness-dependent. A default hardness value of 100 milligrams per liter (mg/L) was used to derive all hardness-dependent values.

- *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (EPA, 1999a)—Freshwater Toxicity Reference Values (TRVs). TRVs provided by EPA in this report were identified from screening toxicity values developed and/or adopted by federal and/or state regulatory agencies. For compounds with no available screening toxicity value, TRVs were determined using toxicity values from available scientific literature, followed by the use of surrogates. Uncertainty factors (UFs) were applied to toxicity values, as necessary, to convert toxicity values to a chronic NOAEL.

- *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota—Tier II Values* (Suter and Tsao, 1996) — Using the method described in the *Proposed Water Quality Guidance for the Great Lakes System* (EPA, 1993a), Suter and Tsao developed Tier II values for those constituents that do not have Federal AWQC. Tier II values include secondary acute values (SAVs) and secondary chronic values (SCVs), which correspond to the CMCs and CCCs in Federal AWQC. SCVs were used in this ERA. The Tier II method was developed so that aquatic benchmarks could be established with fewer data than required for AWQC. The Tier II values presented by Suter and Tsao include values developed by EPA (1993a), as well as other Tier II values calculated by the authors using the EPA methodology and information from additional toxicological studies that were rigorously evaluated prior to use.

2.3 Preliminary Exposure Estimates and Risk Calculation (Step 2)

The components of the Preliminary Exposure Estimates and Risk Calculation (Step 2) are as follows:

- Screening Methodology
- COPECs

The potential for ecological risk associated with chemical contamination of terrestrial and vernal pools at the Site first is assessed using a screening-level approach. This approach is intended to serve as the screening-level ecological effects/risk characterization with which to evaluate whether past Site activities and current levels of contamination in each of the principal habitats: (1) clearly indicate little or no potential for adverse effects to ecological resources at the Site; (2) clearly indicate the potential for adverse effects to ecological resources at the Site; or (3) indicate that the available data are inadequate to make a determination. As it is expected that concentrations in the Site-related media are high enough to warrant a BERA be performed, it also provides a final list of COPECs to be carried through the BERA.

Note that the results presented below are based on a conservative screening and that risk estimates for COPECs will be developed later in the BERA process (i.e., Step 7).

2.3.1 Screening Methodology

For the ecological screening analysis, the maximum detected concentration for each chemical in each medium was compared with ecological screening-level values that represent potential scenarios of ecological exposure for that medium.

In this portion of the assessment, potential risks were estimated by comparing single-point estimates of exposure with effects levels, i.e., the hazard quotient (HQ) approach. The HQ approach allows for a standard interpretation of the results (i.e., the HQ reflects the magnitude by which the sample concentration exceeds or is less than the benchmark value). In general, if an HQ exceeds one, the potential for risk exists. Although the HQ method does not measure risk in terms of likelihood or probability of effects at the individual or population level, it does provide a benchmark for judging potential risk (EPA, 1994).

Tables 2-3 and 2-11 present medium-specific benchmark screenings, as well as the summary statistics.

2.3.2 Chemicals of Potential Ecological Concern

A chemical was considered a COPEC in biota if the chemical was detected. For surface water, COPECs are those chemicals that had a maximum detected concentration exceeding the benchmark. Soil COPECs were those chemicals that had a maximum detected concentration exceeding the benchmark or those that were detected in biota. Any exceptions are noted below. Comparisons with background concentrations were not used to select COPECs.

As stated in EPA's Eco-SSL document for aluminum (EPA, 2003b), "Aluminum is identified as a COPEC only for those soils with a soil pH less than 5.5." This is because the soluble and toxic forms of aluminum are only present in soil under soil pH values of less than 5.5. pH values in the transition zones of the Site range from 3.4 to 6.4; therefore, aluminum was retained as a COPEC. Additional discussions regarding the potential for aluminum to cause adverse effects to ecological receptors will be provided in the uncertainty analysis.

The Eco-SSL guidance for iron (EPA, 2003c) states identifying an iron benchmark for soil is difficult because iron bioavailability to plants is dependent upon Site-specific conditions. However, they did conclude that in well-aerated soils, with pH between 5 and 8, the iron demand of plants is higher than the amount available and that toxicity is not expected. As previously discussed, the soils in the transition zone of the Site are as low as 3.4; therefore, iron is retained as a COPEC.

Note that aluminum and iron were not considered COPECs in the Elizabeth Mine ERA as many of the samples had a pH of greater than 5.5 and those that did not were downgradient of the waste piles. As such, it was assumed that source removal would address the pH issue and that aluminum and iron would not be bioavailable (URS, 2006). For the Site, 20 of 23 samples had a pH that would indicate that aluminum and iron would be bioavailable. In addition, most of these samples were collected in areas not directly influenced by waste pile run-off. Therefore, aluminum and iron were retained as COPECs for this Site.

Cyanide was the only analyte not detected in surface soil. However, out of 42 samples, one sample had a concentration (1.8 milligrams per kilogram (mg/kg)) that exceeded the 1.33 mg/kg soil benchmark based on exposure to a vole (Region V ESL). Because of the lack of toxicity data, cyanide was not quantitatively evaluated in the risk assessment, but discussed in the uncertainty analysis.

Essential nutrients (i.e., calcium, magnesium, potassium, and sodium) are not expected to pose any substantial ecological risk to receptors at the Site and are; therefore, not considered COPECs. Potential implications of eliminating iron as an aquatic COPEC are discussed in the uncertainty analysis.

COPECs for all media are presented in Table 2-12.

2.4 BERA Problem Formulation (Step 3)

EPA (2001) defines a risk management goal as "a general statement of the desired condition or direction of preference for the entity to be protected." This goal is often developed independently of the risk assessment process, but important to guide the process toward the ultimate goal.

The following risk management goals are proposed:

1) Maintenance (or return) of soil quality, food source, and habitat conditions capable of supporting a functioning terrestrial ecosystem for the terrestrial plant and animal populations (including individuals of protected species) inhabiting or utilizing the Ely Mine area.

2) Maintenance (or return) of vernal pool water quality such that conditions are capable of supporting breeding populations of reptiles and amphibians utilizing the vernal pools in the Ely Mine area.

The final CSM and assessment/measurement endpoints were developed with these goals, as well as the results of the SLERA (i.e., Steps 1 and 2 presented herein), in mind.

2.4.1 Final Conceptual Site Model

As noted previously, the CSM provides a description and visual representation of the fate, transport, and effects that COPECs may have on the environment and as such, helps identify appropriate measures (measurement endpoints) that can be used to evaluate the assessment endpoints. In essence, the CSM presents a series of working hypotheses regarding how the contaminants might affect ecological components of the natural environment. Risk hypotheses are specific assumptions about potential risk to assessment endpoints and may be based on theory and logic, empirical data, or mathematical or probability models (EPA, 1998). The hypotheses are formulated using professional judgment and available information of the ecosystem at risk, potential COPEC sources and characteristics, and observed or predicted effects on assessment endpoints. As with the entire ERA process, the development of a CSM is a complex, non-linear process, with many parallel activities that may result in modifications to the CSM as additional information becomes available.

Given that the SLERA indicated the potential for concentrations of contaminants in soil and vernal pools may be high enough to adversely affect ecological receptors, the fate and transport, bioavailability, and ecotoxicity of the COPECs were examined more closely to determine if changes to the preliminary CSM would be necessary. These topics, as well as the resulting final CSM diagram, are presented below.

2.4.1.1 Contaminant Fate and Transport

Previous reports by the USGS (Piatak, et al., 2003 and 2004) that described and evaluated waste material chemistry, mineralogy, and metal transport mechanisms at the Site and terrestrial nature and extent studies conducted by URS (2008) and Nobis (see Section 2.1.1.3) were used to confirm potential fate and transport mechanisms that may result in complete exposure pathways for terrestrial receptors. For an exposure pathway to be complete, a contaminant must be able to travel from the source to ecological receptors and be taken up by the receptors via one or more exposure routes. The fate and transport evaluation for this CSM development focused on the following:

- source of contamination;
- transport mechanisms and exposure media;
- routes of exposure and key receptors; and
- ecotoxicity.

2.4.1.1.1 Source of Contamination

As previously discussed in Section 2.1.1, there are numerous source areas for metals contamination that result from historical mining activities at the Site. These sources have been generally characterized as the upper and lower waste piles, the roast bed, the smelter and slag areas and the smoke flue. Additional studies conducted as part the recent RI have tried to further identify the boundaries of the primary contaminant source areas and determine if contaminated waste materials may be present at other locations not previously recognized (i.e., in vegetated transitional zone areas adjacent to primary waste areas). This Terrestrial BERA focuses on the transition zones that border the main source areas. Source areas themselves are predominantly unvegetated and obviously impacted by the presence of mine waste. Therefore, they will only be qualitatively assessed as part of this Terrestrial BERA.

2.4.1.1.2 Transport Mechanisms and Exposure Media

COPECs have reached the vegetated transition zone and vernal pools primarily through the following transport mechanisms:

- surface runoff and deposition;
- suspension and windblown transport;
- trophic transfer through the terrestrial food chain; and
- migration of dissolved COPECs in groundwater to sediment and surface water in vernal pools. (Note: This transport mechanism is known to be present for VP-1.)

In addition, there may be existing waste material underlying surface soil and litter present within the transitional areas. The release of COPECs to potential receptors at any given location depends greatly on their chemical speciation and ambient conditions that affect bioavailability (see Section 2.2.4.3). Once absorbed or assimilated into biota, metals are subject to numerous fate and transport processes including storage, metabolism, elimination and accumulation.

The exposure media of concern for the Terrestrial BERA are: surface soils, soil invertebrates, small mammals, and vernal pool surface water. Although plant tissue was not collected, COPEC concentrations in plant tissue will be estimated when evaluating potential exposure for herbivorous birds and mammals.

2.4.1.1.3 Routes of Exposure and Key Receptors

Based on Site-specific conditions, numerous studies that have evaluated potential ecological risks at sites where metals are the COPECs, it was determined that the exposure pathways of greatest concern were direct contact with surface soils, soil ingestion, and ingestion exposure resulting from food chain transfer. For vernal pools, the primary exposure pathway of concern is direct contact with surface water. A list of the key receptors and exposure pathways that will be evaluated was presented in Section 2.2.2. Primary exposure to a key receptor such as a bat species would be from aquatic invertebrates; therefore, bats were evaluated in the aquatic BERA.

2.4.1.2 Ecotoxicity

EPA regulates metals and their inorganic and organometallic compounds because they have the potential to cause environmental harm. Metals, unlike organic pollutants, do not degrade and have complex environmental chemistry that needs to be considered when assessing potential risk. Because some metals are essential for living organisms (and when not present in sufficient concentration can limit growth, survival and reproduction) and occur naturally in the environment, special attention to metal forms, bioavailability, bioaccumulation, and toxicity need to be considered in the risk assessment process.

In general, heavy metals (HM) are systemic toxins with specific neurotoxic, nephrotoxic, fetotoxic, and teratogenic effects. Heavy metals can directly influence behavior by impairing mental and neurological function, influencing neurotransmitter production and utilization, and altering numerous metabolic body processes. Systems in which toxic metal elements can induce impairment and dysfunction include the blood and cardiovascular, eliminative pathways (colon, liver, kidneys, skin), endocrine (hormonal), energy production pathways, enzymatic, gastrointestinal, immune, nervous (central and peripheral), reproductive, and urinary.

Other critical factors that need to be considered when evaluating metals-related ecological toxicity are: 1) metals naturally vary in concentration across geographic regions and endemic organisms have evolved under these conditions; therefore, making an understanding of local background concentrations important; and 2) metals occur in mixtures and can interact with each other in numerous ways including synergistically and antagonistically.

2.4.1.3 Final Conceptual Site Model Diagram

CSM diagrams are visual representations of the multiple relationships between COPECs and receptors and the pathways of exposure at a site. Evaluation and inclusion of each relationship in the CSM diagram are based on several criteria:

- Data availability;
- Strength of relationship between COPECs and effects;
- Endpoint significance;
- Relative importance or influence of COPECs;
- Importance of effects to ecosystem function.

Information used to develop the CSM is often one of the most significant sources of uncertainty in a risk assessment. This uncertainty arises from lack of knowledge of how ecosystems function in general, and how the system being evaluated functions specifically; how COPECs move through the environment and cause adverse effects; and how the confounding variables associated with multiple contaminants interact.

The availability of historical data on COPECs and receptors, and a comprehensive ecological characterization reduces the uncertainty associated with the development of the CSM at this Site. In addition, the BERA approach presented in this document tries to address some of the key issues identified by EPA in its *Framework for Metals Risk Assessment* (EPA, 2007a), thereby reducing some of the uncertainties frequently encountered in ERAs at sites where metals are the primary contaminants of concern.

Although general uncertainties associated with assumptions are addressed throughout this BERA, a detailed discussion of specific uncertainties and their implications for the interpretation of risk results is reserved for the Risk Characterization.

Given the available information on fate and transport, bioaccumulation, and ecotoxicity of the COPECs, the preliminary CSM presented in Section 2.2.2, Figure 2-4 remains unchanged and is adopted as the final CSM. Again, this flow diagram provides a working, dynamic representation of the relationships that exist between COPECs and key ecological receptors that may be modified as additional information becomes available, and is not meant to characterize all possible mechanisms of exposure or potentially impacted species.

2.4.1.4 Risk Questions/Hypotheses

Risk hypotheses are specific assumptions about potential risk to assessment endpoints and may be based on theory and logic, empirical data, and mathematical or probability models. The hypotheses are formulated using professional judgment and available information of the ecosystem at risk, potential stressor sources and characteristics, and observed or predicted effects on assessment endpoints.

As a component of the development of the CSM, testable hypotheses or “risk questions” are developed to provide the basis for the study design and selection of measurement endpoints. These hypotheses represent statements regarding anticipated ecological effects and define the focus of the individual lines of evidence. In general, the primary question to be asked by the risk hypothesis is “what probabilities are associated with effects of differing magnitudes as a result of exposure of the assessment endpoint to the COPEC?” For this BERA, the major line of evidence used to answer this question is the comparison of an estimated or measured exposure concentration of a COPEC to concentrations known from the literature to be toxic to receptors associated with the assessment endpoint.

2.4.2 Final Endpoints

As noted previously, a critical early step when conducting an ERA is deciding which aspects of the environment will be selected for evaluation, because not all organisms or ecosystem features can be studied (EPA, 2003a). It is, therefore, essential that risk assessors understand the potential relationship of site-related contamination to ecological endpoints so that well informed risk management decisions can be made at the end of the ERA process (Suter, 1989). Final assessment and measurement endpoints are discussed below.

Given the available chemistry data, results of the benchmark screening, and bioavailability information, the preliminary assessment endpoints are adopted as the final assessment endpoints. The final measurement endpoints that are used to evaluate potential ecological risks resulting from exposure to Site media are presented in Table 2-13 with their corresponding assessment endpoints.

Although many of the endpoints presented here are linked to organism-level effects (e.g., survival and reproduction), these endpoints are in fact strong indicators of potential population-level effects (e.g., viability of the song sparrow population within the Ely Mine area). Extrapolation from organism-level to population-level effects may be logically achieved based on the predictive nature of the endpoint.

2.4.3 Weight-of-Evidence Approach

The assessment methods that are used in this BERA consider a variety of endpoints and effects that differ in their suitability for, and sensitivity to, assessing the potential risks at the Site. In assessing ecological risk, not all measurement endpoints are equivalent in their ecological significance or in their ability to predict risk. For example, it can be argued that comparison of chemical concentrations in soils to benchmark values is less compelling than the results derived from a site-specific earthworm toxicity test.

To account for the strengths and weaknesses of different measurement endpoints that will be used in this assessment and to provide a framework for evaluating multiple lines of evidence, a WOE approach will be used. The objective of this WOE framework is to provide a more rigorous consideration of the strengths and weaknesses of various measurements, the nature of uncertainty associated with them, and their potential utility in the ERA. The framework for the WOE approach used in this assessment was developed by the Massachusetts Weight-of-Evidence Workgroup (the Workgroup) and is detailed in the *Special Report of the Massachusetts Weight-of-Evidence Workgroup: A Weight-of-Evidence Approach for Evaluating Ecological Risks* (Menzie, et al., 1996). In this paper, the Workgroup defines the WOE approach as:

> "…the process by which measurement endpoints are related to an assessment endpoint to evaluate whether a significant risk of harm is posed to the environment. The approach is planned and initiated at the problem formulation stage, and results are integrated at the risk characterization stage."

According to Menzie, et al. (1996), WOE is reflected in three characteristics of measurement endpoints: (1) the weight assigned to each measurement endpoint; (2) the magnitude of response observed in the measurement endpoint; and (3) the degree of concurrence among outcomes of multiple measurement endpoints for a given assessment endpoint. The weight assigned to each measurement endpoint is determined prior to the actual assessment of risk. The magnitude of response and degree of concurrence are determined as part of the Risk Characterization (the final step in the BERA process).

The approach provides the option of performing either a quantitative or qualitative WOE evaluation. Regardless of what form the WOE takes, it should provide clear and transparent documentation of the thought processes used when determining potential ecological risk. For this assessment, a more qualitative approach using a low-medium-high significance rating is used to assign weights to different measurement endpoints. The discussion that follows provides a detailed description of the steps taken to conduct the initial WOE for this BERA.

First, weights are assigned to measurement endpoints based on 10 attributes (summarized in Table 2-14) related to: (1) strength of association between assessment and measurement endpoints; (2) data and study quality; and (3) study design and execution. In either a quantitative or qualitative WOE analysis, the process of assigning weights to measurement endpoints can incorporate two elements:

1) The relative importance assigned to each attribute, a process referred to as "attribute scaling."
2) The score that each measurement endpoint receives with respect to each attribute, typically referred to as "attribute weighting."

For this BERA, it was assumed that all attributes were of equal importance so there was no "attribute scaling" conducted. The second element of the measurement endpoint weighting process, "attribute weighting," was performed for measurement endpoints using a qualitative scale ranging from low to high and following "attribute weighting" guidelines used by EPA in the Aquatic BERA for the Site. This process, even when following guidelines, is somewhat subjective and was accomplished using the combined professional judgment of the ecological risk assessors.

After assigning a weight for each of the 10 attributes, a total measurement endpoint value was determined by summing the 10 attribute weights. Consistency in the weighting process was ensured by assigning each attribute weight a numerical score of 1 (low) through 10 (high). The final qualitative measurement endpoint value was determined by applying the following classification scale to the sum of the attribute weights: ≤30 (Low), 30<x≤45 (Low/Moderate), 45<x≤60 (Moderate), 60<x≤75 (Moderate/High), and >75 (High).

In general, overall endpoint weights developed using the aforementioned approach follow a basic hierarchy:

- Low = generic benchmarks;
- Low-Moderate = food chain modeling using estimated tissue concentrations; and
- Moderate = food chain modeling using measured tissue concentrations and comparing measured tissue concentrations to critical body residues (CBRs).

For this Site, moderate-high and high ratings were not appropriate for the available lines of evidence. The results of this first step are presented in Table 2-15.

The second step of the WOE approach is to evaluate the magnitude of response in the measurement endpoint. This is accomplished by considering the potential risk to the population/community being evaluated and the level of confidence associated with that risk determination.

The third step of the WOE process evaluates the degree of concurrence among measurement endpoints. This is accomplished by presenting the risk results for each line of evidence, their associated weights, and key uncertainties together.

As previously discussed, the second and third steps will be more fully developed in Section 4 – Risk Characterization.

3.0 ANALYSIS PHASE

3.1 Introduction

The Analysis Phase of an ERA consists of the technical evaluation of data as it relates to the potential exposure to and effects from the COPECs identified during the Problem Formulation (Norton, et al., 1992; EPA, 1992a). The Analysis Phase is based on the CSM developed during the Problem Formulation and consists of two primary components: 1) Characterization of Exposure and 2) Ecological Effects Characterization. Information typically associated with the Analysis Phase includes exposure source information; measurements of stressor levels (i.e., chemical concentrations); and direct and indirect measurements of exposure (e.g., exposure models) and biological effects. The format of the Analysis Phase follows EPA's *Guidelines for Ecological Risk Assessment* (EPA, 1998).

The Analysis Phase focuses solely on discussions of exposure and potential effects. The Risk Characterization, the final phase of this BERA, presents the integration and interpretation of exposure and effects information.

A major portion the Analysis Phase is focused on the evaluation and analysis of data. In this BERA, as in most ERAs, direct measurements of exposure and effects were not available for all aspects of the analysis, and in some situations, the absence of data required that certain assumptions and their associated uncertainties be recognized. Uncertainty and variability present in the Analysis Phase can take three forms - parameter variability, measurement error, and extrapolation uncertainty (EPA, 1992a):

- *Parameter variability* refers to the true heterogeneity of parameters used in the assessment; an example of the variability of a parameter would be the range of chemical concentrations in soil. Variability can often be quantified by presenting a distribution, or by presenting one or more points of a distribution of the parameter (e.g., mean, range, and 95th percent upper confidence limit [UCL]).

- *Measurement error* is the difference between the true value and the measured value that are introduced through experimental design or procedures used for measurement and sampling.

- *Extrapolation uncertainty*, one of the principal forms of uncertainty, is present in any ERA in which the measurement and assessment endpoints are not identical. One of the more common forms of extrapolation uncertainty is encountered when laboratory analyses are used to evaluate an attribute of a natural system (e.g., use of laboratory-derived toxicity values). Although this type of uncertainty is unavoidable, it can also be reduced by careful attention to study design and the use of good professional judgment and common sense (Norton, et al., 1992).

Key assumptions and simplifications made during the Analysis Phase are presented and their associated uncertainties are discussed in this section.

The Analysis Phase is organized into two subsections: the Exposure Characterization (Subsection 3.2) and the Ecological Effects Characterization (Subsection 3.3). As stated previously, the information presented in these subsections is integrated with the Risk Characterization to estimate the potential for adverse ecological risks resulting from COPECs at the Site.

3.2 Exposure Characterization

The objective of the exposure characterization is to combine the spatial and temporal distributions of both the ecological component (i.e., potential species, communities, or habitats) and the chemical stressors to evaluate their co-occurrence (Norton, et al., 1992). The most common approach for characterizing ecological exposure is to measure the concentrations of stressors and combine them with assumptions about receptor co-occurrence or uptake (EPA, 1992a). The exposure characterization attempts to evaluate quantifiable routes of exposure (e.g., direct contact with surface soil and ingestion of small mammals) through which species or communities present at the Site may be exposed to COPECs.

In general, a chemical exposure characterization has three objectives: (1) characterize releases to the environment; (2) describe the spatial and temporal distributions within the environment; and (3) characterize contact with the ecological component of concern (EPA, 1992a; Suter, et al., 1994a).

Characterization of historical releases to the terrestrial areas and vernal pools at the Site has been presented in the Problem Formulation (Section 2) of this BERA, and is not addressed further in this section. The Characterization of Exposure is based primarily on measured and in some cases, estimated, COPEC exposure concentrations.

The Exposure Characterization is divided into two sections that 1) describe the spatial and temporal distributions of COPECs at the Site, and 2) characterize potential contact between target receptors and COPECs in the exposure media.

The following discussion provides a brief description of information that is provided in each subsection. Subsection 3.2.1 presents stressor concentrations in surface soil and surface water that were used to directly assess exposure. Subsection 3.2.1 also presents tissue (soil invertebrates and small mammal) concentrations that were used to identify potential exposure for avian and mammalian receptor models. Subsection 3.2.3 presents the quantitative approach that was used to model exposure to avian and mammalian receptors.

3.2.1 Media-Specific Chemical Characterization

This section of the exposure characterization summarizes the distribution of COPECs in different media to which receptors identified in the problem formulation may be exposed.

As previously discussed (see Section 2.2.2.2), all surface soil and biological tissue data were combined into one general exposure area for the Site. Although species-specific foraging areas for noncarnivorous receptors are often smaller than the Ely Mine exposure area, creating one Site exposure area for all ecological receptors simplified risk calculations. Note that surface water data from the four vernal pools were not combined.

Media-specific summary statistics and raw data for each of the data groupings were previously presented (Section 2.2.6 and Appendix F, respectively).

Finally, the Exposure Point Concentrations (EPCs) in selected environmental media (i.e., primarily soil and biological tissue) within the study area are determined. An EPC is the concentration term used in modeling intake that is an estimate of the arithmetic average concentration for a contaminant based on a set of site sampling results (EPA, 1992b). Calculation of the EPC is presented in Subsection 3.2.1.1.

3.2.1.1 EPC Calculation

EPCs were calculated only for those media that were used in the wildlife modeling efforts. EPCs were calculated for one terrestrial-based exposure area for each of the media.

According to EPA regional guidance (EPA, 1994), risk assessments are conducted using an EPC for each COPEC. The EPC represents the concentration to which a receptor is assumed to be continuously exposed while in contact with an environmental medium. For soil, soil invertebrates, and small mammals, the EPC is generally defined as the 95 percent UCL on the mean and is calculated using EPA's ProUCL software (Version 4.00.05, EPA, 2010b). The following general guidelines were used to determine reasonable maximum exposure (RME) EPCs.

- If fewer than 8 samples were collected, the maximum detected concentration was selected as the EPC.

- If 8 or more samples were collected and the dataset contained more than 5 percent but less than 50 percent detects and at least 4 detects, a nonparametric-based UCL (either Kaplan-Meier (KM) or bootstrapping derived), as per ProUCL's non-parametric-based UCL recommendation, was calculated. Note that the bootstrapping method was not considered unless there were at least 10 detects.

- If 8 or more samples were collected and the dataset contained at least 50 percent detects, the appropriate distribution of the dataset was determined and UCLs were selected as guided by the ProUCL supporting documentation. Note that for datasets with censored results (i.e., non-detects), UCLs calculated using estimation procedures (e.g., KM, bootstrapping) were considered instead of employing the simple substitution method (e.g., using one-half the SQL for non-detects) for selecting appropriate UCLs as guided by the ProUCL supporting documentation.

Support documentation (ProUCL Outputs) for the calculation of the UCLs is presented in Appendix G.

The arithmetic or KM-based mean values (in the instances where the UCL was calculated using a KM statistic) were used for the central tendency exposure (CTE) scenario. Maximum detected concentrations, data distributions, 95% UCLs, and selected EPCs are presented in Tables 3-1 through 3-6 for soil, soil invertebrates, and small mammals.

3.2.1.1.1 Calculation of Plant EPCs

Site-specific plant concentrations were not available with which to evaluate herbivore exposure to COPECs; therefore, plant concentrations were estimated. Chemical-specific values/equations were selected as noted in the Eco SSL guidance document (Attachment 4-1 in EPA, 2007g). For chemicals not listed in the Eco SSL guidance, the following hierarchy of sources was employed:

- Bechtel-Jacobs, 1998. Used measured values or regression equations as recommended. Any regression equation used met the criterion in the Eco SSL guidance (i.e., slope must be significantly different from 0 and R^2 is ≥ 0.2).

- Chemical-specific value from EPA (1999a), but only if the reference is not Baes, et al. 1984. (EPA, 1999a uses the Bv values; whereas the Br values are more appropriate for the receptors modeled herein.)

- Chemical-specific value for reproductive parts (Br) from Baes, et al., 1984.

Equations and estimators used to estimate COPEC concentrations in plants due to root uptake are presented in Tables 3-7 and 3-8. Estimated concentrations used as modeling inputs are presented in Table 3-9.

3.2.2 Avian and Mammalian Receptor Exposure Modeling

The potential for food chain impacts of bioaccumulative chemicals in terrestrial systems is well recognized. Because of the significant biomagnification potential associated with some COPECs and the potential risk to terminal receptors in the food chain, representative upper trophic level receptors are evaluated as part of this BERA.

3.2.2.1 Modeling Approaches

Two modeling approaches exist for quantifying risk and they differ dramatically in the level of effort involved and in their abilities to distinguish variability and uncertainty (Thompson and

Graham, 1996). The first and most commonly used approach is the "point estimate" or "deterministic" approach, which involves selecting a single number for each of the model inputs from which a point estimate of risk is generated. Choosing single numbers for inputs reduces the level of effort required for the exposure modeling process, but unavoidably ignores uncertainty and variability in the risk estimate. In contrast, the probabilistic approach (e.g., Monte Carlo simulation) can be a viable statistical tool for analyzing uncertainty and variability. These input distributions are then propagated through the model to produce a probability distribution of risk.

Exposure modeling, whether probabilistic or deterministic, represents one of many ways to characterize exposure. As was previously mentioned, a number of receptor-specific exposure models are considered in this BERA. In an attempt to limit the effort expended as part of the exposure modeling process and still identify potential ecological risks, a "tiered approach" that includes a conservative worst-case (i.e., RME) and more realistic average (i.e., CTE) approach was used (see Section 3.2.1.1).

3.2.2.2 Deterministic Exposure Modeling Approach

Exposure models used in this BERA take the following general form:

$$\mathrm{TDI} = \mathrm{FT} \times \left[\left(\mathrm{FIR} \times \sum_{i=1}^{n} \mathrm{C_i} \times \mathrm{P_i} \times AF_{bio-diet} \right) + \mathrm{SIR} \times \mathrm{C_{soil}} \times AF_{bio-s} \right]$$

Where:

TDI	=	Total daily intake (mg/kg body weight (BW)-day)
FT	=	Foraging time in the exposure area (unitless)
FIR	=	Body weight normalized food intake rate (kg wet weight (WW)/kg BW-day)
C_i	=	Concentration in the i^{th} prey item (mg/kg WW)
P_i	=	Proportion of the i^{th} prey item in the diet (unitless)
$AF_{bio\text{-}diet}$	=	Bioaccessibility adjustment factor from diet to organism (unitless)
SIR	=	Soil ingestion rate (kg dry weight (DW)/kg BW-day)
C_{soil}	=	Concentration in soil (mg/kg DW)
$AF_{bio\text{-}s}$	=	Bioaccessibility adjustment factor from soil to organism (unitless)

Because of the difficulties in measuring intake of free-ranging wildlife, data on food intake rates (FIRs) are not available for many species. Using FIRs for captive animals potentially underestimates the intake rates because these animals do not expend as much energy as their wild counterparts do, since activities for captive animals do not include behaviors such as foraging and avoiding predators. Therefore, allometric equations using measurements of field metabolic rates (FMRs) are used to determine FIRs.

The FMR represents the daily energy requirement that must be consumed by an animal to maintain among other things, body temperature, organ function, digestion, and reproduction. To maintain these physiological functions as well as to perform daily behavioral activities such as foraging, avoiding predators, defending territories, and mating, the animal must replace the lost energy by metabolizing and assimilating the energy in its food (i.e., its metabolic fuel). The balance between an animal's energy loss and replenishment is reflected in the quality and quantity of food in the animal's diet. Assuming that the animal's habitat supports a variety of food items, selection of diet may reflect a preference toward more energy-rich foods (i.e., higher gross energy), although one must consider the energy expended in pursuit of prey.

Not all food that is consumed by an animal is converted to usable energy. Depending on the digestability of the dietary item and the physiology of a particular animal, a substantial portion of the energy may be lost through clearance. Assimilation Efficiency (AE) is a measure of the percentage of food energy (i.e., item-specific gross energy) that is assimilated across the gut wall and is available for metabolism.

The equation used to determine FIRs is as follows:

$$\text{FIR (kg ww/kg BW - day)} = \frac{\text{FMR}}{\sum_{i=1}^{n}\left(\text{AE}_i \times \text{GE}_i \times \text{P}_i\right)}$$

Where:

FIR = Body weight normalized field ingestion rate (kg WW/kg BW-day equals g WW/g BW-day)
FMR = Field metabolic rate (kcal/g BW-day; see Table 3-10)
AE_i = Assimilation efficiency of the ith food item (unitless; see Table 3-11)
GE_i = Gross energy of the i^{th} food item (kcal/g; see Table 3-11)
P_i = Proportion of diet comprised of the i^{th} food item (unitless; see Tables 3-12 through 3-17)

Exposure parameters for the calculation of TDI for each of the following: song sparrow, American robin, American kestrel, deer mouse, short-tailed shrew, and mink, are presented in Tables 3-12 through 3-17.

Bioaccessibility adjustment factors provide an estimate of the fraction of the daily intake of a COPEC in media/prey items that is biologically available to the wildlife receptors. The derivation of these factors is presented in the Elizabeth Copper Mine BERA Section 3.5, Appendices R and S, and Section 5.1.2 (URS, 2006). Table 3-18 presents the values applicable to this BERA.

3.2.2.2.1 Song Sparrow

The song sparrow (*Melospiza melodia*) was selected to represent herbivorous birds. They are abundant in New England and found in a variety of habitats including brushy fields, swamps, forest edges, roadsides, hedgerows, farms, suburbs, cities, and along the shores of lakes and ponds (DeGraaf and Rudis, 1986).

Song sparrows tolerate a wide range of habitat conditions. In the early season, nests are usually constructed on the ground, concealed by grasses, weeds or brush. Later in the season, nests may be on the ground or elevated in shrubs or trees up to 12 feet high. In favorable habitat, song sparrows occupy territories of 0.2 to 0.6 hectares (0.5 to 1.5 acres).

The diet of song sparrows consists primarily of insects, but following the breeding season, weed seeds and fruits are also consumed (Cornell, 2003). Song sparrows glean their food primarily from the ground, but also from herbs, and twigs.

The exposure of the song sparrow to Site-specific COPECs is assumed to be through the ingestion of plants; as well as the incidental ingestion of soil. Table 3-12 presents the exposure model and summarizes the exposure factors used to estimate COPEC exposure to the song sparrow.

3.2.2.2.2 American Robin

The American robin (*Turdus migratorius*) was selected to represent invertivorous birds. The American robin inhabits forests, wetlands, swamps, and habitat edges where forested areas meet agricultural and range land (EPA, 1999a).

The American robin requires access to freshwater, protected nesting sites, and productive forage in areas for breeding. Breeding habitats include moist forests, swamps, open woodlands, orchards, parks, and lawns. Robins may forage on the ground, along habitat edges, stream edges, or above ground in shrubs and the lower branches of trees (EPA, 1999a). The summer foraging home range of adults feeding nestlings averages approximately 0.37 acres and those feeding fledglings approximately 2 acres. Their territory during the breeding season ranges from 0.3 – 2 acres (EPA, 1993b).

Robins eat invertebrates, seeds, and fruit (EPA, 1999a). Directly preceding and during the breeding season, robins diet consists of greater than 90% (by volume) invertebrates and some fruit. During the rest of the year, their diet consists of 80-99% (by volume) of fruits. Fruits commonly eaten include plums, dogwood, sumac, hackberries, blackberries, cherries, greenbriers, raspberries, and juniper. Invertebrates commonly taken include beetles, caterpillars, moths, grasshoppers, spiders, millipedes, and earthworms (EPA, 1993b).

The exposure of the American robin to Site-specific COPECs is assumed to be through the ingestion of soil invertebrates, as well as the incidental ingestion of soil. Table 3-13 presents the exposure model and summarizes the exposure factors used to estimate COPEC exposure to the American robin.

3.2.2.2.3 American Kestrel

The American kestrel (*Falco sparverius*) was selected to represent insectivorous/carnivorous birds. The American kestrel inhabits semi-open areas and the edges of groves. Some studies have indicated that male kestrels tend to use woodland openings while females tend to use areas characterized by short or sparse ground vegetation (EPA, 1993b).

The American kestrel is solitary, except during the breeding season. Nests are typically built in tree cavities. The size of the breeding territory ranges from 52 to 1235 acres, depending on the quality of the habitat. During the winter, the territory decreases to 24 to 106 acres (EPA, 1993b). The kestrel preys upon a variety of invertebrates (e.g., worms, spiders, beetles), small to medium-sized birds and mammals (EPA, 1993b and 1999a), and frogs, lizards, and snakes (EPA, 1993b). During the summer, grasshoppers are the primary prey, with vertebrates being taken in their absence. During the winter, small mammals and birds comprise the majority of their diet (EPA, 1993b). In turn, kestrels are preyed upon by larger raptors (e.g., red-tailed hawks) (EPA, 1999a).

The exposure of the American kestrel to Site-specific COPECs is assumed to be through the ingestion of soil invertebrates and small mammals; as well as the incidental ingestion of soil. Table 3-14 presents the exposure model and summarizes the exposure factors used to estimate COPEC exposure to the American kestrel.

3.2.2.2.4 Deer Mouse

The deer mouse (*Peromyscus maniculatus*) was selected to represent the herbivorous mammal. The deer mouse is mainly nocturnal (EPA, 1993b and 1999a), spending most of its day in a burrow underground. Deer mice commonly use more than one nest site (EPA, 1999a). Their home range averages 0.02 to 2.5 acres. Population density of deer mice ranges from 3 to 36 mice per acre (Merritt, 1987).

The diet of the prairie deer mouse consists of herbaceous vegetation (e.g., sweet clover, ragweed, pokeweed, and various grasses), cultivated grains, soybeans, and corn. The woodland-dwelling cloudland deer mouse consumes a variety of seeds, berries, buds, nuts, and fungi. Although primarily an herbivore, during late summer, the deer mouse will ingest various insects (e.g., crickets, grasshoppers, ground beetles, caterpillars, earthworms, centipedes, millipedes, slugs, and spiders) (Merritt, 1987).

Because the deer mouse is ubiquitous and abundant, it represents the major herbivore component in the terrestrial food web. Predators of the deer mouse include snakes, shrews, foxes, and hawks (Merritt, 1987).

The exposure of the deer mouse to Site-specific COPECs is assumed to be through the ingestion of plants, as well as the incidental ingestion of soil. Table 3-15 presents the exposure model and summarizes the exposure factors used to estimate COPEC exposure to the deer mouse.

3.2.2.2.5 Short-tailed Shrew

The northern short-tailed shrew (*Blarina brevicauda*) was selected to represent the invertivorous small mammal. The short-tailed shrew may be found in a variety of habitats with a well-developed layer of leaf litter and humus, including grasslands, brushy thickets, meadows, old fields, and deciduous, coniferous, and mixed forest (Merritt, 1987).

Two different types of nests are constructed by the short-tailed shrew - a breeding nest and a resting nest. Both types are commonly located 6 to 16 inches below ground, or under logs, stumps, or old boards. The home range of the shrew is 0.5 to 1 acre. Population densities of the shrew range from 1 to 10 per acre (Merritt, 1987).

The short-tailed shrew's diet includes invertebrates (e.g., spiders, centipedes, slugs, snails, and earthworms), salamanders, mice, voles, and occasionally birds. It has a preference for animal food, but also eats fungi and plant material such as roots, nuts, fruits, and berries. In winter, insect larvae and pupae serve as important food sources (Merritt, 1987). Predators of the short-tailed shrew include snakes, foxes, and hawks (Merritt, 1987).

The exposure of the short-tailed shrew to Site-specific COPECs is assumed to be through the ingestion of soil invertebrates; as well as the incidental ingestion of soil. Table 3-16 presents the exposure model and summarizes the exposure factors used to estimate COPEC exposure to the short-tailed shrew.

3.2.2.2.6 Mink

The mink (*Mustela vison*) was selected to represent the carnivorous mammal. Mink are found in a variety of wetland, riverine, and lacustrine habitats such as wetlands, small streams, rivers, lakes, tidal flats, cattail marshes, bogs, swamps, and bottomland woods. Habitats associated with small streams are preferred to habitats near large, broad rivers. They prefer irregular shorelines with bushy cover that provides ample prey and den sites. This species will also use upland habitat provided that there is sufficient cover and prey.

Because foraging in riverine and lacustrine systems occurs primarily along the shoreline, cover and structural diversity within the riparian vegetative community affect habitat use by mink. Cover can be provided by overhanging or emergent vegetation, rocks or rock crevices, exposed roots, debris, logjams, undercut banks, or boulders (Allen, 1986). The availability of suitable den sites may also affect habitat use by mink. Typically, several den sites are located close to preferred foraging sites within an individual's home range (Allen, 1986). Dens are established in burrows excavated by other animals (typically muskrats), tree root cavities, rock piles, logjams, and beaver lodges. Several dens may be established and used at the same time. Dens are found within 200 m of the shoreline (Eagle and Sargeant, 1985; Allen, 1986; Lariviere, 1999).

The actual shape of home territories ranges from linear for riverine habitats to circular for marsh habitats (Birks and Linn, 1982; EPA, 1993b). Home range size depends on food availability, age and sex of mink, season, and social stability. Adult males have larger home ranges (average 85.4% larger) than adult females and adults occupy larger home ranges than juveniles (Gerell, 1970; Lariviere, 1999; Birks and Linn, 1982; Allen, 1986; Whitaker and Hamilton, 1998). Expressed as shoreline length, the average adult home range encompasses 2,600 meters for males and 1,800 meters for females in stream and riverine habitats (Whitaker and Hamilton, 1998). However, linear home ranges may be larger depending of the availability of food and the condition of habitat (Lariviere, 1999). Population density ranges from 3 to 20 mink per square mi. Adult males occupy home ranges that are exclusive of other adult males, but include the home ranges of one or more females (Mitchell, 1961; Birks and Dunstone, 1985; Whitaker and Hamilton, 1998).

Mink are almost exclusively carnivorous. A number of factors influence the composition of the mink's diet. Mink diet varies with season, habitat and availability of prey (Proulx, et al., 1987). Shallow water and low flow conditions in streams and rivers contribute to effective aquatic foraging by mink. Commonly important items include fish, crayfish, clams, frogs, snakes, muskrat, voles, and birds. Mink tend to consume more fish in winter and crayfish in spring and summer. In autumn, terrestrial species may increase in importance as prey. Females tend to feed on smaller prey (e.g., fish, crustaceans, and birds), whereas males prefer larger prey (e.g., rabbit and muskrat) (Birks and Dunstone, 1985).

The primary food items in the mink diet include small mammals, fish, benthic invertebrates (crayfish), birds (waterfowl), and amphibians (Alexander, 1977; Burgess and Bider, 1980; Cowan and Reilly, 1973; Gilbert and Nanckivell, 1982; Hamilton, 1959 and 1940; Melquist, et al., 1981; Proulx, et al., 1987). Combining the available data, an average of 23% (range of 0 to 64.7%) of the mink diet consists of fish. Mammals comprise 15% of the diet, reptiles and amphibians also constitute an average of 15% (range of 0 to 30%) of the diet, birds (i.e., waterfowl) 11% (range of 0 to 39%) of the diet, and invertebrates constitute 36% of the diet. Because Site-specific data were available for only small mammals it was conservatively assumed that the mink's diet consists of only small mammals. (Note: Mink exposure to aquatic prey was evaluated separately in the Aquatic BERA.)

Table 3-17 presents the exposure model and summarizes the exposure factors used to estimate COPEC exposure to the mink.

3.2.2.2.7 Total Daily Intakes

TDIs for the six target receptors modeled are presented in Tables 3-19 through 3-22 for RME and CTE exposures in the vegetated and background areas.

3.3 Ecological Effects Characterization

The Ecological Effects Characterization is the qualitative and quantitative description of the relationship between the stressor and response (effects) in the exposed individuals, populations, or ecosystems (Suter, et al., 1994b); and, more specifically (in this assessment), the relationship between observed inorganic chemical levels and the assessment and measurement endpoints identified during the Problem Formulation (Norton, et al., 1992). Specifically, for this BERA, ecological effects associated with the evaluation of the most recent data are primarily characterized by:

- Comparisons of soil concentrations with phytotoxicity and soil invertebrate screening benchmarks;
- Comparisons of modeled avian and mammalian exposure doses with literature-based toxicity data; and
- Comparisons of vernal pool surface water concentrations with EPA's Freshwater AWQC and other appropriate surface water quality benchmarks.

(Note: All discussions of comparisons to reference concentrations are reserved for Section 4.) In general, most risk assessments have found that using a "suite" of stressor-response approaches, such as those selected for this Site provides a more complete Ecological Effects Characterization (EPA, 1998).

Because assessment endpoints frequently cannot be measured directly, one or more measurement endpoints are selected as surrogates to characterize assessment endpoints. Measurement endpoint selection is accomplished by first establishing the relationship between the stressor and assessment endpoint, then identifying relevant surrogates and any additional extrapolations, analyses, and assumptions necessary to predict or infer changes in the assessment endpoint.

As the cause-effect relationship between the measurement endpoint and the assessment endpoint becomes stronger, the uncertainty in extrapolation of the effects data in the risk assessment is reduced. Similarly, the more closely related the test species is to the species of interest, the less uncertainty there is in the risk assessment (Suter, 1993). Extrapolations that frequently occur in an ERA include those from laboratory to field conditions, across taxonomic classifications, and across spatial and temporal scales.

This BERA concentrates on evaluating direct and indirect effects that may be associated with contaminant exposure in soil (i.e., to plants, soil invertebrates, birds, and small mammals) and vernal pool surface water.

Another component integral to the Ecological Effects Characterization involves the selection of stressor-response data that best illustrate a causal relationship. Attributing the causality of effects, particularly with complex mixtures of chemicals and stressors, continues to be a challenge in ERAs. Individual stressors rarely occur alone; typically there are other chemical, biological, or physical stressors that co-occur and that may alter or compound the effects and risk associated with the subject stressor, thereby increasing the difficulty and uncertainty when trying to identify causality.

As stated previously, the most valuable approach for assessing effects and causality is to provide multiple lines of evidence. The key lines of evidence that can be provided to assist in assigning cause-and-effect relationships, which were formalized by Hill (1965) and adapted to risk assessment by Suter (1993), are summarized as follows:

- Analogy—Cause-and-effect relationship similar to well-established cases.
- Experiment—Changes in effects should follow experimental treatments representing the hypothesized cause.
- Coherence—Implicit relationships should be consistent with available evidence.
- Plausibility—Underlying theory should make it plausible that the effect resulted from the cause.
- Biological gradient—Effect should increase with increasing exposure.

- Temporality—Cause must precede its effect.
- Strength—High magnitude of effect is associated with exposure to stressor.
- Specificity—The more specific the cause, the more convincing the association with an effect.
- Consistency—Consistent association of an effect with a hypothesized cause.

This approach is similar to and consistent with several of the attributes used to assess potential weights associated with each measurement endpoint (see Subsection 2.4.3).

Whereas information relevant to illustrating the relationship between stressor and its response is provided in the Ecological Effects Characterization, the interpretation of the strength of this relationship is presented in the Risk Characterization.

The remainder of the Ecological Effects Characterization focuses on the Ecological Response Analysis, which examines the relationship between stressor levels and potential adverse ecological effects.

3.3.1 Ecological Response Analysis

The ecological response analysis provides information on three main subject areas:

- Stressor-response analysis—Provides a description of the potential types of stressor-response relationships; a description of the specific effects information used in this BERA; and a general discussion of the qualitative WOE associated with each measurement endpoint or endpoint group.

- Causality—Provides a description of the general criteria used to assess the strength of causal relationships between stressors and response.

- Linking measures of effects to assessment endpoints—Provides a discussion of the type of extrapolations typically required to link measurement and assessment endpoints.

These subject areas examine the relationship between stressor levels and effects, present the supporting evidence that the stressor causes the effect, and provide a link between the measurable effect and the assessment endpoint (EPA, 1998). This information is combined and assessed in the Lines of Evidence portion of the Risk Characterization. The following subsections provide a more detailed discussion of the key components essential to developing a comprehensive ecological response analysis.

3.3.1.1 Stressor-Response Analysis

The stressor-response relationship used in an assessment depends on the scope and nature of the ERA defined in the problem formulation. Several different relationships can be established, including:

- single point estimates of effect;
- stressor-response curves;
- no-effect and low-effect levels; and
- cumulative effects distributions.

The majority of quantitative stressor-response techniques have been developed for univariate analysis. These studies, in which one response variable (e.g., incidence of abnormalities, mortality) is measured, reflect the simplest stressor-response relationship. Multivariate techniques, those in which the response of interest is a function of many individual variables (e.g., organism abundance in an aquatic community), also have a long history of use in ecological evaluations (EPA, 1998).

The different stressor-response relationships have inherent uncertainties. Point estimates (e.g., EC_{50} [50% effective concentration]) can be useful in simple assessments or to compare risks, but provide little information regarding uncertainty and variability surrounding the point estimate (EPA, 1998).

Stressor-response curves are advantageous in that all of the available experimental data are used, and values other than the data points measured can be interpolated (Suter, 1993). However, sufficient data points necessary to describe the curve may not be available. Stressor-response modeling has been recognized as the most appropriate analysis method for toxicity test data and is considered the best approach for analyzing data at contaminated sites (Suter, 1996a). Often, particular levels of effect (e.g., LD_{50} [lethal dose at 50%]) are determined from curve-fitting analyses. These are point estimates interpolated from the fitted line. Although the level of uncertainty is minimized at the midpoint of the regression curve, the percentage levels selected (e.g., 10%, 50%, 95%) may not be protective for the assessment endpoint (EPA, 1998).

When effects at lower stressor levels are of interest, a no-effect level is frequently established based on comparisons between experimental treatments and control treatments. Statistical hypothesis testing is generally used for this purpose. With this method, the risk assessor does not pick an effect level of concern, and the no-effect level is determined by the experimental conditions (e.g., number of replicates and data variability). Numerous authors (Hoekstra and Van Ewijk, 1992; Laskowski, 1995; Suter, 1996a) have discussed the limitations and drawbacks associated with the use of no observed effect levels (NOEL) in ecotoxicology and ERAs; principal among these concerns are:

- loss of important information regarding significance level;
- no accounting for natural variability;
- terms suggest effects are low in magnitude and importance, which may not be the case.

Uncertainty also exists with using this relationship when the stressor levels or receptors in the control differ from those used in the experiment. Statistical hypothesis testing is also often used in observational field studies to compare site and reference conditions. General limitations with using hypothesis testing in ERAs have been discussed in detail by Suter (1996a). Suter's overarching concern is that hypothesis testing typically does a poor job at estimating risk. However, confidence in statistical hypothesis testing can be increased through the use of experimental field studies, in conjunction with laboratory studies and observational studies (EPA, 1998).

Multiple-point estimates that can be displayed as cumulative effects distribution functions are generated from combining experimental data. Distributions, frequently referred to as species sensitivity distributions, can be used to identify stressor levels that affect different numbers of species or portions of populations. This approach has been used by EPA and other regulatory agencies to develop chemical- and medium-specific criteria and benchmarks (Posthuma, et al., 2002). The amount of data necessary to derive these distributions is often a limiting factor; to date sufficient data needed to apply this approach is restricted primarily to toxicity testing of aquatic organisms. Cumulative effects distribution functions can also be derived from probabilistic methods such as the Monte Carlo analysis (EPA, 1998).

The measures of effect evaluated in this BERA use several of the above approaches. The specific ecological effects to be characterized in this BERA were listed at the beginning of Subsection 3.3, Ecological Effects Characterization.

The remainder of the Ecological Effects Characterization is divided into two subsections:

- Subsection 3.3.1.1.1 – Abiotic (i.e., soil and surface water) Toxicity Values
- Subsection 3.3.1.1.2 - Toxicity Reference Values

To avoid confusion, it should be reiterated that the actual comparison of exposure concentrations to guidelines or benchmarks and the integration and interpretation of exposure and effects data are reserved for the Risk Characterization. The primary function of the Ecological Effects Characterization is to present relevant stressor-response data.

Critical body residues for whole body concentrations of metals in soil invertebrates and small mammals were not found. Sources searched during the literature review process included:

- The ERED Database (http://el.erdc.usace.army.mil/ered/);
- SCIRUS (http://www.scirus.com/);
- SETAC Journals;
- Various in-house texts, journals, and EPA publications.

Therefore, the potential effects from Site metals on soil invertebrates and small mammals could not be assessed using whole body residue concentrations.

3.3.1.1.1 Abiotic Media Toxicity Values

3.3.1.1.1.1 Soil

3.3.1.1.1.1.1 Phytotoxicity

To evaluate the potential for phytotoxicity at the Site, available terrestrial plant toxicity values from three sources were used. The preference hierarchy was as follows:

- Plant-based Eco SSLs (EPA, 2003b and c; 2005a through i; 2006; and 2007b through f). SSLs were discussed in Section 2.2.7.1.

- Efroymson, et al. (1997b) phytotoxicity values. Phytotoxicological benchmarks were derived by rank-ordering the lowest observed effect concentration (LOEC) values drawn from the literature. The 10th percentile LOEC value was selected as the benchmark, so the "assessor should be 90% certain of protecting plants growing in the site soil." Rigorous criteria were applied when selecting studies to be included in the generation of these benchmarks.

- EPA (1999a). *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (the Protocol). Plant TRVs were developed largely from information provided in Efroymson et al., 1997b; the Protocol includes additional COPECs. Toxicity reference values were developed in a manner similar to that of Efroymson et al., 1997b; however in some cases, additional margins of safety were incorporated in the Protocol.

TRVs for phytotoxicity are presented in Table 3-23. Note that Efroymson et al. (1997b) and EPA (1999a) do have values for aluminum. However, following the preference in the hierarchy, the Eco SSL document for aluminum (EPA, 2003b) states that total aluminum in soil is not correlated with toxicity to the tested plants. Therefore, screening benchmarks for aluminum-based phytotoxicity are not used in this BERA.

3.3.1.1.1.1.2 Soil Invertebrates

To evaluate the potential for toxicity to soil invertebrates at the Site available soil invertebrate toxicity values from three sources were used. The preference hierarchy was as follows:

- Soil invertebrate-based Eco SSL (EPA, 2003b and c; 2005a through i; 2006; and 2007b through f). SSLs were discussed in Section 2.2.7.1.

- Efroymson, et al., 1997c—*Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Processes* – Earthworm and microbial heterotroph benchmarks were derived using the same methodology used to generate the phytotoxicological benchmarks (Efroymson, et al., 1997b). Toxicity benchmarks were derived by rank-ordering LOEC values gathered from an extensive literature search, then selecting the 10th percentile LOEC value as the benchmark. Earthworm benchmarks were derived for several metals and SVOCs; microbial heterotroph benchmarks were derived for numerous metals and a few organic compounds. The lower of the earthworm and microbe values were used if both were available.

- EPA, 1999a. *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities.*

TRVs for soil invertebrates are presented in Table 3-24. Note that Efroymson, et al. (1997c) and EPA (1999a) do have values for aluminum. However, following the preference in the hierarchy, the Eco SSL document for aluminum (2003b) states that total aluminum in soil is not correlated with toxicity to the tested soil invertebrates. Therefore, screening benchmarks for aluminum-based effects to soil invertebrates are not used in this BERA.

3.3.1.1.1.2 Surface Water

3.3.1.1.1.2.1 Water Quality Criteria/Benchmarks

Under CERCLA, EPA's AWQC (2009) are considered applicable or relevant and appropriate requirements (ARARs). EPA's 1985 Guidelines (Stephan, et al., 1985) describe an objective, internally consistent and appropriate way for deriving chemical-specific, numeric water quality criteria for the protection of the presence of, as well as the uses of, fresh water aquatic organisms. AWQC are derived to protect most of the aquatic communities and their uses most of the time (40 CFR 131).

When sufficient data is available to support their derivation, EPA provides acute criteria or criterion maximum concentration (CMC) which corresponds to concentrations that would cause less than 50% mortality in 5% of the exposed population in a brief exposure (Suter and Mabrey, 1994a). The CMC represents an acute criterion applied as 1-hour average concentrations not to be exceeded more than once in any 3-year period. Acute exposure involves a stimulus severe enough to rapidly induce an adverse response. An acute effect is not always measured in terms of lethality; it can measure a variety of short term adverse effects.

Chronic criteria or criteria continuous concentration (CCC) are selected by choosing the most protective value after reviewing and analyzing chronic toxicity information for aquatic organism, aquatic plants, and tissue residue level studies that demonstrate a water/tissue concentration relationship that is unacceptable for consumption by humans or wildlife. The CCC represents a chronic criterion applied as an average four-day concentration not to be exceeded more than once in a three-year period and involving a stimulus that produces an adverse response that lingers or continues for a relatively long period of time, often one-tenth of the life span or more. Chronic exposure should be considered a relative term depending on the lifespan of the organism. A chronic effect can be lethality, growth or reproductive impairment, or any other longer term adverse effect.

In addition, benchmarks from EPA (1999a) and Suter and Tsao (1996) were used when AWQC values were not available. These benchmarks were discussed in Section 2.2.7.2.

Surface water toxicity values are presented in Table 3-25.

3.3.1.1.1.2.2 Amphibian Toxicity Values

To evaluate the potential for toxicity to amphibians in the vernal pools, RATL – A Database of Reptile and Amphibian Toxicity Literature (Pauli, et al., 2000), was searched for toxicity values. Potential risks to amphibians are estimated based on surface water exposure. Amphibian TRVs from RATL are presented in Table 3-26. In addition, as noted in Section 2.2.4.2.2, the results of the amphibian toxicity study mimicked findings observed in a prior fathead minnow study (*Pimephales promelas*) conducted as part of the Aquatic BERA (EPA, 2010a). It was, therefore, recommended by EPA that aquatic toxicity information for the fathead minnow could be used as a surrogate for assessing potential effects to amphibians present in the vernal pools identified on-site. Amphibian toxicity values derived from *P. promelas* data are presented in Table 3-27.

3.3.1.1.2 Wildlife TRVs

To evaluate the potential for toxicity to mammals and birds at the Site, TRVs used in the Elizabeth Mine ERA (URS, 2006) were used. For Site COPECs not evaluated in the Elizabeth Mine ERA, a hierarchy of sources was searched as follows: Eco SSLs documents, USACHPPM's *Wildlife Toxicity Assessment Reports*, EPA's *Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (1999a), Sample, et al. (1996), EcoTox, and peer-reviewed primary literature. Studies that met the following criteria could be used for TRVs development:

- Test species similar to the target receptor.
- In vivo study.

- Oral administration via food, drinking water, or gavage (feeding study preferred).
- NOAEL or LOAEL identifiable.
- Effects of potential "ecological significance" evaluated (e.g., lethality and reproductive effects).

Primary considerations in the TRV selection process include study species, study duration, effect level, and toxicological endpoint. The following paragraphs present the considerations that were used in the study and dose selection process.

Studies using the Site-specific target wildlife species were sought preferentially. However, toxicological data for the target wildlife species were often unavailable; therefore, studies were chosen that, to the extent possible, used species related to the target species and that had similar diets and digestive systems.

Suitable chronic exposure studies were given preference over acute studies. Chronic exposure represents the extended exposure of an organism to a chemical, generally greater than one-tenth of the typical life span of the species. Acute exposure represents either an instantaneous single-dose exposure or a continuous exposure of minutes to a few days duration.

Endpoints that could directly affect the target species at the population level were given preference (e.g., reproductive effects and mortality of adults or offspring). The next preference was given to serious histopathological effects (e.g., necrosis or damage to liver, kidney, or brain) that alter primary body functions. In the absence of preferred data, consideration was given to effects such as alterations in biochemical functions of an organ or alterations in normal behavior that could be correlated with decreased survivability. Other effects such as altered body weight, decreased liver size, and changes in blood chemistry are not readily associated with decreased survivability or longevity and were used only in the absence of the preferred toxicity data.

Best professional judgment was used to select the most appropriate studies, doses, and endpoints for use in TRV development. To develop chronic NOAEL- and chronic LOAEL-based TRVs, uncertainty factors presented in *Standard Practice for Wildlife Reference Values Technical Guide No. 254* (USACHPPM, 2000) were applied as noted below to account for studies of less than chronic duration.

Type of Data Available	UF to Approximate a Chronic-based TRV
Subchronic	10
Acute	30
LC_{50} or LD_{50}	100 for NOAEL and 20 for LOAEL

If the NOAEL or LOAEL were unbounded, then it was assumed that the chronic LOAEL was 5 times the chronic NOAEL; and in the opposite circumstance, the chronic NOAEL was 5 times less than the chronic LOAEL (USACHPPM, 2000).

Body scaling factors were not used to account for intertaxon variability between test species and the target receptor species. The effect of this decision, if any, will be discussed in the uncertainty analysis. Target receptor-specific avian and mammalian TRVs are presented in Tables 3-28 and 3-29, respectively.

The values summarized in Tables 3-28 and 3-29 can be considered conservative but for the most part realistic. The degree of conservatism built into the TRVs likely protects a range of potential wildlife receptors.

3.3.1.2 Causality

In a chemical risk assessment context, causality is defined as the relationship between one or more stressors and the response to the stressor(s). Uncertainty in the conclusions of an ERA would be high without the proper support linking a cause (stressor) to an effect (response).

General criteria for affirming causality for observational data are: (1) strength of association; (2) predictive performance; (3) demonstration of a stressor-response relationship; and (4) consistency of association. All these criteria need not be satisfied to infer causality; rather, each criterion incrementally reinforces causality. The same is true when evaluating the following criteria for rejecting causality. Criteria for rejecting causality in observational data are (1) inconsistency in association; (2) temporal incompatibility; and (3) factual implausibility. Other factors relevant to assessing causality are the specificity of association and theoretical and biological plausibility (EPA, 1998). The use of multiple criteria to assess causality is in fact a WOE approach. A similar WOE approach is applied in Section 2.4.3 to assess the confidence associated with any prediction of adverse ecological impacts.

Most of the studies used to evaluate potential ecological risk for this BERA (i.e., benchmark comparisons and exposure and effect modeling) are predictive in nature and do not readily lend themselves to a direct assessment of causality. Where possible, causality is evaluated qualitatively.

3.3.1.3 Linking Measurement Endpoints to Assessment Endpoints

When assessment endpoints are different from their measurement endpoints, the two must be linked to evaluate the environmental values of concern. At times, extrapolations need to be used to link the endpoints. Extrapolations from the measurement to the assessment endpoints may include comparisons:

- Between taxa (e.g., rat to shrew).
- Between responses (e.g., mortality to growth).
- From laboratory to field.
- Between geographic areas.
- Between spatial scales.
- Between exposure durations (e.g., acute to chronic).
- Between individual effects and population, community, or ecosystem effects.

Extrapolations have a level of uncertainty associated with the adequacy of the data on which they are based. Linkages can be based on professional judgment or empirical (e.g., allometric extrapolation equations) or process models (e.g., trophic transfer models). A common tool employed in risk assessments to deal with the uncertainty encountered when trying to link measurement and assessment endpoints is the use of uncertainty or safety factors (Chapman, et al., 1998; Duke and Taggart, 2000; Suter, et al., 2000). Basically, uncertainty factors are conservative empirical factors used to reduce the probability of underestimating risk. Examples of uncertainty factors frequently used in ERAs include: acute-to-chronic ratios, interspecies adjustment factors, and no-effect-to-effect ratios. Many of the uncertainty factors used in this BERA have been presented in prior sections of the report. A more detailed evaluation of the implication of using uncertainty factors is presented in Section 4.2.4, the Uncertainty Analysis.

4.0 RISK CHARACTERIZATION

4.1 Introduction

The Risk Characterization is the final phase of the ERA, the purpose of which is to evaluate the likelihood that adverse effects have occurred or may occur as a result of exposure to the COPECs (EPA, 1998 and 1992a). The goal of the Risk Characterization is to provide estimates of risk to the assessment endpoints identified in the Problem Formulation (Section 2) by integrating information presented in the Analysis Phase (Section 3) and by interpreting individual and population level effects.

The following Risk Characterization is divided into two stages: risk estimation and risk description. The Risk Estimation (Subsection 4.2) integrates exposure and effects information from the Analysis Phase and estimates the likelihood of adverse effects on the assessment endpoint of concern. A summary of the qualitative and quantitative elements of uncertainty also is included as part of the risk estimation. The Risk Description (Subsection 4.3) provides a complete and informative synthesis of the overall conclusions regarding risk estimates; addresses the uncertainty, assumptions, and limitations; and is useful for risk management decision making.

The ultimate goal of the Risk Characterization is to fully describe the strengths and weaknesses of the risk assessment so that risk managers fully understand the conclusions reached in the ERA.

4.2 Risk Estimation

4.2.1 Introduction

The risk estimation describes the likelihood of adverse effects to assessment endpoints by integrating exposure and effects data (EPA, 1992a). The risk estimation process uses exposure and ecological effects information described in the Analysis Phase. However, it is important to recognize that the interpretation and synthesis of the results presented in the Risk Estimation are reserved for the Risk Description (Subsection 4.3).

Risk estimations can range from highly quantitative to highly qualitative presentations. For example, it is likely that a qualitative approach might consist of the direct comparison of Site-specific tissue concentrations to literature or database derived effect levels, while a quantitative approach is typical for the evaluation of detailed exposure and effects models like those used to evaluate effects to song sparrow, American robin, American kestrel, deer mouse, short-tailed shrew, or mink (see Section 4.2.2.4).

The following sections describe how HQs are calculated, how background concentrations are used, and a description of the incremental risks analysis. The remainder of the section describes the risks calculated for soil-based exposures and vernal pools and the uncertainties associated with the estimates.

4.2.1.1 Hazard Quotient Analyses

HQs were developed to determine potential effects to target receptors from exposure to COPEC-contaminated soil, surface water, and prey items. The HQ approach used for this evaluation simplifies the comparison process and allows for a more standardized interpretation of the results (i.e., the HQ reflects the magnitude by which the sample concentration exceeds or is less than the guideline, benchmark, or TRV). In general, if an HQ exceeds 1, some potential for risk is expected (EPA, 1993c). While the quotient method does not measure risk in terms of likelihood of effects at the individual or population level, it does provide a valid benchmark for judging potential risk (EPA, 1994).

HQs were calculated specific to each measurement receptor and exposure area evaluated in this BERA as follows:

$$HQ = EEL/TRV$$

Where:

HQ = hazard quotient (unitless)

EEL = estimated exposure level (medium concentration in units of mg COPEC/kg or µg COPEC/L medium; or for dietary exposure to wildlife target receptors: estimated dose in units of mg/kg BW-day)

TRV = toxicity reference value (benchmarks in units of mg COPEC/kg or µg COPEC/L medium; or for dietary exposure to wildlife target receptors: dose in units of mg/kg BW-day)

For the on-site vernal pools, surface water concentrations are compared with chemical-specific ecological benchmarks; specifically, Federal AWQC for the Protection of Aquatic Life (EPA, 2009) and other surface water toxicity benchmarks (from EPA, 1999a and Suter and Tsao, 1996), amphibian toxicity values identified from Pauli, et al. (2000) and fathead minnow toxicity values identified in EPA's EcoTox database (EPA, 2007h accessed January 2011).

Potential risks to community and individual target receptors from exposure to COPECs for each exposure area are presented in Sections 4.2.2 and 4.2.3 below.

4.2.1.2 Site-Specific Background Comparison

Statistical comparisons were conducted for COPEC concentrations in surface soil and small mammal samples collected from the vegetated and background exposure areas. Comparisons follow statistical guidelines presented in EPA's *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (EPA, 2002).

Statistical tests of significant differences between means were performed using either parametric or nonparametric tests. As discussed in Section 3.2.1.1, distributions and subsequent summary statistics were calculated using EPA's ProUCL software (EPA, 2010b). EPA's ProUCL software was also used to run statistical comparisons based on both the data distribution and the equality of variance using the following selection criteria:

- The parametric Student's t-test is used for comparisons of samples with normal data distribution assuming that the variance of the two populations are approximately equal. The F-test is used to determine whether the true underlying variances of the populations are equal.

- The parametric Satterthwaite t-test is used for comparisons of samples with normal data distribution assuming that the variance of the two populations are not equal. As with the Student's t-test, the F-test is used to check the variance of the populations.

- The two-sample nonparametric Wilcoxon-Mann-Whitney test is used for comparisons where data are not normally or lognormally distributed.

Note that for this evaluation, the two populations were not normally or lognormally distributed for any of the COPECs and therefore the Wilcoxon-Mann-Whitney was used for all comparisons. A p-level of ≥ 0.05 was used to indicate that no significant difference exists between the means of the COPEC levels in the vegetated and background area surface soils or small mammals. Tables 4-1 and 4-2 present the results of the background comparisons for soil and small mammals, respectively. Figures 4-1a through 4-1i present box plots of the transition zone and background concentrations side by side. The ProUCL outputs are presented in Appendix G. The results of the background comparisons are discussed in the subsections below.

4.2.1.3 Incremental Risk Analysis

Potential risk to inorganic chemicals derived from past mining-related activities should be differentiated from risks associated with local reference (background) conditions. This objective is achieved by calculating the Incremental Risk (IR) for each inorganic COPEC using the HQ method, as follows:

$$IR_i = \text{site } HQ_i - \text{background } HQ_i$$

Where: HQ is the hazard quotient for COPEC i.

Background risk exceeded site risk if the IR for a particular COPEC was negative. If the IR was above 1.0, then the site risk exceeded background and the incremental risk is high enough to suggest the potential for site-related risk. IR was only calculated for ecological receptors where the site-related HQ exceeded 1.0. For this assessment incremental risks are considered most important for determining Site-specific risks.

4.2.2 Soil-Based Exposure

Presented within this soil-based exposure is a description of the earthworm bioaccumulation and toxicity test results and HQs calculated based on sample-by-sample comparisons for terrestrial plants and soil invertebrates and intakes based on wildlife modeling.

4.2.2.1 Earthworm Bioaccumulation and Toxicity Test

No definitive conclusions could be drawn from either of the toxicity tests because an insufficient number of replicates were used in the 14-day pilot study to account for variability and low worm survival in the laboratory control for the 28-day follow-up test.

For the 14-day pilot study, none of the worms exposed to the reference soil or artificial soil died (i.e., 100% survival), meeting the Test Acceptability Criterion (TAC) of 80% survival of the controls. Survival was relatively the same across a range of copper concentrations in soil (17 mg/kg to 1,333 mg/kg) when the sample pH was adjusted to approximately 4 (note: literature suggests the *E. fetida* range of survival is a pH between 4 and 10). The survival data were not statistically analyzed because the 14-day study was only a pilot to determine if the method would produce a successful test based on survival and biomass; however, survival was greater than 90% (i.e., it was relatively consistent among samples). Although not conclusive, these findings suggest copper (the most prominent COPEC) is not toxic to earthworms at the Site.

The 28-day follow-up test did not meet the TAC because only 71.25% of the worms in the laboratory control soil survived. In addition, the laboratory control worms lost 49.5% of biomass after 28 days of exposure. This is approximately twice the loss of worms in the pilot study; during which the worms were not fed. This suggests that the worms used in the follow-up test were unhealthy before the exposures started. Mites were noted in the worm ranches reserved for the 28-day test during the pre-test acclimation period. The mites were present throughout the soil and on a few dead worms. The ranches were placed in a refrigerator for several days to kill the mites; however, the temperature was below optimum for the worms.

4.2.2.2 Terrestrial Plants

Risks estimated for the on-site vegetated and background areas to terrestrial plants are presented below.

4.2.2.2.1 On-site Transition Zone

Table 4-3 presents a summary of the sample-by-sample comparison of soil concentrations with TRVs for phytotoxicity for the transition zone. The sample-by-sample comparisons are presented in Appendix H. The COPECs found to be significantly different than background and with concentrations that exceeded the TRVs for phytotoxicity include (samples exceeding/samples detected):

- Antimony (30/66)
- Chromium (182/182)
- Cobalt (70/182)
- Copper (144/182)
- Selenium (162/165)
- Vanadium (182/182)

- Zinc (33/182)

With the exception of cobalt and zinc, the above COPECs all had HQs greater than 10.

4.2.2.2.2 Background Area

Table 4-3 presents a summary of the sample-by-sample comparison of soil concentrations with TRVs for phytotoxicity for the background area. The sample-by-sample comparisons are presented in Appendix H. The COPECs with concentrations that exceeded the TRVs for phytotoxicity include (samples exceeding/samples detected):

- Chromium (16/16)
- Cobalt (2/16)
- Manganese (11/16)
- Selenium (16/16)
- Thallium (7/7)
- Vanadium (16/16)

With the exception of cobalt and selenium, the above COPECs all had HQs greater than 10. Note that manganese had only 2 HQs greater than 10.

4.2.2.3 Soil Invertebrates

Risks estimated for the on-site vegetated and background areas to soil invertebrates are presented below.

4.2.2.3.1 On-site Transition Zone

Table 4-4 presents a summary of the sample-by-sample comparison of soil concentrations with TRVs for soil invertebrates for the transition zone. The sample-by-sample comparisons are presented in Appendix I. The COPECs found to be significantly different than background and with concentrations that exceeded the TRVs for soil invertebrates include (samples exceeding/samples detected):

- Chromium (182/182)

- Copper (142/182)
- Iron (182/182)
- Selenium (86/165)
- Vanadium (157/182)
- Zinc (59/182)

The above COPECs all had HQs greater than 10. Note that vanadium and zinc only had one HQ greater than 10.

4.2.2.3.2 Background Area

Table 4-4 presents a summary of the sample-by-sample comparison of soil concentrations with TRVs for soil invertebrates for the background area. The sample-by-sample comparisons are presented in Appendix I. The COPECs with concentrations that exceeded the TRVs for soil invertebrates include (samples exceeding/samples detected):

- Arsenic (16/16)
- Chromium (16/16)
- Iron (16/16)
- Manganese (10/16)
- Vanadium (11/16)

With the exception of vanadium, the above COPECs all had HQs greater than 10. Note that manganese had only 2 HQs greater than 10.

4.2.2.4 Mammalian and Avian Receptors

Risks estimated for the on-site vegetated and background areas to mammalian and avian receptors are presented below.

4.2.2.4.1 On-site Transition Zone

Table 4-5 presents the RME NOAEL- and LOAEL-based HQs developed for wildlife receptors in the transition zone. Dietary exposures of avian and mammalian receptors to COPECs resulting in NOAEL- and LOAEL-based HQs greater than one for the RME scenario are as follows:

COPEC	NOAEL-Based	LOAEL-Based
Copper	Deer mouse (HQ of 1.6) Short-tailed shrew (HQ of 2.1)	Deer mouse (HQ of 1.2) Short-tailed shrew (HQ of 1.6)
Iron	Deer mouse (HQ of 21) Short-tailed shrew (HQ of 21)	Deer mouse (HQ of 2.1) Short-tailed shrew (HQ of 2.1)
Selenium	Song sparrow (HQ of 5.2) Deer mouse (HQ of 1.4)	Song sparrow (HQ of 2.6)
Thallium	Deer mouse (HQ of 1.8)	No exceedances
Zinc	American robin (HQ of 1.2)	No exceedances

Dietary exposures of avian and mammalian receptors to COPECs resulting in NOAEL- and LOAEL-based HQs greater than one for the CTE scenario (Table 4-6) are as follows:

COPEC	NOAEL-Based	LOAEL-Based
Copper	Deer mouse (HQ of 1.5) Short-tailed shrew (HQ of 1.4)	Deer mouse (HQ of 1.1) Short-tailed shrew (HQ of 1.1)
Iron	Deer mouse (HQ of 16) Short-tailed shrew (HQ of 13)	Deer mouse (HQ of 1.6) Short-tailed shrew (HQ of 1.3)
Selenium	Song sparrow (HQ of 3.5)	Song sparrow (HQ of 1.8)
Thallium	Deer mouse (HQ of 1.1)	No exceedances

4.2.2.4.2 Background Area

Table 4-7 presents the RME NOAEL- and LOAEL-based HQs developed for wildlife receptors in the background area. Dietary exposures of avian and mammalian receptors to COPECs resulting in NOAEL- and LOAEL-based HQs greater than one for the RME scenario are as follows:

COPEC	NOAEL-Based	LOAEL-Based
Iron	Deer mouse (HQ of 6.5) Short-tailed shrew (HQ of 3.1)	No exceedances
Manganese	Deer mouse (HQ of 1.8)	No exceedances
Thallium	Deer mouse (HQ of 1.4)	No exceedances

Dietary exposures of avian and mammalian receptors to COPECs resulting in NOAEL- and LOAEL-based HQs greater than one for the CTE scenario (Table 4-8) are as follows:

COPEC	NOAEL-Based	LOAEL-Based
Iron	Deer mouse (HQ of 5.1) Short-tailed shrew (HQ of 2.5)	No exceedances
Thallium	Deer mouse (HQ of 1.1)	No exceedances

4.2.2.4.3 Incremental Risk for Avian and Mammalian Receptors

As discussed previously, incremental HQs were derived in order to differentiate Site-related risks from those associated with background conditions. Table 4-9 presents the incremental RME NOAEL- and LOAEL-based HQs developed for wildlife receptors in the transition zone. Dietary exposures of avian and mammalian receptors to COPECs resulting in NOAEL- and LOAEL-based incremental HQs greater than one for the RME scenario are as follows:

COPEC	NOAEL-Based	LOAEL-Based
Copper	Deer mouse (HQ of 1.3) Short-tailed shrew (HQ of 1.4)	Short-tailed shrew (HQ of1.1)
Iron	Deer mouse (HQ of 15) Short-tailed shrew (HQ of 18)	Deer mouse (HQ of 1.5) Short-tailed shrew (HQ of 1.8)
Selenium	Song sparrow (HQ of 4.6) Deer mouse (HQ of 1.2)	Song sparrow (HQ of 2.3)

Dietary exposures of avian and mammalian receptors resulting in NOAEL- and LOAEL-based incremental HQs greater than one for the CTE scenario (Table 4-10) are as follows:

COPEC	NOAEL-Based	LOAEL-Based
Copper	Deer mouse (HQ of 1.2)	No exceedances
Iron	Deer mouse (HQ of 11) Short-tailed shrew (HQ of 10)	Deer mouse (HQ of 1.1)
Selenium	Song sparrow (HQ of 2.9)	Song sparrow (HQ of 1.5)

Table 4-11 presents a summary of the modeling-based incremental HQs greater than one for the transition zone and the associated driver pathways. Soil ingestion is a driver pathway for all receptors with incremental HQs greater than one. Additionally, plant ingestion is a driver for the deer mouse HQ exceedances and soil invertebrate ingestion is a driver for the American robin and short-tailed shrew HQ exceedances.

4.2.3 Vernal Pools

4.2.3.1 Surface Water Comparison to Aquatic Life Benchmarks

Tables 4-12 and 4-13 present sample-by-sample comparisons of vernal pool concentrations with acute and chronic surface water benchmarks, respectively. Copper and zinc were the only COPECs with concentrations exceeding the acute benchmark as follows: copper from VP-1 (HQ of 27) and zinc form VP-1 and VP-3 (HQs of 1.5 and 1.6, respectively). The remaining COPECs (barium, cadmium, and manganese) had HQs less than one for their respective acute surface water benchmark. However, all surface water COPECs (barium, cadmium, copper, manganese, and zinc) exceeded their respective chronic surface water benchmark at VP-1 with HQs ranging from 1.5 to 37. Additionally, barium concentrations exceeded the chronic surface water benchmark at VP-2, VP-3 and duplicate, and VP-4 (HQs ranging from 3.2 to 4.0), copper concentrations exceeded at VP-2 (HQ = 1.3), and zinc concentrations exceeded at VP-3 (HQ = 1.6). The remaining COPECs were either not detected or not evaluated at VP-2 through VP-4.

4.2.3.2 Amphibian Toxicity Benchmark Comparisons

Table 4-14 presents the sample-by-sample comparison of vernal pool concentrations with amphibian TRVs. Cadmium, copper, manganese, and zinc concentrations exceeded their respective amphibian TRVs at VP-1 (HQs ranging from 3.4 to 7,300). In addition, copper concentrations exceed the amphibian TRV at VP-2 (HQ = 235) and zinc concentrations exceeded at VP-3 (HQ = 689). Note that barium did not have an available TRV for comparison and the remaining COPECs were either not detected or not evaluated at VP-2 through VP-4.

Table 4-15 presents the amphibian HQs for VP-1 based on *P. promelas* toxicity data. Copper was the only COPEC with HQs greater than one. Concentrations in VP-1 exceeded all four of the TRVs, with HQs ranging from 1.2 to 59 and in VP-2 exceeded the sulfuric acid copper salt TRV with an HQ of 2.0. The remaining COPECs had HQs less than one, with the exception of barium, for which there was no toxicity data for comparison.

4.2.4 Uncertainty Analysis

4.2.4.1 Introduction

As mentioned previously, one of the major components of the Risk Characterization is the discussion of the uncertainties associated with estimating risk. Many of the uncertainties associated with the measurement endpoints selected as part of this BERA were discussed throughout the Problem Formulation and Analysis Phase. The primary objective of the Uncertainty Analysis is to combine and summarize the uncertainty present throughout the ERA process so that this information can be combined with risk estimation information to more completely describe actual or potential risk and to assess the ecological significance of observed or predicted impacts. As stated previously, the actual integration and interpretation of the information presented in the Risk Estimation section are provided in the Risk Description (Section 4.3).

The Uncertainty Analysis identifies and, to the extent possible, quantifies the uncertainties present in the Problem Formulation, Analysis Phase, and Risk Characterization. As previously discussed, virtually every step in an ERA involves numerous assumptions that contribute to the total uncertainty in the final evaluation of risk (e.g., are fathead minnow effect levels appropriate for evaluating potential impacts to vernal pool amphibians). The uncertainties that are incorporated in this BERA may result in an increase or decrease in the estimated potential for adverse ecological effects. When methodologies and input factors for this BERA were selected, conservative, yet realistic approaches and values were used when Site-specific information was unavailable (e.g., dietary intake values for avian and mammalian exposure models). This approach to handling uncertainty may tend to overestimate risks; however, it should be noted that only conservative assumptions compatible with sound scientific evidence or processes were used.

Uncertainties in ERAs may be identified as belonging to one or more of the four following categories: conceptual model formulation uncertainty, data and information uncertainty, natural variability (stochasticity), and error (EPA, 1992a). These are not discrete categories, and overlap does exist among them. EPA's Ecological Framework document provides a more detailed discussion of these generic uncertainty categories (EPA, 1992a).

After discussing general uncertainties (Subsection 4.2.4.2) associated with the ERA process used for this BERA, the Uncertainty Analysis follows the order of presentation of endpoints used in the previous subsection on Risk Estimation and discusses uncertainties specific to each endpoint. Where possible, the effect of a given uncertainty, i.e., under- or overestimate of risk, is noted. In instances where the direction of the uncertainty is unknown, i.e., may under-or overestimate risk, the effect generally is not stated. Table 4-16 summarizes the major uncertainties for each endpoint.

4.2.4.2 General Uncertainties

There are numerous uncertainties that may be associated with this BERA in general, or to one or more measurement endpoints specifically that were used in this BERA. In an effort to limit the repetitious listing of common uncertainties, the general uncertainty categories previously presented (i.e., conceptual model formulation, information and data, natural variability, and error) are used to highlight common uncertainties present throughout the assessment. The general uncertainties associated with these categories are described below.

4.2.4.2.1 Conceptual Model Formulation

- Food web and trophic dynamics within a system (which directly impacts bioavailability of COPECs) are complex and not completely understood.

- Detected concentrations in soil, prey items, and surface water may not be indicative of bioavailable concentrations. This is addressed throughout the remainder of the Uncertainty Analysis.

- Target receptors identified in the Problem Formulation were selected to represent a variety of organisms with similar feeding and behavioral strategies and to assist in the evaluation of measurement endpoints. However, species-specific exposure and susceptibility to toxic effects within similar feeding groups may vary and result in differing risk potential. Target receptors were selected with the intent of optimizing exposure and assuming that a significant portion of their life cycles was restricted to the area of contamination. The assumption that avian and mammalian target receptors spend a significant portion of their life cycles at the Site may be conservative (i.e., overestimate risk) for some receptors (e.g., mink).

4.2.4.2.2 Information and Data

- Factors unrelated to COPEC contamination may influence the number and composition of species that reproduce or forage on-site and the frequency of their exposure to Site-related contamination. Examples of these types of factors include habitat modification in the vicinity of the Site, natural population fluctuations, off-site contaminant release, soil pH, and migration.

- Surface water grab samples represent snapshots of surface water conditions in the vernal pools; they may not reflect chronic water conditions and unless taken frequently over time may not capture acute COPEC pulses.

- Media sampling was typically not random; most sampling strategies used were designed to identify “worst case” situations or delineate the areal extent of contamination, which would tend to overestimate risk.

- In general, media chemical sampling was limited to direct measurement of inorganic concentrations; the presence of other chemicals that may act synergistically or antagonistically was not determined.

- As noted in Section 2.2.2.2, only the transition zone of the Site was evaluated in this BERA. Concentrations of COPECs in the barren area are presented alongside those for the transition zone in Table 4-17. Average concentrations of the risk drivers (i.e., antimony, copper, iron, selenium, and zinc) in the barren area were either similar to or within a factor of 3 times higher than the transition zone. Only copper and selenium had maximum concentrations that were higher in the barren area than in the vegetated.

- Because of the complexity of community and population dynamics, it is not possible to evaluate all possible exposures or effects, so target receptors are selected for evaluation. However, numerous authors (Cairns, 1988; Chapman, 1995; Forbes, et al., 2001) have expressed concern regarding the extrapolation of individual species effects evaluations to population level impacts, let alone how species-level impacts might affect community dynamics.

- Only five composite soil invertebrate samples were collected within the study area. The composition of each soil invertebrate sample was dominated by grasshoppers, crickets, ground beetles and spiders; these species are exposed to soil contamination primarily through the ingestion of food and incidental amounts of soil. Only 3 earthworms were observed during a full week of tissue collection activities.

- Small mammals and soil invertebrates were collected from areas that included the barren areas where contamination may be higher. Therefore, risks for insectivores and carnivores calculated for the transition zones may be overestimated. However, it is not known exactly what fraction of their dietary intake is derived from the barren areas versus transition zone versus the surrounding forest.

- Approximately 180 XRF surface soil samples were collected in on-site transition zones; a summary of this data is provided in Table 2-4. When average XRF concentrations are compared with the fixed laboratory surface soil data for transition zones (see Tables 2-3 and 2-4), the fixed laboratory data had higher concentrations for all five metals.

Analysis of paired XRF and fixed laboratory soil data was provided in Appendix A of the Ely Mine Human Health Risk Assessment (HHRA) (Nobis, 2010). The conclusion of this analysis was that the XRF and fixed laboratory results were relatively comparable. Given the comparability of these two types of data, and the fact that the higher quality fixed laboratory data showed higher average concentrations, it is reasonable to assume that the inclusion of XRF data into the exposure assessment would not result in an increase in the estimation of potential ecological risk.

4.2.4.2.3 Natural Variability (Stochasticity)

- Fluctuations in seasonal or annual temperature and precipitation may temporarily affect habitat suitability and subsequent receptor exposure. These fluctuations can also directly influence the availability of water in vernal pools.

- Within a target species, there exists variability in species sensitivity to inorganic-related toxicity.

- Soil pH is the master variable controlling metal availability in the soil matrix. Key chemical processes influenced by pH include: dissolution and precipitation of metal solid phases, complexation and acid-base reactions of metal species and metal sorption (EPA 2007a). As soil pH increases, there is an increase in the number of negatively charged soil particles, thereby decreasing the number of free cations (e.g., Cu^{+2}, Cd^{+2}, Zn^{+2} etc.). At any specific location, pH in association with alkalinity, calcium, organic matter (OM), iron and manganese oxyhydrides, oxygen and aging affect metal bioavailability. Because these variables can fluctuate substantially within a small area, it is often difficult to access Site-wide availability of COPECs within the terrestrial ecosystem. However, it should be noted that the preliminary earthworm bioaccumulation and toxicity study failed because all of the earthworms in Site soils died. During the subsequent study, Site soil pH was adjusted to above 4 (the minimum literature-based survival pH), 14-day survival was greater than 90% even at copper concentrations of >1,300 mg/kg (TechLaw, 2010). Although not conclusive, these findings suggest that pH may be more of an ecological issue than COPEC concentrations.

- Vernal pool characteristics, such as pH, inorganic and organic ligand concentrations, dissolved oxygen (DO), and Eh (oxidation potential) influence metal speciation and complexation reactions which in turn determine bioavailability and toxicity. In general, free metal ions are thought to be the primary metal species that cause toxicity to aquatic organisms; therefore, natural variations in these properties can significantly impact the aquatic life present in vernal pools (EPA, 1997a).

4.2.4.2.4 Error

- The use of summary statistics and estimates of variability are reflective of the sampling strategy and sample sizes. Non-random sampling may introduce bias.

- The HQ approach used throughout the assessment fails to account for uncertainty in the point estimates used and typically compounds conservatism by using "worst case" assumptions when selecting parameter estimates.

- Quantification of NOECs and LOECs (this also includes NOAELs and LOAELs) depends critically on experiment size and variability, and as such has been criticized by numerous authors (Hockstra and Van Ewijk, 1992; Laskowski, 1995; Chapman, et al., 1998) as having limited value in assessing risk.

- Factors like recruitment, natural attenuation of COPECs, adaptive tolerance, the small size of the impacted area relative to the range of most species, and adaptive reproduction potential could not be assessed. These factors tend to mitigate the degree and significance of impacts to chemical stressors; therefore, results presented using the current approach tend to overestimate risk.

4.2.4.2.5 Bioavailability

- Results regarding bioavailability data (TechLaw, 2011) should be viewed as Site-specific and in the context of evaluating multiple lines of evidence.

- Based on the sequential extraction, the "bioavailable fraction" of the soil was less than 10% of the total concentrations (TechLaw, 2011). The literature-based bioaccessibility factors (see Table 3-18) were higher than 10% (with the exception of antimony, chromium, and mercury for which no Site-specific data were available); therefore, risks calculated from direct exposure to soil are overestimated. Given the findings provided in the14-day earthworm toxicity pilot study, there are indications that factors other than the metal concentrations (i.e., pH) may be contributing to the lack of biota in the barren areas.

4.2.4.2.6 COPEC Selection

- As stated in EPA's Eco-SSL document for aluminum and iron (EPA, 2003b and c) and noted in Section 2.2.4.3, the bioavailability and toxicity of these metals is pH dependent. "Aluminum is identified as a COPEC only for those soils with a soil pH less than 5.5" and for iron, in well-aerated soils with a pH between 5 and 8, the iron demand of plants is higher than the amount available and that toxicity is not expected. Because pH values in the transition zones of the Site range from 3.4 to 6.4 and no soil-based benchmarks for soil invertebrates, birds, or mammals were available, aluminum and iron were retained as COPECs. For the Site, 20 of 23 samples had a pH that would indicate that aluminum and iron would be bioavailable. In addition, most of these samples were collected in areas not directly influenced by waste pile run-off.

- Cyanide was not detected in surface soil, but 1 out of 42 SQLs (ranging from 1.2 to 1.8 mg/kg) exceeded the soil benchmark (1.33 mg/kg based on exposure to a vole; EPA, 2003e). Because of the lack of toxicity data, cyanide was not quantitatively evaluated in the risk assessment. Given that only one sample had a concentration exceeding the screening benchmark and that the resulting HQ was only 1.4, it is unlikely that cyanide in soil is of concern in the transition-zone.

- Aluminum, beryllium, cadmium, cobalt, lead, nickel, and silver had SQLs in at least one vernal pool sample that were higher than the aquatic benchmark. HQs based on SQLs for aluminum, cobalt, lead, and nickel are all less than 3. The HQs based on SQLs for beryllium are 7.6, for cadmium are a maximum of 5.6, and for silver are 4.2. Given that the SQLs are higher than the concentrations in the vernal pools, the magnitude of the HQs are not high, and that the results of the risk assessment would indicate that copper, the sentinel COPEC for this terrestrial BERA, is not of concern in any vernal pool but VP-1, it is unlikely that Site-related elevated risks are occurring from potential concentrations below the SQLs for these chemicals.

4.2.4.2.7 Plant Concentration Estimation

- Site-specific plant concentrations were not available; therefore a variety of methods were used to estimate COPEC concentrations in terrestrial plants depending upon data availability. First, the herbivorous small mammals at the Site were assumed to be ingesting seeds. The most recent plant concentration estimation approach, as used in the development of Eco-SSLs is based on the vegetative portion of the plant (e.g., shoots and leaves). Because the use of regression equations that incorporate the fact that bioaccumulation is not 1:1 with soil concentrations as soil concentrations increase, these equations were used preferentially. However, comparing vegetative and reproductive (i.e., root, tuber, fruit, and seed) BCFs from Baes, et al. (1984) indicates that the accumulation in vegetative portions of the plant are generally higher, sometimes by orders of magnitude. For example, the plant concentration for selenium estimated for the vegetated portion of the Site using the multiple regression equation from Bechtel-Jacobs (1998; the source of many of the regressions used to develop Eco-SSLs) was 0.53 mg/kg; whereas the plant concentration using the Baes, et al., (1984) the reproductive BCF value was 0.04 mg/kg. Therefore, using the vegetative-based accumulation estimation methods likely overestimate seed concentrations and subsequent risk to the herbivorous small mammals at the Site.

4.2.4.3 Hazard Quotient Uncertainties

When sufficient data are available to quantify exposure and effects estimates, the simplest approach for comparing estimates is the ratio approach (EPA, 1998). As presented in Section 4.2.1.2, the HQ is being used throughout this BERA to evaluate risk to target receptors and communities. The advantages to using this approach are: 1) it is quick and simple to use; 2) risk managers are familiar with its application; and 3) it provides an efficient means to identify high- or low- risk situations. There are, however, a number of limitations associated with this approach that have been discussed by several authors (Smith and Cairns, 1993; Suter, 1993; Suter, et al., 2000) and include: 1) inability to provide incremental quantification of risk (e.g., an HQ of 10, does not necessarily mean 10X more risk than an HQ of 1; 2) not appropriate for evaluating secondary effects; and 3) the quotient approach does not explicitly consider uncertainty.

4.2.4.3.1 Benchmark Comparisons

4.2.4.3.1.1 Phytotoxicity Screening Benchmarks

Uncertainties for specific COPECs are presented below.

- The phytotoxicity screening benchmark for antimony was 0.5 mg/kg from EPA (1999a). The duration, endpoint, and test organism were not specified in the original document and an uncertainty factor of 10 was applied to the value of 5 mg/kg. Efroymson, et al. (1997b) use the 5 mg/kg value as a screening benchmark and indicate that there is low confidence in the benchmark as it is the only value available, is from a secondary reference, and notes undefined, qualitative phytotoxic effects on plants. If the value without the uncertainty factor applied was used as the benchmark, only 3 out of 66 detected concentrations would produce HQs >1. An Eco-SSL was not derived for phytotoxicity from antimony because the studies were not of sufficient quality to develop a reasonable value.

- The Eco-SSL for selenium, 0.52 mg/kg, is the geometric mean of the maximum acceptable toxicant concentration (MATC) and 20% effective concentration (EC20) values for growth for 6 species under different test conditions (pH and % OM). Species used were alfalfa, barley, brassica, *Trifolium*, and cowpea. Differences in toxicity between these species and those present at the Site are an uncertainty.

- The Eco-SSL for zinc is the geometric mean of the MATC values for three species under different test conditions (pH and % OM) and is equal to 160 mg/kg dw. Soybean, oats, and lettuce were the species, with growth being the endpoint. Differences in toxicity between these food crops and indigenous vegetation is unknown.

4.2.4.3.1.2 Soil Invertebrate Screening Benchmarks

Uncertainties for specific COPECs are presented below.

- The soil invertebrate screening benchmark for iron was 200 mg/kg from Efroymson, et al. (1997c) based on microbial activity in soils. Out of nine studies, 280 mg/kg was the lowest effective concentration reported. This value relates to iron III exposure reducing nitrogen mineralization. This benchmark was given “low” confidence by Efroymson, et al. (1997c). Other studies considered reduced acid phosphatase activities under various iron species and concentrations, as well as differing pH, OM, and clay contents. In these studies, activity was reduced in some soils at 1,398 mg iron/kg. The ecological significance of these potential effects at the Site is not clear.

- The selenium soil invertebrate Eco-SSL of 4.1 mg/kg is the geometric mean of the EC20 values for three test species (i.e., earthworm, springtail, and *Enchytraeis*) from one study. Because confidence in a value based on one study is not particularly high, the other benchmark sources were considered. EPA (1999a) presents a soil invertebrate TRV of 7.7 mg/kg based on reduced cocoon production in earthworms based on a single dose tested (77 mg/kg with an uncertainty factor of 10 applied). Efroymson, et al., (1997c) presented a value of 70 mg/kg for soil invertebrates based on the same study as EPA (1999a). If the least conservative screening value is used, only three concentrations would exceed the screening level and the maximum HQ would be 1.2.

- The zinc soil invertebrate Eco-SSL is the geometric mean of the EC10 and MATC values for at least three test species under different test conditions (pH and OM%) and is equal to 120 mg/kg dw. The value was based on springtail and nematode reproduction and population changes.

4.2.4.3.1.3 Surface Water Benchmarks

The use of EPA's AWQC for evaluating the potential impacts of reported contaminant concentrations in surface water has the following general associated uncertainties:

- The use of the AWQC as a screening tool does not consider Site-specific interactions with other chemicals present and cannot be interpreted as a direct measurement of Site-specific bioavailability.

- The AWQCs account for direct exposure only, and do not account for the possibility that uptake from food may add to the contaminant intake from water alone. This may underestimate risk.

- There may be differences between the species with toxicological data used to develop the AWQC and those present in the vernal pools.

- EPA's AWQC are based on a threshold for statistical significance rather than biological significance.

- There is uncertainty surrounding the extrapolation of laboratory data (used to develop criteria) to field conditions.

- Acute and subchronic laboratory toxicity tests frequently do not measure the most sensitive ecological endpoints; in particular, fecundity is often not measured (Suter, 1996b).

- Chronic AWQCs are based on the most statistically sensitive of the measured response parameters in each chronic or subchronic test. Therefore, cumulative effects over the life cycle of fish and invertebrates are not considered (Suter, 1996a). This would tend to underestimate risk.

The major uncertainties associated with the other benchmarks (i.e., EPA, 1999a and Suter and Tsao, 1996) is that the dataset from which they were derived is generally small and may not incorporate values protective enough or that are too protective for the aquatic community in general.

4.2.4.3.1.4 Amphibian Toxicity Values

Amphibian toxicity values obtained from Pauli, et al. (2000) were from the most sensitive of the available data. Given the small dataset from which these values were gleaned, the direction of the uncertainties is unknown.

Fathead minnow toxicity was correlated to wood frog larvae toxicity observed in the on-site pond complex (EPA, 2010a). However, it is uncertain as to how well this relationship applies to the on-site vernal pools and the other amphibian receptors that utilize them.

4.2.4.3.2 TRV Comparisons with Exposure Modeling Results

Uncertainties associated with the wildlife modeling and subsequent comparisons with TRVs can be divided into two categories: those associated with the exposure estimate (i.e., estimating daily intake) and those associated with the TRVs. General uncertainties associated with each are discussed below, followed by target-receptor specific uncertainties.

4.2.4.3.2.1 General Exposure Characterization Uncertainties Associated with Wildlife Dose Modeling

In the exposure assessment, numerous assumptions were made to estimate daily intakes for selected target species (i.e., song sparrow, American robin, American kestrel, deer mouse, short-tailed shrew, and mink). Because site-specific receptor information was not available, assumptions were made regarding ingestion rates, frequency of exposure, and EPCs. This BERA used a deterministic approach for calculating exposures (both RME and CTE); exposure parameters used were point estimates and did not incorporate information regarding parameter-specific variability. In general, an effort was made to use modeling assumptions that were conservative, yet realistic. The primary assumptions used in the exposure characterization follow.

- Prey tissue data collected during one collection effort (Fall 2009) were used to determine EPCs. Due to the seasonal variations of tissue concentrations, the use of data from only one season may under-or overestimate the exposure of wildlife to COPECs during any given season.

- Tissue residue concentrations detected in the soil invertebrates and small mammals collected were assumed to be representative of other prey items of the same trophic level that may be ingested by the target receptors. This assumption may under- or overestimate risk, depending upon the actual prey items ingested.

- The bioavailability and toxicity of metal ions to wildlife are dependent on the form in which they exist in the environment (i.e., speciation). Factors that determine the naturally occurring forms of metals include soil texture, soil and surface water chemistry, pH, redox potential, and solute and ligand concentrations. Because analytical procedures used to evaluate metal concentrations do not provide species-specific concentrations, the associated bioavailability and toxicity are difficult to assess. In this BERA, a bioaccessibility adjustment was applied when calculating intakes to account for instances where availability from dietary or soil is less than 100%. Data to include this adjustment was often not available and bioaccessibility was conservatively assumed to be 100% (see Table 3-18). Based on the sequential extraction, the “bioavailable fraction” of the soil was less than 10% of the total concentrations (TechLaw, 2011). The literature-based bioaccessibility factors were higher than 10% (with the exception of antimony, chromium, and mercury for which no Site-specific data were available); therefore, risks calculated from direct exposure to soil are overestimated.

- Risks were calculated for each inorganic alone. Calculating risk in this manner does not account for additivity, synergism, or antagonism of other contaminants to which receptors may be exposed. Calculating risks on a chemical-by-chemical basis may result in an over- or underestimation of total potential risk.

- The ingestion route is the only exposure route evaluated in this analysis because there is limited information to assess other potential exposure routes such as dermal absorption and inhalation. Exposure via dermal absorption and inhalation may be of particular concern for species that clean themselves by rolling in any dry surface (i.e., shrew pups) (EPA, 1993b). By not estimating exposure by these pathways, risks are likely underestimated.

- Average body weights were used to estimate exposure intakes for all target receptors. This approach may under- or overestimate daily intake for individuals depending upon their sex, age, breeding status, and time of year.

- Risks were calculated on a Site-wide basis and it was assumed that all of the receptors obtained 100% of their diet within the Site. Given the feeding ranges of the American kestrel and mink in particular, this may be a conservative assumption.

- Although soil ingestion rates are presented as a percentage of the diet, it was conservatively assumed that any soil ingestion intake was in addition to 100% of the dietary (food) intake, and not part of the total diet. This may overestimate the intake of contaminants.

- The soil ingestion rates were calculated by applying a percentage of soil assumed to be in the diet to a DW food ingestion rate. DW food ingestion rates, were calculated from WW food ingestion rates for the song sparrow and deer mouse assuming that seeds contained 9.3% moisture (seeds; EPA, 2007g). However, because different seeds contain various amounts of water, the use of a single moisture content value may result in an over- or underestimate of daily soil intake rate. Soil ingestion rates for the American robin and short-tailed shrew are less uncertain as the mean Site-specific soil invertebrate moisture content was used in the soil ingestion rate calculations.

4.2.4.3.2.2 General Effects Characterization Uncertainties Associated with TRV Development

The interpretation and application of toxicological data in the ecological effects characterization are potentially the greatest sources of uncertainty in the estimate of risk from avian and mammalian food chain modeling. Appropriate toxicity data specific to target receptors were not always available; therefore, application of literature-derived toxicity data to the species of concern was sometimes necessary. When selecting toxicological data to compare with Site-specific conditions, avian TRVs were selected from the lowest-available bird NOAELs and LOAELs. However, species sensitivity may vary even among closely related species. Variations in species sensitivity may be due to differences in some of the following factors: toxicity, tolerance thresholds, toxic symptoms exhibited, time period until toxic effects are observed, and metabolism of the ingested chemical. Because study designs and presentation of results can be quite different, steps were taken to make sure the concentrations and/or doses were comparable. As such, the primary uncertainties potentially associated with the derivation of TRVs are noted below.

- The medium in which a chemical is administered in toxicity tests can have a substantial effect on its gastrointestinal absorption. However, sufficient information was not available with which to make adjustments to account for differences between the bioavailability of the administered form in the toxicity test and dietary items/soil. For example, if a TRV value was based on a study that administered compound X via corn oil gavage, the target receptor exposure dose would have to be calculated based on the relative bioavailability of the chemical in corn oil as it compares with the bioavailability of the chemical in dietary items (e.g., plants or small mammals). An inability to account for differences in bioavailability may over- or underestimate potential hazards to Site receptors.

- In calculating TRVs, adjustments (uncertainty factors) were not applied to toxicity data to account for differences in species. The possibility exists that the indicator species may be more sensitive to a certain chemical exposure than the test species. It may also be possible that the animal used in the laboratory or field study from which the TRV is derived may be more sensitive than the receptor species. Therefore, the TRVs may be overly conservative, or may not be adequately protective.

- Iron is an essential nutrient and most studies appear to concentrate on effects of iron deficiencies. The selected mammalian TRVs of 3.15 and 31.5 mg/kg-day (NOAEL and LOAEL, respectively) were based on apoptosis of the pancreas and slight cardiomyopathy. The ecological significance of this effect is not known. The next highest NOAEL/LOAEL pairing (31.5/315 mg/kg-day) was based on behavioral, liver, pancreatic, and heart effects. If the latter values were used, incremental risk for iron would only exceed one for deer mouse RME and CTE case NOAEL HQs and the short-tailed shrew RME NOAEL. All would be <2.

- The avian TRV for selenium was based on the administration of selenomethionine to mallards. Selenomethionine is an amino acid based compound that is highly bioavailable. Given that selenium in the -2 oxidation state (i.e., selenide) tends to exist in reducing environments (acid and organic conditions), as hydrogen selenide and metal selenide with copper, lead, and iron, it is likely that selenium in soils is not as bioavailable as that used to derive the avian TRV. This would overestimate risk to an unknown degree (Cal EPA, 2010).

4.2.4.3.2.3 Target Receptor-Specific Uncertainties

4.2.4.3.2.3.1 Song Sparrow

Because the majority of the risks to the song sparrow from selenium are based on soil ingestion; and as noted previously, the form of selenium found in the soils is likely inorganic as opposed to the organic form used to develop the TRV, risks are likely overestimated.

4.2.4.3.2.3.2 American Kestrel

The foraging range of the American kestrel, and many carnivorous birds exceeds the Site area. Therefore, risks to these animals are likely overestimated.

Soil ingestion was not considered to be an important exposure pathway for the American kestrel and was; therefore, not evaluated. Kestrels eat insects like grasshoppers and dragonflies, generally catching prey on the ground. As they do not scratch or dig to find their prey, it is not likely that the soil ingestion rate would be particularly high. Although receptor-specific data are not available, EPA (1999a) uses the bald eagle value as a surrogate, which is 1% of the dry dietary intake. In addition, soil/litter invertebrate concentrations were used to estimate concentrations in the kestrel's prey. Given that these invertebrates were not depurated, and that they are more intimately associated with soil than the kestrel's prey items are, the EPCs used likely overestimate exposure to the kestrel.

4.2.4.3.2.3.3 Mink

Because this is a terrestrial BERA, it was assumed that the mink ingests only terrestrial prey (i.e., small mammals). In fact, the mink is a more aquatic mammal and a good portion of its diet should be fish and aquatic/sediment invertebrates. Therefore, risks based on soil-mediated exposures is likely overestimated.

4.3 Risk Description

4.3.1 Introduction

The risk description is the part of the ERA in which the risk assessors integrate and interpret the available information into conclusions about risks to the assessment endpoints.

The risk description incorporates two primary elements. The first is the lines of evidence evaluation, which provides a process and framework for determining confidence in the risk estimate. The second is the determination of ecological adversity, which represents whether the valued structural or functional attributes of the ecological entities under consideration are altered, the degree of adversity to the entities, and if recovery is possible (EPA, 1998). The following risk description is divided into two subsections: WOE Analysis (Subsection 4.3.2) and the Risk Summary (Subsection 4.3.3).

4.3.2 Weight-of-Evidence Analysis

As discussed in the Problem Formulation, the actual evaluation of how well a measurement endpoint and its one or more lines of evidence represent an assessment endpoint is determined in the WOE analysis. The goal of the WOE analysis is to integrate all relevant findings of the ERA in an effort to determine the occurrence or potential for adverse ecological impacts. This is accomplished by: 1) assigning weights to each measurement endpoint; 2) evaluating the magnitude of response with respect to each measurement endpoint; and 3) determining the concurrence among the measurement endpoint(s) used to answer the question(s) posed by the assessment endpoint.

Weights were assigned to measurement endpoints (see Section 2.4.3) based on 10 attributes (see Table 2-15) in relation to: 1) strength of association between assessment and measurement endpoints; 2) data and study quality; and 3) study design and execution.

4.3.2.1 Magnitude of Response

The second step of the WOE approach outlined by Menzie, et al. (1996) is to evaluate the magnitude of response in the measurement endpoint, considering two questions:

1) Does the measurement endpoint indicate the presence of risk (possible, unlikely, or undetermined)?
2) Is the response low or high?

Specifically, likelihood and magnitude of response determinations were made for each COPEC within an endpoint. Criteria for determining evidence of harm and magnitude of response for all lines of evidence are provided below.

Sample-by-sample Comparisons with Soil Screening Values:

- If ≤10% of the detected Site concentrations have HQs >10, “Risk?” = “Unlikely.”
- If the COPEC concentrations at the Site are greater than background concentrations, >10% of the detected Site concentrations have HQs >1, and >10% of the detected background concentrations exceeded the benchmark, “Risk?” = “Undetermined.”
- If the COPEC concentrations at the Site are greater than background concentrations, ≤10% of the detected background concentrations exceeded the benchmark, and ≥10% of the detected Site concentrations were greater than the benchmark value, “Risk?” = “Possible.”
    - If “Risk” was noted as “Possible,” and <10% of the HQs greater than one were >10, “Magnitude” = “Low;” else “Magnitude” = “High.”

Estimated Daily Intake Comparisons with TRVs:

An “Interpretive Ecological Risk Matrix” was developed. A general matrix is as follows.

RME Case	CTE Case	Population Risk?	Magnitude	Confidence
N≤1 & L≤1	N≤1 & L≤1	Unlikely	---	High
N>1 & L≤1	N≤1 & L≤1	Unlikely	---	Moderate
N>1 & L>1	N≤1 & L≤1	Undetermined	---	Low
N>1 & L≤1	N>1 & L≤1	Undetermined	---	Low
N>1 & L>1	N>1 & L≤1	Possible	Low	Moderate
N>1 & L>1	N>1 & L>1	Possible	If RME Case HQs < 5 then "Low," else "High"	High

N = an HQ based on dividing an exposure by its appropriate no effect benchmark
L = an HQ based on dividing an exposure by its appropriate effect benchmark

In addition, it is important to note that "unlikely" indicates that *population-level* effects are unlikely to the receptors represented by the measurement endpoint and that "possible" indicates that there is a potential for adverse *population-level* effects to the receptors represented by the measurement endpoint. The confidence rating was assigned using professional judgment based on the combination of the RME and CTE case results. For example, if HQs for a COPEC did not exceed one under any circumstance, it is assumed that there is a high level of confidence in stating that population risks are "unlikely." The confidence rating will be employed in the "Risk Conclusions."

Vernal Pool Water Concentration Comparisons with Surface Water Benchmarks:

- If the concentration was less than the chronic value, "Risk?" = "Unlikely."
- If the concentration was greater than the chronic value, "Risk?" = "Possible."
  - If "Risk" was noted as "Possible," and the concentration was less than the acute value, "Magnitude" = "Low;" else, "Magnitude" = "High."

Note that undetermined is not a possibility for these comparisons.

Vernal Pool Water Concentration Comparisons with Amphibian Toxicity Values:

- If the concentration was less than the toxicity value, "Risk?" = "Unlikely."
- If the concentration was greater than the toxicity value, "Risk?" = "Possible."
  - If "Risk" was noted as "Possible," and the HQ was <10, "Magnitude" = "Low;" else "Magnitude" = "High."

Note that undetermined is not a possibility for these comparisons.

Table 4-18 presents the results of the evidence of harm and magnitude. Note that, for soil-based exposures only COPECs that are significantly different from background are discussed; and in the case of modeling results, it is the HQs from the ***incremental risk*** (IR) calculation (i.e., the risk attributable releases from the Site) that were used to determine magnitude of response.

4.3.2.2 Concurrence Among Endpoints

The third step of the WOE process evaluates the degree of concurrence among measurement endpoints by plotting the output of the endpoint weighting and magnitude of response on a matrix for all measurement endpoints per assessment endpoint. Because only one or two measurement endpoints were evaluated per assessment endpoint, all of the endpoints evaluated are presented on one matrix (Table 4-19), allowing easy visual examination of agreements or divergences among the endpoints.

When evaluating concurrence among measurement endpoints, there is an examination of the agreement or lack thereof among measurement endpoints as they relate to a specific assessment endpoint. Logical connection, interdependence, and correlations among measurement endpoints need to be considered.

Agreement between different lines of evidence increases confidence in the conclusions derived in the risk estimation. When lines of evidence disagree, it is important to distinguish between true inconsistencies and those related to uncertainty and variability associated with each measurement endpoint. The evaluation process involves more than just listing the evidence that supports or refutes the risk estimate. This BERA presents in detail the considerations and interpretations involved in evaluating all lines of evidence. As with assigning qualitative significance ratings to the measurement endpoints, professional judgment is required when evaluating the various results and conflicting lines of evidence.

Completed matrices illustrating the results of the WOE assessment for each COPEC indicating “possible” harm for at least one endpoint are presented in Table 4-19.

4.3.3 Risk Summary

The results of the ecological risk characterization require interpretation to aid the risk manager in making remedial decisions and to promote understanding by the stakeholders and the public

(Suter, et al., 2000). The purpose of this section is to summarize the major findings of this BERA and to discuss the implications of these findings for the target communities and receptors in the Ely Mine study area. Specifically each assessment endpoint is evaluated to determine if adverse impacts are anticipated and whether those impacts can be considered significant. The criteria for interpreting significant changes in an assessment endpoint include:

- Intensity of effects
- Spatial and temporal scale
- Potential for recovery

The whole process of determining significant adverse effects requires professional judgment and, therefore, justification for decisions made during this final step in the risk assessment process is essential. Table 4-20 provides a summary of the risk findings for each assessment endpoint. Potential for recovery from inorganic contamination in this system is not specifically addressed in this assessment. Overall risks to ecological receptors are relatively low.

4.4 Risk Conclusions

During the planning stages of this terrestrial BERA, it was agreed by all the ecological assessment team members, that the barren locations throughout the study area (i.e., waste rock piles, roast beds, smelter area and slag piles) were severely impacted by the presence of ARD and metal contamination.

The results of the sequential extraction evaluation conducted by USGS (Piatak, et al., 2007), suggest that <10% of the total concentration of any specific metal in Site soils is bioavailable. These findings are supported by the earthworm bioaccumulation and toxicity study (TechLaw, 2010) that showed relatively no toxicity to earthworms exposed to copper concentrations >1,300 mg/kg (when the pH was adjusted to above 4), well above the copper Eco SSL of 80 mg/kg for soil invertebrates (EPA, 2007b).

It was assumed that these impacted areas would be addressed in the FS and that they did not warrant further assessment in the terrestrial BERA. Sampling and subsequent ecological risk analysis focused on determining the potential for significant adverse ecological effects in the transition zones that border these barren areas and any vernal pools located therein. The target communities and receptors selected to evaluate potential ecological impacts include: terrestrial plants, soil invertebrates, herbivorous birds and mammals, invertiverous birds and mammals, carnivorous birds and mammals and the aquatic and amphibian communities associated with the on-site vernal pools. Ecological risks were assessed by comparing media concentrations to benchmark values and modeled exposure concentrations to TRVs. The following table summarizes the findings of this risk analysis.

Receptor Group	Overall Risk Conclusion/Chemicals of Concern	
	Possible	**Not Expected**
Terrestrial Plants	Copper and to a lesser extent, zinc (however endpoint confidence is low)	
Soil Invertebrates	Copper and to a lesser extent, zinc (however endpoint confidence is low)	
Herbivorous Birds	-	√
Invertiverous Birds	-	√
Carnivorous Birds	-	√
Herbivorous Mammals	-	√
Invertiverous Mammals	-	√
Carnivorous Mammals	-	√
Aquatic Community	VP-1 only from cadmium and copper	
Amphibian Populations	VP-1 only from cadmium, copper, manganese, and zinc	

When evaluating whether significant ecological risk has occurred, risk managers need to consider whether the observed or predicted adverse effects were likely caused by Site-related stressors; are the impacts to local populations or communities sufficient in magnitude, severity, areal extent and duration such that they will not be able to recover and maintain themselves in a healthy state; and whether effects appear to exceed the natural changes in the components typical of similar non-site-impacted habitats (EPA, 1999b). Although all the conditions associated with significant ecological risk are present in the on-site transition zones, the magnitude and severity of risks are not high (with the exception of VP-1) and signs of recovery (i.e., the establishment of early successional vegetative communities) are present in the on-site vegetative communities.

In addition, it is important to note that in the earthworm toxicity tests performed using soils from the waste piles (i.e., barren areas), adjusting the soil pH to a range in which the earthworms could survive resulted in relatively similar survival for reference and Site samples, with concentrations ranging from 17 to 1,330 mg/kg copper. Therefore, it is surmised that where harm may be apparent, it is not clearly attributable to the COPECs identified in the BERA, but rather by low pH in the soil and mine wastes.

Therefore, this terrestrial BERA concludes that remedial action is not required in the on-site transition zones.

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TABLES

TABLE 2-1
COMMON VEGETATION OBSERVED IN TERRESTRIAL COVERTYPES AND POTENTIAL WETLAND AREAS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Common Name	Latin Name	Northern Hardwood Forest	Red Spruce Northern Hardwood	Disturbed/Transitional Areas	Upland Meadow	Potential Wetland Areas
Apple	*Malus sylvestris*	•			•	
Ash, Green	*Fraxinus pennsylvanica*	•				
Ash, White	*Fraxinus americana*	•				
Aspen, Big-tooth	*Populus grandidentata*	•	•	•	•	
Aspen, Quaking	*Populus tremula*	•	•		•	
Beech, American	*Fagus grandifolia*	•				
Birch, Gray	*Betula populifolia*		•	•		
Birch, Paper	*Betula papyrifera*			•		
Birch, White	*Betula alba*	•	•			
Birch, Yellow	*Betula alleghaniensis*			•		
Blackberry	*Rubus sp.*	•			•	
Blueberry, Lowbush	*Vaccinium angustifolium*	•				
Blueberry, Highbush	*Vaccinium corymbosum*	•				
Cattail, Broad-leaf	*Typha latifolia*					•
Cottongrass	*Eriophorum spp.*			•		
Fern, Christmas	*Polystichum acrostichoides*	•				
Fern, Cinnamon	*Osmunda cinnamomea*					•
Fern, Hay-scented	*Dennstaedtia punctilobula*	•				•
Fern, Interrupted	*Osmunda claytoniana*					•
Fern, Marsh	*Thelypteris thelypteroides*					•
Fern, Ostrich	*Matteuccia struthiopteris*					•
Fern, Royal	*Osmunda regalis*	•				•
Fern, Sensitive	*Onoclea sensibilis*					•
Fern, Spinulose Wood	*Dryopteris spinulosa*	•				
Fir, Balsam	*Abies balsamea*		•	•		
Goldenrod	*Solidago spp.*	•			•	•
Ground-pine, Trailing	*Lycopodium digitatum*	•				
Hemlock, Eastern	*Tsuga canadensis*		•			
Hornbeam, Eastern Hop	*Ostrya virginiana*	•				
Horsetail	*Equisetum spp.*	•	•			•
Larch, American	*Larix laricina*		•			
Laurel, Sheep	*Kalmia angustifolia*			•		
Maple, Red	*Acer rubrum*	•	•			•
Maple, Striped	*Acer pensylvanicum*	•	•			
Maple, Sugar	*Acer saccharum*	•	•			•
Meadow-sweet, White	*Spiraea alba*					•
Oak, Black	*Quercus velutina*	•				
Oak, Northern red	*Quercus rubra*	•				
Pine, Eastern white	*Pinus strobus*		•			
Pine, Princess	*Lycopodium obscurum*	•				
Pine, Red	*Pinus resinosa*		•			
Rush, Soft	*Juncus effusus*					•
Sedge sp.	*Carex sp.*					•
Sedge, Fringed	*Carex crinita*					•
Sedge, Shallow	*Carex lurida*					•
Sphagnum	*Sphagnum spp.*					•
Spruce, Red	*Picea rubens*	•	•	•		
Spruce, White	*Picea glauca*		•			
Woodfern, Spinulose	*Scirpus cyperinus*					•

Notes:
Modified from Tables 1 and 2 of the *Habitat Characterization Report, Ely Mine, Vershire, Vermont* (URS, 2005).

TABLE 2-2
WILDLIFE POTENTIALLY INHABITING VARIOUS COVERTYPES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Common Name	Latin Name	Northern Hardwood Forest	Red Spruce Northern Hardwood	Disturbed/Transitional Areas	Upland Meadow	Wetland and Aquatic Habitats
Birds						
American robin	*Turdus migratorius*	◊	•	◊	•	
Belted kingfisher	*Ceryle alcyon*					•
Black and white warbler	*Mniotilta varia*	•	•			
Black-capped chickadee	*Parus atricapillus*	◊	•	•	•	
Black-throated blue warbler	*Dendroica caerulescens*	•	•			
Blue jay	*Cyanocitta cristata*	◊	•			
Common raven	*Corvus corax*	◊	•			
Eastern kingbird	*Tyrannus tyrannus*					◊
Eastern wood pewee	*Contopus virens*	•	•			
Great horned owl	*Bubo virginianus*	◊	•			
Hermit thrush	*Catharus guttatus*	•	•			
Northern mockingbird	*Mimus polyglottos*	◊	•			
Ovenbird	*Seiurus aurocapillus*	◊	•			
Piliated woodpecker	*Dryocopus pileatus*	•	•			
Red-eyed vireo	*Vireo olivaceus*	•	•			
Red-tailed hawk	*Buteo jamaicaensis*	◊			•	
Red-winged blackbird	*Agelaius phoeniceus*				•	•
Rose-breasted grosbeak	*Pheucticus ludovicianus*	•	•			
Ruffed grouse	*Bonasa umbellus*	◊	•			
Scarlet tanager	*Piranga olivacea*	•	•			
Song sparrow	*Melospiza melodia*	◊	•			
Swamp sparrow	*Melospiza georgiana*					•
Tree swallow	*Tachycineta bicolor*					
Veery	*Catharus fuscescens*	•	•			•
Wild turkey	*Meleagris gallopavo*	•	•	◊	•	
White-breasted nuthatch	*Sitta carolinensis*	◊	•			
Mammals						
American beaver	*Castor canadensis*					•
Black bear	*Ursus americanus*	•	•		•	
Bobcat	*Lynx rufus*	•	•			
Chipmunk	*Tamias striatus*	•	•		•	
Coyote	*Canis latrans*	•	◊			
Deer mouse*	*Peromyscus maniculatus*	•	•	◊	•	
Eastern cottontail	*Sylvilagus floridanus*	•	•		•	
Fisher	*Martes pennanti*	•	•			
House mouse	*Mus musculus*			•		
Little brown bat	*Myotis lucifugus*			•		
Masked shrew	*Sorex cinereus*	•	•			
Meadow jumping mouse	*Zapus hudsonius*				◊	◊
Meadow vole	*Microtus pennsylvanicus*				•	
Mink	*Mustela vison*					•
Moose	*Alces alces*	•	•	•		◊
Muskrat	*Ondatra zibethicus*					•
Northern flying squirrel	*Glaucomys sabrinus*	•	•			
Porcupine	*Erethizon dorsatum*	•	•		•	
Red fox	*Vulpes vulpes*	•	•	•	•	
Red-backed vole	*Clethrionomys gapperi*	◊	◊	•		
Red squirrel	*Tamiasciurus hudsonicus*	◊	•			
Short-tailed shrew*	*Blarina brevicauda*	◊	•	◊	•	•
Snowshoe hare	*Lepus americanus*	◊	•	•	•	•
Southern flying	*Glaucomys volans*	•	•			
White-footed mouse	*Peromyscus leucopus*	•	•	◊		
White-tailed deer	*Odocoileus virginiana*	◊	•	•	•	
Woodland jumping mouse*	*Napaeozapus insignis*	•	•	◊		
Amphibians/Reptiles						
Bullfrog	*Rana catesbeiana*				•	◊
Common Garter snake	*Thamnophis sirtalis*				•	•
Eastern newt	*Notophthalmus viridescens*	•	•			
Grey treefrog	*Hyla versicolor*				•	◊
Northern leopard frog	*Rana pipiens*					•
Northern redbelly snake	*Storeria occipitomaculata*	•	•			
Northern two-lined salamander	*Eurycea bislineata*					•
Redback salamander	*Plethodon cinereus*	•	•			
Spotted salamander	*Ambystoma maculatum*	•	•			
Spring peeper	*Pseudacris crucifer*					•
Spring salamander	*Gyrinophilus porphyriticus*	•	•			
Wood frog	*Rana sylvatica*	•	•			

Notes:
1. Species list adapted from Thompson and Sorenson (2000), *Wetland, Woodland, Wildland: A guide to the Natural Communities of Vermont.*
2. •, indicates an animal that has the potential to occur within the respective habitat.
3. ◊, indicates an animal or signs of an animal that were observed during numerous site visits.
4. Modified from Table 3 of the *Habitat Characterization Report, Ely Mine, Vershire, Vermont* (URS, 2005).

*Captured during small mammal trapping.

TABLE 2-3
SUMMARY STATISTICS - SURFACE SOIL - TRANSITION ZONE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection	Maximum Detect Location	Range of SQLs	Average	Standard Deviation	Soil Benchmark (mg/kg)	Basis	FOE	% FOE	COPEC?	Rationale
Inorganics													
Aluminum	170/170	mg/kg	940 - 100000	ELY-SS-NF-03 (4-12)	NA	11586	9652	NBA	See text	---	---	Yes	See text
Antimony	63/169	mg/kg	0.0480 - 8.10	ELY-SS-TR-08A (0.5-12)DUP	0.460 - 43.0	7.22	7.87	0.27 a	Mammal	41/63	65.1	Yes	GTB
Arsenic	135/170	mg/kg	0.480 - 22.0	ELY-SS-TZ-12 (3-8)	0.590 - 8.60	2.79	2.65	18 a	Plant	1/135	0.7	Yes	GTB
Barium	170/170	mg/kg	8.30 - 220	SS-13X-082809AX	NA	69.5	40.3	330 a	Soil Invertebrate	NE	NE	No	LTB
Beryllium	131/170	mg/kg	0.0530 - 5.40	ELY-SS-NF-03 (4-12)	0.0350 - 4.30	0.562	0.660	21 a	Mammal	NE	NE	No	LTB
Cadmium	135/169	mg/kg	0.0170 - 7.20	SS-13X-082809AX	0.210 - 10.0	1.38	1.56	0.36 a	Mammal	92/135	68.1	Yes	GTB
Calcium	170/170	mg/kg	55.0 - 42000	ELY-SS-TR-02A (1.5-11), ELY-SS-TR-02C (3-12)	NA	3133	5962	NBA		---	---	No	NUT
Chromium	170/170	mg/kg	2.50 - 440	ELY-SS-NF-03 (4-12)	NA	38.0	38.1	26 a	Bird	114/170	67.1	Yes	GTB
Cobalt	170/170	mg/kg	1.80 - 120	ELY-SS-SA-09 (0-4)	NA	16.3	17.4	13 a	Plant	65/170	38.2	Yes	GTB
Copper	170/170	mg/kg	16.0 - 7850	TF-13X-090909BX	NA	665	899	28 a	Bird	163/170	95.9	Yes	GTB
Iron	170/170	mg/kg	2400 - 300000	ELY-SS-TZ-14 (4-12)	NA	43203	42898	NBA	See text	---	---	Yes	See text
Lead	170/170	mg/kg	0.720 - 1700	ELY-SS-TZ-12 (0-3)	NA	49.6	134	11 a	Bird	140/170	82.4	Yes	GTB
Magnesium	170/170	mg/kg	400 - 24000	ELY-SS-NF-03 (4-12)	NA	4696	3091	NBA		---	---	No	NUT
Manganese	170/170	mg/kg	29.0 - 8380	SS-13X-082809AX	NA	354	704	220 a	Plant	77/170	45.3	Yes	GTB
Mercury	161/169	mg/kg	0.00700 - 2.80	ELY-SS-TZ-39 (3-8)	0.0140 - 0.100	0.138	0.232	0.000051 b	American Woodcock	161/161	100	Yes	GTB
Molybdenum	129/169	mg/kg	0.200 - 27.0	ELY-SS-SA-06 (0-6)	0.240 - 43.0	5.08	6.29	0.475 b	Short-tailed Shrew	118/129	91.5	Yes	GTB
Nickel	170/170	mg/kg	3.60 - 110	ELY-SS-NF-03 (4-12)	NA	21.5	13.6	38 a	Plant	12/170	7.1	Yes	GTB
Potassium	170/170	mg/kg	398 - 19000	ELY-SS-TZ-14 (4-12)	NA	2939	2771	NBA		---	---	No	NUT
Selenium	154/169	mg/kg	0.420 - 83	ELY-SS-TR-06A (1-12)	1.30 - 3.60	10.7	15.6	0.52 a	Plant	151/154	98.1	Yes	GTB
Silver	139/170	mg/kg	0.110 - 22.0	ELY-SS-TR-09D (0-3)	0.110 - 2.40	2.60	3.49	4.2 a	Bird	31/139	22.3	Yes	GTB
Sodium	78/169	mg/kg	23.0 - 3800	ELY-SS-TR-02D (2-12) DUP	160 - 2000	464	434	NBA		---	---	No	NUT
Strontium	43/43	mg/kg	1.20 - 107	SS-27X-082609AX, SS-25X-082709AX	NA	17.6	24.2	NBA		---	---	Yes	NBA
Thallium	80/169	mg/kg	0.0200 - 16.0	ELY-TP-109 (0-1)	0.250 - 13.0	3.59	3.14	0.21 b	Short-tailed Shrew	45/80	56.3	Yes	GTB
Vanadium	170/170	mg/kg	5.20 - 400	ELY-SS-NF-03 (4-12)	NA	46.8	37.1	7.8 a	Bird	165/170	97.1	Yes	GTB
Zinc	170/170	mg/kg	24.0 - 1500	ELY-SS-TR-02D (2-12) DUP	NA	118	133	46 a	Bird	141/170	82.9	Yes	GTB
Conventionals													
Acid-Base Accounting	5/5	t CaCO3/1000t	-37.0 - 10.0	SS-12X-090309AX	NA	-3.10	18.4	NBA		---	---	No	CONV
Acid Base Potential	2/2	t CaCO3/1000t	-6.00 - 120	ELY-TP-104 (0-1)	NA	57.0	89.1	NBA		---	---	No	CONV
Acid Generation Potential	2/2	t CaCO3/1000t	11.0 - 52.0	ELY-TP-104 (0-1)	NA	31.3	28.6	NBA		---	---	No	CONV
Acid Neutralization Potential	2/2	t CaCO3/1000t	4.30 - 180	ELY-TP-104 (0-1)	NA	89.7	121	NBA		---	---	No	CONV
Cation Exchange Capacity	19/19	meq/100 g	13.1 - 112	SS-25X-082709AX	NA	62.7	26.0	NBA		---	---	No	CONV
pH	23/23	SU	3.42 - 6.42	SS-27X-082609AX	NA	4.77	0.740	NBA		---	---	No	CONV
Saturated Paste Conductivity	23/23	mmhos/cm	0.120 - 0.950	SS-29X-083109AX	NA	0.458	0.216	NBA		---	---	No	CONV
Sulfate	2/2	%	0.0600 - 0.100	ELY-TP-104 (0-1) DUP	NA	0.0750	0.0212	NBA		---	---	No	CONV
Sulfur	2/2	%	0.410 - 1.72	ELY-TP-104 (0-1)	NA	1.07	0.926	NBA		---	---	No	CONV
Sulfur, Dissociable	1/2	%	0.0100 - 0.0100	ELY-TP-109 (0-1)	0.0100 - 0.0100	0.0100	NC	NBA		---	---	No	CONV
Sulfur, Pyritic	1/2	%	0.0100 - 0.0100	ELY-TP-109 (0-1)	0.0100 - 0.0100	0.0100	NC	NBA		---	---	No	CONV
Sulfur, Residual	2/2	%	0.320 - 1.65	ELY-TP-104 (0-1)	NA	0.978	0.930	NBA		---	---	No	CONV
Total Organic Carbon	10/10	%	0.760 - 34.0	SS-19X-082709AX	NA	17.5	11.8	NBA		---	---	No	CONV

Notes:
The average is the arithmetic mean concentration.
Raw data presented in Appendix F.
a = Lowest Eco-SSL.
b = Efroymson et al., 1997a

CONV = Conventional
FOE = Frequency of exceedance. Number of detected concentrations exceeding the benchmark.
GTB = Greater than benchmark.
LTB = Less than benchmark.
NA = Not applicable.
NBA = No benchmark available.
NC = Not calculated.
NE = Not exceeding.
NUT = Nutrient
SQL = Sample quantitation limit.
SSL = Chemical-specific Eco SSL document; EPA, 200x.

TABLE 2-4
SUMMARY STATISTICS - SURFACE SOIL - TRANSITION ZONE - XRF-BASED
ELY COPPER MINE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection				Maximum Detect Location	Range of SQLs			Average	Standard Deviation
Copper	181 / 181	mg/kg	19.0	-	42679		TW-0BX-090309AX	NA			547	3183
Iron	180 / 181	mg/kg	0.100	-	100000	*	See footnote below	100000	-	100000	40271	22433
Lead	179 / 181	mg/kg	0.410	-	1073		TC-01X-082609AX	7.00	-	8.00	42.5	104
Sulfur	47 / 181	mg/kg	0.100	-	37016		TW-02X-090309AX	1636	-	3648	5607	7738
Selenium	52 / 181	mg/kg	3.00	-	390		TC-01X-082609AX	2.00	-	7.00	9.38	30.6
Zinc	180 / 181	mg/kg	23.0	-	4236		TW-0BX-090309AX	29.0	-	29.0	113	317

Note: The average is the arithmetic mean concentration.

*The upperbound detection limit of 1E+05 was used as the maximum detection for the following samples: TD-06X-082809AX, TD-09X-082809AX, TE-07X-090109AX, TE-17X-090309AX, TF-08X-090109AX, TF-09X-090109AX, TF-10X-090209AX, TF-16X-090109AX, TS-03X-090309AX.

NA = Not applicable.

TABLE 2-5
SUMMARY STATISTICS - SURFACE SOIL - BARREN AREAS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection	Maximum Detect Location	Range of SQLs	Average	Standard Deviation
Inorganics							
Aluminum	100/100	mg/kg	860 - 20000	ELY-SS-TZ-13 (4-12)	NA	7527	4297
Antimony	43/100	mg/kg	0.0520 - 4.60	ELY-SS-SA-26 (0-6)	0.500 - 35.0	7.40	7.66
Arsenic	58/100	mg/kg	0.360 - 23.0	ELY-SS-TZ-05 (0-1)	0.410 - 7.00	2.91	3.03
Barium	100/100	mg/kg	20.0 - 130	ELY-SS-TR-04A (0-1)	NA	56.2	24.1
Beryllium	57/100	mg/kg	0.0400 - 0.950	ELY-SS-TZ-13 (4-12)	0.100 - 2.60	0.565	0.544
Cadmium	75/100	mg/kg	0.083 - 8.50	ELY-SS-TR-04A (1-12)	0.200 - 5.50	1.27	1.46
Calcium	99/100	mg/kg	34.0 - 18000	ELY-SS-TZ-22 (0-2)	44.0 - 44.0	1952	3007
Chromium	100/100	mg/kg	3.80 - 78.0	ELY-SS-TZ-32 (2-9)	NA	30.5	15.5
Cobalt	100/100	mg/kg	2.20 - 200	ELY-SS-TR-04A (1-12)	NA	21.4	32.3
Copper	100/100	mg/kg	7.50 - 23000	ELY-SS-TR-04A (1-12)	NA	1471	2452
Iron	100/100	mg/kg	2900 - 210000	ELY-SS-SA-26 (0-6)	NA	71842	54474
Lead	100/100	mg/kg	1.80 - 680	ELY-SS-TZ-44 (3-12)	NA	42.8	92.4
Magnesium	100/100	mg/kg	9.70 - 9400	ELY-SS-TR-09A (2.5-12)	NA	3572	2023
Manganese	100/100	mg/kg	17.0 - 1200	ELY-SS-TZ-22 (0-2)	NA	199	192
Mercury	91/100	mg/kg	0.00600 - 0.840	TP-16X-080309AX	0.0190 - 0.100	0.105	0.132
Molybdenum	87/100	mg/kg	0.330 - 69.0	ELY-SS-SA-31 (0-6)	0.220 - 12.0	7.56	10.2
Nickel	98/100	mg/kg	1.10 - 46.0	ELY-SS-TR-04A (1-12)	3.00 - 13.0	15.6	9.29
Potassium	100/100	mg/kg	540 - 11000	ELY-SS-SA-28 (0-6)	NA	3485	2367
Selenium	99/100	mg/kg	0.580 - 170	ELY-SS-SA-31 (0-6)	0.820 - 0.820	23.7	25.8
Silver	82/100	mg/kg	0.0790 - 23.0	ELY-SS-SA-16 (0-6)	0.180 - 2.60	3.80	4.56
Sodium	42/99	mg/kg	40.2 - 1800	ELY-SS-TZ-24 (1-12)	160 - 1400	546	325
Strontium	5/5	mg/kg	2.20 - 6.50	TP-16X-080309AX	NA	4.12	1.75
Thallium	58/100	mg/kg	0.100 - 14.0	ELY-SS-TZ-20 (0-1)	0.550 - 14.0	4.59	3.02
Vanadium	100/100	mg/kg	7.90 - 180	ELY-SS-SA-29 (0-6)	NA	48.3	28.1
Zinc	100/100	mg/kg	10.0 - 860	ELY-SS-TR-04A (1-12)	NA	137	125
Conventionals							
1:2 Conductivity	2/2	mmhos	0.680 - 3.14	ELY-SB-7_8	NA	1.91	1.74
Acid-Base Accounting	1/1	t CaCO3/1000t	1.00 - 1.00	TP-16X-080309AX	NA	1.00	NC
pH	3/3	SU	4.30 - 5.90	ELY-SB-7_8	NA	5.06	0.803
Saturated Paste Conductivity	3/3	mmhos/cm	0.220 - 3.14	ELY-SB-7_8	NA	1.35	1.57

Notes:
The average is the arithmetic mean concentration.
Raw data presented in Appendix F.

NA = Not applicable.
NC = Not calculated due to insufficient data variability.
SQL = Sample quantitation limit.

TABLE 2-6
SUMMARY STATISTICS - SURFACE SOIL - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection	Maximum Detect Location	Range of SQLs	Average	Standard Deviation
Inorganics							
Aluminum	15/15	mg/kg	840 - 12000	ELY-SS-BK-10B (0-1), ELY-SS-BK-10C (0-6) DUP, ELY-SS-BK-07A (0-3), ELY-SS-BK-08C (0-12), ELY-SS-BK-10A (0-6)	NA	7669	4043
Arsenic	15/15	mg/kg	0.910 - 4.30	ELY-SS-BK-07B (0-3)	NA	2.11	0.879
Barium	15/15	mg/kg	19.0 - 350	ELY-SS-BK-08C (0-12)	NA	83.1	87.6
Beryllium	15/15	mg/kg	0.0280 - 1.00	ELY-SS-BK-07A (0-3)	NA	0.535	0.282
Cadmium	8/15	mg/kg	0.200 - 0.520	ELY-SS-BK-15B (0-0.5), ELY-SS-BK-07C (0-4)	0.210 - 1.80	0.606	0.465
Calcium	15/15	mg/kg	660 - 4600	ELY-SS-BK-08C (0-12)	NA	1922	1164
Chromium	15/15	mg/kg	1.40 - 32.0	ELY-SS-BK-07A (0-3), ELY-SS-BK-08C (0-	NA	20.4	11.0
Cobalt	15/15	mg/kg	0.350 - 16.0	ELY-SS-BK-07A (0-3)	NA	6.60	4.35
Copper	15/15	mg/kg	5.50 - 45.0	ELY-SS-BK-07A (0-3)	NA	15.3	10.1
Iron	15/15	mg/kg	780 - 31000	ELY-SS-BK-07A (0-3)	NA	13852	8528
Lead	15/15	mg/kg	7.80 - 77.0	ELY-SS-BK-07B (0-3)	NA	27.7	22.9
Magnesium	15/15	mg/kg	300 - 4700	ELY-SS-BK-07A (0-3)	NA	2654	1576
Manganese	15/15	mg/kg	26.0 - 7800	ELY-SS-BK-08B (0-7)	NA	1386	2202
Mercury	15/15	mg/kg	0.0200 - 0.290	ELY-SS-BK-15C (0-2.5)	NA	0.130	0.0805
Molybdenum	4/15	mg/kg	0.290 - 0.640	ELY-SS-BK-15B (0-0.5), ELY-SS-BK-14C (0-1)	0.190 - 8.80	3.61	2.96
Nickel	15/15	mg/kg	3.50 - 30.0	ELY-SS-BK-08C (0-12)	NA	15.3	7.87
Potassium	15/15	mg/kg	280 - 3000	ELY-SS-BK-08C (0-12)	NA	919	734
Selenium	15/15	mg/kg	0.940 - 2.90	ELY-SS-BK-07B (0-3)	NA	1.77	0.584
Silver	4/15	mg/kg	0.0790 - 1.40	ELY-SS-BK-08C (0-12)	0.0780 - 0.650	0.394	0.337
Sodium	1/15	mg/kg	110 - 110	ELY-SS-BK-15A (0-2)	100 - 350	194	73.1
Thallium	7/15	mg/kg	0.910 - 4.30	ELY-SS-BK-08C (0-12)	1.10 - 6.50	2.32	1.83
Vanadium	15/15	mg/kg	3.90 - 59.0	ELY-SS-BK-07A (0-3)	NA	28.8	16.2
Zinc	15/15	mg/kg	17.0 - 86.0	ELY-SS-BK-07C (0-4)	NA	42.8	20.9

Notes:
The average is the arithmetic mean concentration.
Raw data presented in Appendix F.

NA = Not applicable.
SQL = Sample quantitation limit.

TABLE 2-7
SUMMARY STATISTICS - SOIL INVERTEBRATES - SITE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection			Maximum Detect Location	Range of SQLs			Average	Standard Deviation
Aluminum	5 / 5	mg/kg ww	21.0	-	240	IV-03X-091609AX		NA		125	91.6
Cadmium	2 / 5	mg/kg ww	0.750	-	1.10	IV-03X-091609AX	0.500	-	0.500	0.670	0.264
Calcium	5 / 5	mg/kg ww	740	-	3000	IV-01X-091609AX		NA		1608	838
Chromium	2 / 5	mg/kg ww	1.70	-	2.90	IV-03X-091609AX	1.00	-	1.00	1.52	0.829
Copper	5 / 5	mg/kg ww	16.0	-	43.0	IV-03X-091609BX		NA		28.0	11.0
Iron	5 / 5	mg/kg ww	43.0	-	730	IV-03X-091609BX		NA		375	267
Magnesium	4 / 5	mg/kg ww	360	-	520	IV-01X-091609AX	250	-	250	380	96.2
Manganese	5 / 5	mg/kg ww	20.0	-	34.0	IV-01X-091609AX		NA		25.8	7.05
Potassium	5 / 5	mg/kg ww	2900	-	3300	IV-01X-091609AX		NA		3140	152
Silver	1 / 5	mg/kg ww	1.00	-	1.00	IV-02X-091709AX	1.00	-	1.00	1.00	NC
Sodium	5 / 5	mg/kg ww	320	-	570	IV-03X-091609AX		NA		480	99.2
Zinc	5 / 5	mg/kg ww	47.0	-	95.0	IV-03X-091609AX		NA		64.0	19.7
Percent Moisture	5 / 5	%	69.9	-	72.9	IV-02X-091709AX		NA		71.0	1.33

Notes:

1) COPECs were not selected using tissue screening benchmarks. Rather, any metal detected in at least one soil invertebrate tissue sample was retained as a COPEC for use in wildlife food chain modeling.

2) The average is the arithmetic mean concentration.

3) Raw data presented in Appendix F.

mg/kg ww = Milligrams per kilograms wet weight.
NA = Not applicable.
NC = Not calculated due to insufficient data variability.
SQL = Sample quantitation limit.

TABLE 2-8
SUMMARY STATISTICS - SOIL INVERTEBRATES - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection			Maximum Detect Location	Average	Standard Deviation
Calcium	2 / 2	mg/kg ww	360	-	440	IV-REF-091609AX	400	56.6
Copper	2 / 2	mg/kg ww	14.0	-	15.0	IV-REF-091609BX	14.5	0.707
Iron	2 / 2	mg/kg ww	22.0	-	29.0	IV-REF-091609BX	25.5	4.95
Magnesium	2 / 2	mg/kg ww	270	-	280	IV-REF-091609BX	275	7.07
Manganese	2 / 2	mg/kg ww	4.80	-	5.40	IV-REF-091609AX	5.10	0.424
Potassium	2 / 2	mg/kg ww	3300	-	3300	IV-REF-091609AX, IV-REF-091609BX	3300	NC
Sodium	2 / 2	mg/kg ww	250	-	270	IV-REF-091609AX	260	14.1
Zinc	2 / 2	mg/kg ww	50.0	-	51.0	IV-REF-091609BX	50.5	0.707
Percent Moisture	2 / 2	%	67.5	-	69.3	IV-REF-091609BX	68.4	1.27

Notes:

The average is the arithmetic mean concentration.

Raw data presented in Appendix F.

mg/kg ww = Milligrams per kilograms wet weight.

NC = Not calculated due to insufficient data variability.

SQL = Sample quantitation limit.

TABLE 2-9
SUMMARY STATISTICS - SMALL MAMMALS - SITE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection	Maximum Detect Location	Range of SQLs	Average	Standard Deviation
Aluminum	7 / 30	mg/kg ww	20.0 - 77.0	MA-01X-091509EX	20.0 - 20.0	23.2	10.8
Arsenic	8 / 30	mg/kg ww	1.00 - 1.60	MA-02X-091509BX	1.00 - 1.00	1.05	0.125
Cadmium	1 / 30	mg/kg ww	1.20 - 1.20	MA-03X-091509CX	0.500 - 0.500	0.523	0.128
Calcium	30 / 30	mg/kg ww	5200 - 12000	MA-01X-091509FX	NA	8157	1621
Chromium	3 / 30	mg/kg ww	1.00 - 3.70	MA-02X-091509KX	1.00 - 1.00	1.10	0.496
Copper	30 / 30	mg/kg ww	3.20 - 12.0	MA-01X-091509CX	NA	5.03	1.99
Iron	30 / 30	mg/kg ww	41.0 - 640	MA-01X-091509CX	NA	116	105
Lead	1 / 30	mg/kg ww	1.60 - 1.60	MA-03X-091509DX	1.00 - 1.00	1.02	0.110
Magnesium	30 / 30	mg/kg ww	270 - 490	MA-02X-091509GX, MA-03X-091509GX	NA	364	51.8
Manganese	28 / 30	mg/kg ww	3.90 - 34.0	MA-03X-091509CX	1.50 - 1.50	9.20	6.53
Potassium	30 / 30	mg/kg ww	2000 - 3400	MA-01X-091509JX	NA	2848	265
Sodium	30 / 30	mg/kg ww	1000 - 1600	MA-01X-091509GX	NA	1317	142
Zinc	30 / 30	mg/kg ww	26.0 - 46.0	MA-03X-091509CX	NA	30.6	4.32
Percent Moisture	30 / 30	%	60.7 - 76.0	MA-02X-091509CX	NA	71.7	3.04
% Lipids	30 / 30	%	3.13 - 17.4	MA-02X-091509BX	NA	5.39	2.76

Notes:

1) Small mammal samples were whole-body.

2) COPECs were not selected using tissue screening benchmarks. Rather, any metal detected in at least one small mammal tissue sample was retained as a COPEC for use in wildlife food chain modeling.

3) The average is the arithmetic mean concentration.

4) Raw data presented in Appendix F.

mg/kg ww = Milligrams per kilograms wet weight.
NA = Not applicable.
SQL = Sample quantitation limit.

TABLE 2-10
SUMMARY STATISTICS - SMALL MAMMALS - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Frequency of Detection	Units	Range of Detection	Maximum Detect Location	Range of SQLs	Average	Standard Deviation
Aluminum	5 / 10	mg/kg ww	24.0 - 34.0	MA-REF-091509AX	20.0 - 20.0	25.0	6.11
Calcium	10 / 10	mg/kg ww	3400 - 11000	MA-REF-091509HX	NA	8055	2260
Chromium	2 / 10	mg/kg ww	1.40 - 1.50	MA-REF-091509JX	1.00 - 1.00	1.09	0.191
Copper	10 / 10	mg/kg ww	2.70 - 5.90	MA-REF-091509JX	NA	3.73	0.971
Iron	10 / 10	mg/kg ww	46.0 - 180	MA-REF-091509CD, MA-REF-091509CX	NA	101	39.6
Magnesium	10 / 10	mg/kg ww	260 - 430	MA-REF-091509EX	NA	365	51.2
Manganese	8 / 10	mg/kg ww	4.00 - 14.0	MA-REF-091509CD, MA-REF-091509CX	1.50 - 1.50	6.39	4.57
Potassium	10 / 10	mg/kg ww	2300 - 2900	MA-REF-091509BX	NA	2640	171
Sodium	10 / 10	mg/kg ww	1000 - 1500	MA-REF-091509HX	NA	1235	149
Zinc	10 / 10	mg/kg ww	24.0 - 36.0	MA-REF-091509HX, MA-REF-091509JX	NA	31.3	3.99
Percent Moisture	10 / 10	%	62.3 - 74.4	MA-REF-091509BX, MA-REF-091509FX	NA	71.0	4.08
% Lipids	10 / 10	%	3.37 - 18.1	MA-REF-091509DX	NA	6.69	4.66

Notes:
The average is the arithmetic mean concentration.
Raw data presented in Appendix F.

mg/kg ww = Milligrams per kilograms wet weight.
NA = Not applicable.
SQL = Sample quantitation limit.

TABLE 2-11
VERNAL POOL SURFACE WATER DATA AND COPEC SELECTION
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Units	Aquatic Life Benchmark	Source	Surface Water Concentration[a]									
				VP-1		VP-2		VP-3		VP-3 DUP		VP-4	
Inorganics													
Aluminum	µg/L	87 [c]	EPA, 2009	200	U	200	U	200	U	200	U	200	U
Antimony	µg/L	30	EPA, 1999	2.00	U	2.00	U	2.00	U	2.00	U	2.00	U
Arsenic	µg/L	150	EPA, 2009	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Barium	µg/L	4	EPA, 1999	24.3		12.6	J	13.8	J	13.0	J	16.1	J
Beryllium	µg/L	0.66	EPA, 1999	5.00	U	5.00	U	5.00	U	5.00	U	5.00	U
Cadmium	µg/L	d	EPA, 2009	0.360	J	0.500	UJ	0.500	UJ	0.500	UJ	0.500	UJ
Calcium	µg/L	116000	Suter and Tsao, 1996	12400		12500		10600		10700		3360	J
Chromium	µg/L	11 [e]	EPA, 2009	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Cobalt	µg/L	23	Suter and Tsao, 1996	9.40	J	50.0	U	50.0	U	50.0	U	50.0	U
Copper	µg/L	d	EPA, 2009	145		4.70		1.50	J	1.70	J	2.00	U
Iron	µg/L	1000	EPA, 2009	418		45.5	J	177		150		22.2	J
Lead	µg/L	d	EPA, 2009	1.00	U	1.00	U	1.00	U	1.00	U	1.00	U
Magnesium	µg/L	82000	Suter and Tsao, 1996	1630	J	923	J	803	J	853	J	617	J
Manganese	µg/L	120	Suter and Tsao, 1996	184		10.9	J	114		84.9		8.60	J
Mercury	µg/L	0.77	EPA, 2009	0.100	U	0.100	U	0.100	U	0.100	U	0.100	U
Molybdenum	µg/L	370	Suter and Tsao, 1996	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Nickel	µg/L	d	EPA, 2009	2.30	J	40.0	U	40.0	U	40.0	U	40.0	U
Potassium	µg/L	53000	Suter and Tsao, 1996	2730	J	980	J	1460	J	1290	J	697	J
Selenium	µg/L	5 [c]	EPA, 2009	1.70	J	5.00	UJ	5.00	UJ	5.00	UJ	5.00	UJ
Silver	µg/L	0.12	EPA, 1999	0.500	UJ	0.500	UJ	0.500	UJ	0.500	UJ	0.500	UJ
Sodium	µg/L	680000	Suter and Tsao, 1996	1700	J	1300	J	1450	J	1490	J	891	J
Strontium	µg/L	1500	Suter and Tsao, 1996	53.9		64.3		37.1		37.5		13.3	
Thallium	µg/L	4	EPA, 1999	0.0690	J	1.00	U	1.00	U	1.00	U	1.00	U
Vanadium	µg/L	20	Suter and Tsao, 1996	5.00	UJ	5.00	UJ	0.290	J	0.360	J	5.00	UJ
Zinc	µg/L	d	EPA, 2009	77.6		13.6	J	68.9		23.8	J	31.5	J
Conventionals													
Acidity, Total	mg/L	NBA	---	10.0		18.0		8.70		13.0		9.40	
Alkalinity (As $CaCO_3$)	mg/L	NBA	---	9.50		35.0		26.0		29.0		5.00	
Alkalinity, Bicarbonate (As $CaCO_3$)	mg/L	NBA	---	9.50		35.0		26.0		29.0		5.00	
Alkalinity, Carbonate (As $CaCO_3$)	mg/L	NBA	---	5.00		5.00		5.00		5.00		5.00	
Alkalinity, Hydroxide (As $CaCO_3$)	mg/L	NBA	---	5.00		5.00		5.00		5.00		5.00	
Chloride	mg/L	230	EPA, 2009	0.340		0.200		0.230		0.230		0.220	
Hardness (calculated)[b]	mg/L	---	---	38.0		35.0		30.0		30.0		11.0	
Nitrogen, Nitrite + Nitrate	mg/L	NBA	---	0.0200		0.0200		0.0200		0.0200		0.0860	
pH	pH units	NBA	---	6.33		6.39		7.27		7.46		6.33	
Specific Conductivity	µmhos/cm	NBA	---	98.0		67.0		62.0		62.0		29.0	
Sulfate	mg/L	NBA	---	31.0		1.80		5.60		5.60		4.30	

Notes:

NBA= No benchmark available.

Shading indicates concentration exceeds the aquatic life benchmark.

[a]Only one surface water sample collected from each vernal pool.

[b]Hardness calculated using following equation: 2.497*[Ca]+4.118*[Mg] where [Ca] and [Mg] in mg/L.

[c]Benchmark is total recoverable; therefore, data presented is total recoverable. All other metals are dissolved.

[d]EPA (2009) hardness-dependent. Based on sample-specific hardness values resulting in the following (µg/L). The default minimum hardness of 25 mg/L was used to calculate values for VP-4.

	VP-1	VP-2	VP-3	VP-4
Cadmium	0.13	0.12	0.11	0.09
Copper	3.9	3.7	3.2	2.7
Lead	0.87	0.79	0.66	0.54
Nickel	23	21	19	16
Zinc	52	49	43	36

[e]Chromium VI value.

TABLE 2-12
COPEC LIST
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Soil	Soil Invertebrates	Small Mammals	Surface Water Vernal Pools			
				VP-1	VP-2	VP-3	VP-4
Aluminum	√	√	√	√*	√*	√*	√*
Antimony	√						
Arsenic	√		√				
Barium				√	√	√	√
Beryllium				√*	√*	√*	√*
Cadmium	√	√	√	√	√*	√*	√*
Chromium	√	√	√				
Cobalt	√				√*	√*	√*
Copper	√	√	√	√	√		
Cyanide	√*						
Iron	√	√	√				
Lead	√		√	√*	√*	√*	√*
Manganese	√	√	√	√			
Mercury	√						
Molybdenum	√						
Nickel	√				√*	√*	√*
Selenium	√						
Silver	√	√		√*	√*	√*	√*
Strontium	√						
Thallium	√						
Vanadium	√						
Zinc	√	√	√	√		√	

√* = Detection limits exceed the respective medium benchmark. Will be discussed qualitatively in the uncertainty analysis.

TABLE 2-13

FINAL ECOLOGICAL ASSESSMENT AND MEASUREMENT ENDPOINTS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Receptor	Assessment Endpoint	Measurement Endpoint
Terrestrial Plants	Support of a functioning plant community	Ecological effects quotient based on COPEC soil concentration comparison with literature-based phytotoxicity values.
Soil Invertebrates	Support of a functioning soil invertebrate community	Ecological effects quotient based on COPEC soil concentration comparison with literature-based effect values. Comparison of soil invertebrate COPEC concentrations with critical body residues.
Herbivorous Mammals	Support of a functioning herbivorous mammal community	Ecological effects quotient based on dietary intake of COPECs by the deer mouse using site-specific soil concentrations and modeled dietary concentrations compared with literature-based effect values. Comparison of mammal COPEC concentrations with critical body residues.
Invertivorous Mammals	Support of a functioning invertivorous mammal community	Ecological effects quotient based on dietary intake of COPECs by the short-tailed shrew using site-specific soil and invertebrate concentrations compared with literature-based effect values. Comparison of mammal COPEC concentrations with critical body residues.
Carnivorous Mammals	Support of a functioning carnivorous mammal community	Ecological effects quotient based on dietary intake of COPECs by the mink using site-specific soil and small mammal concentrations compared with literature-based effect values. Comparison of mammal COPEC concentrations with critical body residues.
Herbivorous Birds	Support of a functioning herbivorous bird community	Ecological effects quotient based on dietary intake of COPECs by the song sparrow using site-specific soil concentrations and modeled dietary concentrations compared with literature-based effect values.
Invertivorous Birds	Support of a functioning invertivorous bird community	Ecological effects quotient based on dietary intake of COPECs by the American robin using site-specific soil concentrations and modeled dietary concentrations compared with literature-based effect values.
Carnivorous Birds	Support of a functioning carnivorous bird community	Ecological effects quotient based on dietary intake of COPECs by the American kestrel using site-specific soil concentrations and modeled dietary concentrations compared with literature-based effect values.
Vernal Pool Aquatic Life	Support of a functioning aquatic life community	Comparison of surface water chemistry with freshwater benchmark values.
Vernal Pool Amphibians	Support of a functioning amphibian community	Comparison of surface water with available amphibian toxicity data and surrogate *Pimephales promelas* values.

TABLE 2-14

ATTRIBUTES FOR JUDGING MEASUREMENT ENDPOINTS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

1. Strength of Association Between Assessment and Measurement Endpoints
Biological linkage between measurement endpoint and assessment endpoint—This attribute refers to the extent to which the measurement endpoint is representative of, correlated with, or applicable to the assessment endpoint. If there is no biological linkage between a measurement endpoint (e.g., a study that may have been performed for some other purpose) and the assessment endpoint of interest, then that study should not be used to evaluate the stated assessment endpoint. Biological linkage pertains to similarity of effect, target organ, mechanism of action, and level of ecological organization. **Correlation of stressor to response**—This attribute relates to the degree to which a correlation is observed between levels of exposure to a stressor and levels of response and the strength of that correlation. **Utility of measure**—This attribute relates to the ability to judge results of the study against well-accepted standards, criteria, or objective measures. As such, the attribute describes the applicability, certainty, and scientific basis of the measure, as well as the sensitivity of a benchmark in detecting environmental harm. Examples of objective standards or measures for judgment might include ambient water quality criteria, sediment quality criteria, biological indices, and toxicity or exposure thresholds recognized by the scientific or regulatory community as measures of environmental harm.
2. Data and Overall Study Quality
Quality of data and overall study—This attribute reflects the degree to which data quality objectives and other recognized characteristics of high quality studies are met. The key factor affecting the quality of the data is the appropriateness of data collection and analysis practices. The key factor of the quality of the study is the appropriateness and implementation of the experimental design and the minimization of confounding factors. If data are judged to be of poor or no quality, the study would be rejected for use in the ERA.
3. Design and Execution
Site-specificity—This attribute relates to the extent to which media, species, environmental conditions, and habitat types that are used in the study design reflect the site of interest. **Sensitivity of the measurement endpoint to detecting changes**—This attribute relates to the ability to detect a response in the measurement endpoint, expressed as a percentage of the total possible variability that the endpoint is able to detect. Additionally, this attribute reflects the ability of the measurement endpoint to discriminate between responses to a stressor and those resulting from natural or design variability and uncertainty. **Spatial representativeness**—This attribute relates to the degree of compatibility or overlap between the study area, locations of measurements or samples, locations of stressors, and locations of ecological receptors and their points of potential exposure. **Temporal representativeness**—This attribute relates to the temporal compatibility or overlap between the measurement endpoint (when data were collected or the period for which data are representative) and the period during which effects of concern would be likely to be detected. Also linked to this attribute is the number of measurement or sampling events over time and the expected variability over time. **Quantitativeness**—This attribute relates to the degree to which numbers can be used to describe the magnitude of response of the measurement endpoint to the stressor. Some measurement endpoints may yield qualitative or hierarchical results, whereas others may be more quantitative. **Use of a standard method**—The extent to which the study follows specific protocols recommended by a recognized scientific authority for conducting the method correctly. Examples of standard methods are study designs or chemical measures published in the Federal Register or the Code of Federal Regulations, developed by ASTM, or repeatedly published in the peer-reviewed scientific literature, including impact assessments, field surveys, toxicity tests, benchmark approaches, toxicity quotients, and tissue residue analyses. This attribute also reflects the suitability and applicability of the method to the endpoint and the site, as well as the need for modification of the method.

Source: Menzie, et al., 1996.

TABLE 2-15
BERA ENDPOINTS AND WEIGHT-OF-EVIDENCE DOCUMENTATION
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

				Attributes									
Assessment Endpoint	**Measures of Effect**	**Descriptive Score[a]**	**Numeric Score[b]**	**Biological Linkage**	**Correlation of Stressor/Response**	**Utility of Measure**	**Quality of Data**	**Site-Specificity**	**Sensitivity**	**Spatial Representativeness**	**Temporal Representativeness**	**Quantitativeness**	**Standard Measure**
1. Plant growth, yield or germination	1.A: Compare COPEC levels in soil samples to conservative benchmarks.	L	27	2	2	2	7	1	2	2	3	2	4
2. Growth, reproduction, or activity of soil invertebrates	2.A: Compare COPEC levels in soil samples to conservative benchmarks.	L	27	2	2	2	7	1	2	2	3	2	4
	2.B: Compare COPEC levels in soil invertebrates to CBRs	M	56	5	6	6	7	5	6	4	3	6	8
3. Survival, growth, or reproduction of herbivorous mammals	3.A: Use food chain modeling to calculate CTE and RME doses for comparison to TRVs	L-M	41	4	7	3	5	5	2	4	4	2	5
	3.B: Compare COPEC levels in small mammals to CBRs	M	56	5	6	6	7	5	6	4	3	6	8
4. Survival, growth, or reproduction of invertiverous mammals	4.A: Use food chain modeling to calculate CTE and RME doses for comparison to TRVs	M	57	7	7	6	7	7	6	4	4	2	7
	4.B: Compare COPEC levels in small mammals to CBRs	M	56	5	6	6	7	5	6	4	3	6	8
5. Survival, growth, or reproduction of carnivorous mammals	5.A: Use food chain modeling to calculate CTE and RME doses for comparison to TRVs	M	57	7	7	6	7	7	6	4	4	2	7
	5.B: Compare COPEC levels in small mammals to CBRs	M	56	5	6	6	7	5	6	4	3	6	8
6. Survival, growth, or reproduction of herbivorous birds	6.A: Use food chain modeling to calculate CTE and RME doses for comparison to TRVs	L-M	41	4	7	3	5	5	2	4	4	2	5
7. Survival, growth, or reproduction of invertiverous birds	7.A: Use food chain modeling to calculate CTE and RME doses for comparison to TRVs	M	57	7	7	6	7	7	6	4	4	2	7
8. Survival, growth, or reproduction of carnivorous birds	8.A: Use food chain modeling to calculate CTE and RME doses for comparison to TRVs	M	57	7	7	6	7	7	6	4	4	2	7
9. Survival, growth, or reproduction of vernal pool aquatic	9.A: Compare COPEC levels in surface water samples to conservative benchmarks	L	27	2	2	2	7	1	2	2	3	2	4
10. Survival, growth, or reproduction of amphibians associated with vernal pools	10.A: Compare COPEC levels in surface water samples to amphibian toxicity data	L	27	2	2	2	7	1	2	2	3	2	4
	10.B: Compare COPEC levels in surface water samples to *Pimephales promelas* toxicity data	L-M	44	5	6	4	7	4	3	2	3	4	6

[a]See text Sectioin 2.4.3 for description.

[b]The numeric scores represent the sum of all the individual attribute scores for each measure of effect.

TABLE 3-1
SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR COPECS - SURFACE SOIL - TRANSITION ZONE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Maximum Detected Concentration (mg/kg)	Data Distribution[a]	Calculation Method[a]	95% UCL[a] (mg/kg)	RME[b] Exposure Point Concentration (mg/kg)	CTE[c] Exposure Point Concentration (mg/kg)
Aluminum	100000	Gamma	95% Approximate Gamma UCL	12686	12686	11586
Antimony	8.10	Lognormal	95% KM (BCA) UCL	1.16	1.16	0.898
Arsenic	22.0	Not Discernable	95% KM (BCA) UCL	2.85	2.85	2.49
Cadmium	7.20	Not Discernable	95% KM (BCA) UCL	1.03	1.03	0.908
Chromium	440	Not Discernable	95% Chebyshev (Mean, Sd) UCL	50.8	50.8	38.0
Cobalt	120	Not Discernable	95% Chebyshev (Mean, Sd) UCL	22.1	22.1	16.3
Copper	7850	Gamma	95% Approximate Gamma UCL	772	772	665
Iron	300000	Not Discernable	95% Chebyshev (Mean, Sd) UCL	57545	57545	43203
Lead	1700	Not Discernable	95% Chebyshev (Mean, Sd) UCL	94.5	94.5	49.6
Manganese	8380	Lognormal	95% H-UCL	367	367	354
Mercury	2.80	Lognormal	95% KM (BCA) UCL	0.174	0.174	0.137
Molybdenum	27.0	Not Discernable	95% KM (Chebyshev) UCL	5.00	5.00	3.38
Nickel	110	Gamma	95% Approximate Gamma UCL	23.1	23.1	21.5
Selenium	83.0	Not Discernable	95% KM (Chebyshev) UCL	15.9	15.9	10.7
Silver	22.0	Not Discernable	95% KM (Chebyshev) UCL	3.69	3.69	2.51
Strontium	107	Lognormal	95% H-UCL	27.0	27.0	17.6
Thallium	16.0	Not Discernable	95% KM (Chebyshev) UCL	2.37	2.37	1.46
Vanadium	400	Not Discernable	95% Chebyshev (Mean, Sd) UCL	59.2	59.2	46.8
Zinc	1500	Not Discernable	95% Chebyshev (Mean, Sd) UCL	163	163	118

[a]Based on ProUCL recommendation.

[b]The RME EPC is based on the lower of the maximum detected concentration and the 95% UCL.

[c]The CTE EPC is based on the arithmetic mean. In instances where the Kaplan-Meier (KM) method was used to derive the UCL, the KM-based arithmetic mean was used.

CTE = Central tendency exposure.

mg/kg = Milligrams per kilogram.

RME = Reasonable maximum exposure.

TABLE 3-2
SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR COPECS - SURFACE SOIL - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC[a]	Maximum Detected Concentration (mg/kg)	Data Distribution[b]	Calculation Method[b]	95% UCL[b] (mg/kg)	RME[c] Exposure Point Concentration (mg/kg)	CTE[d] Exposure Point Concentration (mg/kg)
Aluminum	12000	Normal	95% Student's-t UCL	9508	9508	7669
Arsenic	4.30	Normal	95% Student's-t UCL	2.51	2.51	2.11
Cadmium	0.520	Normal	95% KM (t) UCL	0.386	0.386	0.315
Chromium	32.0	Not Discernable	95% Chebyshev (Mean, Sd) UCL	32.7	32.0	20.4
Cobalt	16.0	Normal	95% Student's-t UCL	8.58	8.58	6.60
Copper	45.0	Gamma	95% Approximate Gamma UCL	20.2	20.2	15.3
Iron	31000	Normal	95% Student's-t UCL	17730	17730	13852
Lead	77.0	Gamma	95% Approximate Gamma UCL	40.0	40.0	27.7
Manganese	7800	Gamma	95% Approximate Gamma UCL	2901	2901	1386
Mercury	0.290	Normal	95% Student's-t UCL	0.167	0.167	0.130
Molybdenum	0.640	Normal	95% KM (t) UCL	0.561	0.561	0.433
Nickel	30.0	Normal	95% Student's-t UCL	18.9	18.9	15.3
Selenium	2.90	Normal	95% Student's-t UCL	2.04	2.04	1.77
Silver	1.40	Normal	95% KM (t) UCL	0.386	0.386	0.211
Thallium	4.30	Not Discernable	95% KM (t) UCL	1.87	1.87	1.42
Vanadium	59.0	Normal	95% Student's-t UCL	36.2	36.2	28.8
Zinc	86.0	Normal	95% Student's-t UCL	52.3	52.3	42.8

[a]COPECs selected previously as discussed in Section 2.3.2.

[b]Based on ProUCL recommendation.

[c]The RME EPC is based on the lower of the maximum detected concentration and the 95% UCL.

[de]The CTE EPC is based on the arithmetic mean. In instances where the Kaplan-Meier (KM) method was used to derive the UCL, the KM-based arithmetic mean was used.

CTE = Central tendency exposure.

mg/kg = Milligrams per kilogram.

RME = Reasonable maximum exposure.

TABLE 3-3
SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR COPECS - SOIL INVERTEBRATES - SITE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Exposure Point Concentration (mg/kg ww)	
	RME[a]	CTE[b]
Aluminum	240	125
Cadmium	1.10	0.670
Chromium	2.90	1.52
Copper	43.0	28.0
Iron	730	375
Manganese	34.0	25.8
Silver	1.00	1.00
Zinc	95.0	64.0

[a]The RME EPC is based on the maximum detected concentration because less than 8 samples collected.

[b]The CTE EPC is based on the arithmetic mean.

CTE = Central tendency exposure.

mg/kg = Milligrams per kilogram.

RME = Reasonable maximum exposure.

TABLE 3-4
SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR COPECS - SOIL INVERTEBRATES - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC[a]	Exposure Point Concentration (mg/kg ww)	
	RME[b]	CTE[c]
Copper	15.0	14.5
Iron	29.0	25.5
Manganese	5.40	5.10
Zinc	51.0	50.5

[a]COPECs selected previously as discussed in Section 2.3.2.

[b]The RME EPC is based on the maximum detected concentration because less than 8 samples collected.

[c]The CTE EPC is based on the arithmetic mean.

CTE = Central tendency exposure.

mg/kg = Milligrams per kilogram.

RME = Reasonable maximum exposure.

TABLE 3-5
SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR COPECS - SMALL MAMMALS - SITE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Maximum Detected Concentration (mg/kg ww)	Data Distribution[a]	Calculation Method[a]	95% UCL[a] (mg/kg ww)	RME[b] Exposure Point Concentration (mg/kg ww)	CTE[d] Exposure Point Concentration (mg/kg ww)
Aluminum	77.0	Gamma	95% KM (t) UCL	26.7	26.7	23.2
Arsenic	1.60	Lognormal	95% KM (t) UCL	1.09	1.09	1.05
Cadmium	1.20	ND	ND	NC	1.20 [c]	0.523
Chromium	3.70	Normal	95% KM (t) UCL	1.29	1.29	1.10
Copper	12.0	Not Discernable	95% Student's-t UCL	5.64	5.64	5.03
Iron	640	Not Discernable	95% Chebyshev (Mean, Sd) UCL	200	200	116
Lead	1.60	ND	ND	NC	1.60 [c]	1.02
Manganese	34.0	Not Discernable	95% KM (Chebyshev) UCL	14.4	14.4	9.36
Zinc	46.0	Not Discernable	95% Student's-t UCL	32.0	32.0	30.6

[a]Based on ProUCL recommendation unless there is an insufficient sample size.

[b]The RME EPC is based on the lower of the maximum detected concentration and the 95% UCL.

[c]The maximum detected concentration used for EPC because of less than 5% detection.

[d]The CTE EPC is based on the arithmetic mean. In instances where the Kaplan-Meier (KM) method was used to derive the UCL, the KM-based arithmetic mean was used.

CTE = Central tendency exposure.

mg/kg ww = Milligrams per kilogram wet weight.

NC = Not calculated due to insufficient sample size.

ND = Not determined due to insufficient sample size.

RME = Reasonable maximum exposure.

TABLE 3-6
SUMMARY OF EXPOSURE POINT CONCENTRATIONS FOR COPECS - SMALL MAMMALS - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC[a]	Maximum Detected Concentration (mg/kg ww)	Data Distribution[b]	Calculation Method[b]	95% UCL[b] (mg/kg ww)	RME[c] Exposure Point Concentration (mg/kg ww)	CTE[d] Exposure Point Concentration (mg/kg ww)
Aluminum	34.0	Normal	95% KM (t) UCL	29.7	29.7	27.0
Chromium	1.50	Not Discernable	95% KM (t) UCL	1.44	1.44	1.41
Copper	5.90	Normal	95% Student's-t UCL	4.29	4.29	3.73
Iron	180	Normal	95% Student's-t UCL	124	124	101
Manganese	14.0	Not Discernable	95% KM (BCA) UCL	9.07	9.07	6.89
Zinc	36.0	Normal	95% Student's-t UCL	33.6	33.6	31.3

[a]Based on ProUCL recommendation unless there is an insufficient sample size.

[b]Based on ProUCL recommendation.

[c]The RME EPC is based on the lower of the maximum detected concentration and the 95% UCL.

[d]The CTE EPC is based on the arithmetic mean. In instances where the Kaplan-Meier (KM) method was used to derive the UCL, the KM-based arithmetic mean was used.

CTE = Central tendency exposure.

mg/kg ww = Milligrams per kilogram wet weight

RME = Reasonable maximum exposure.

TABLE 3-7

COPEC CONCENTRATIONS IN PLANTS DUE TO ROOT UPTAKE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Based on

Measured BCF: $C_{TP} = C_S \times BCF_r \times CF$

Single Variable Regression: $C_{TP} = \left[e^{B0 + B1 * \ln(Cs)}\right] \times CF$

Multiple Regression with pH: $C_{TP} = \left[e^{B0 + B1 * \ln(Cs) + B2(pH))}\right] \times CF$

Parameter	Definition	Value	Reference
C_{TP}	Concentration of COPEC in terrestrial plants (mg COPEC/kg WW).		
C_S	Concentration of COPEC in soil (mg COPEC/kg DW soil).	COPEC-specific	3-1 and 3-2
BCF_r	Soil to plant bioconcentration factor based on root uptake [(mg COPEC/kg DW plant tissue)/(mg COPEC/kg DW soil)]	COPEC-specific	3-8
CF	Dry to wet weight conversion factor. Assumes seeds to contain 9.3% moisture (kg DW/kg WW).	0.907	EPA, 2007g
B0	y-intercept	COPEC-specific	3-8
B1	slope	COPEC-specific	3-8
B2			3-8
pH	Potential of hydrogen (unitless)	4.8	Average vegetated area-specific soil pH

TABLE 3-8
PLANT ESTIMATION VALUES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Measured BCF (mg COPEC/kg dry tissue)/ (mg COPC/kg dry soil)	Measured BCF Source	Regression Values[a] B0	B1	B2	Source
Aluminum	0.00065	Baes et al., 1984				
Antimony			-3.23	0.938		EPA, 2007g
Arsenic	0.03752	EPA, 2007g				
Cadmium			0.704	0.544	-0.17	Bechtel-Jacobs, 1998[b]
Chromium	0.041	EPA, 2007g				
Cobalt	0.0075	EPA, 2007g				
Copper			0.668	0.394		EPA, 2007g
Iron	0.001	Baes et al., 1984				
Lead			-1.33	0.561		EPA, 2007g
Manganese	0.079	EPA, 2007				
Mercury			-4.12	0.635	0.419	Bechtel-Jacobs, 1998[b]
Molybdenum	0.06	Baes et al., 1984				
Nickel			-2.22	0.748		EPA, 2007g
Selenium			-8.94	0.984	1.182	Bechtel-Jacobs, 1998[b]
Silver	0.014	EPA, 2007				
Strontium	0.25	Baes et al., 1984				
Thallium	0.0004	Baes et al., 1984				
Vanadium	0.00485	EPA, 2007				
Zinc			2.28	0.571	-0.13	Bechtel-Jacobs, 1998[b]

[a]Resulting units mg/kg dry tissue.

[b]Multiple regression using pH.

TABLE 3-9
TERRESTRIAL PLANT EXPOSURE POINT CONCENTRATIONS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Exposure Point Concentration (mg/kg ww)			
	RME		CTE	
	Transition Zone	Background	Transition Zone	Background
Aluminum	7.48	5.61	6.83	4.52
Antimony	0.0410	ND	0.0323	ND
Arsenic	0.0969	0.0854	0.0847	0.0718
Cadmium	0.841	0.493	0.784	0.441
Chromium	1.89	1.19	1.41	0.759
Cobalt	0.150	0.0584	0.111	0.0449
Copper	24.3	5.78	22.9	5.18
Iron	52.2	16.1	39.2	12.6
Lead	3.08	1.90	2.15	1.55
Manganese	26.3	208	25.4	99.3
Mercury	0.0363	0.0354	0.0312	0.0302
Molybdenum	0.272	0.0305	0.184	0.0236
Nickel	1.03	0.886	0.973	0.757
Selenium	0.529	0.0699	0.357	0.0609
Silver	0.0469	0.00490	0.0319	0.00268
Strontium	6.11	ND	4.00	ND
Thallium	<0.001	<0.001	<0.001	<0.001
Vanadium	0.260	0.159	0.206	0.127
Zinc	87.9	45.9	73.3	41.0

ND = Not detected.

TABLE 3-10

CALCULATION OF FIELD METABOLIC RATES*
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

$$FMR\ (kcal/g\ BW\text{-}day) = a \times BW^{b} \times \frac{1\ kcal}{4.1876\ kJ} \div BW$$

Target Receptor	Allometric Equation Basis	a	b	Body Weight in Grams	FMR (kcal/g BW-day)
Song Sparrow	Birds – Passerines	10.4	0.68	20 (Dunning, 1984)	0.95
American Robin	Birds – Passerines	10.4	0.68	77 (Sample and Suter, 1994)	0.62
American Kestrel	Birds – All Birds	10.5	0.681	119 (EPA, 1993b)	0.55
Deer Mouse	Mammals – Rodentia	5.48	0.712	17.9 (Nagy, 2001)	0.57
Short-Tailed Shrew	Mammals – Insectivores	6.98	0.622	15 (EPA, 1993b)	0.60
Mink	Mammals – Carnivora	1.67	0.869	1000 (Sample and Suter, 1994)	0.16

*From Nagy et al., 1999 unless otherwise indicated.

TABLE 3-11

ASSIMILATION EFFICIENCY (AE) AND GROSS ENERGY (GE) OF ANTICIPATED PREY ITEMS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Predator/Prey Item	Assimilation Efficiency (unitless)	Basis of Value	Gross Energy (kcal/g ww)	Basis of Value
Birds				
Terrestrial Plants	0.75	Passerines – Wild Seeds	1.1	Terrestrial - Fruit (Pulp, Skin)
Soil Invertebrates	0.72	Birds – Terrestrial insects	1.3	Mean of earthworms, grasshoppers/crickets, and beetles
Small Mammals	0.78	Birds of Prey – Birds, Small Mammals	1.7	Mice, Voles, and Rabbits
Mammals				
Terrestrial Plants	0.85	Voles, Mice – Seeds, Nuts	1.1	Terrestrial - Fruit (Pulp, Skin)
Soil Invertebrates	0.87	Small Mammals – Insects	1.3	Mean of earthworms, grasshoppers/crickets, and beetles
Small Mammals	0.84	Mammals – Small Birds, Mammals	1.7	Mice, Voles, and Rabbits

Source: EPA, 1993b.

TABLE 3-12

COPEC DOSE INGESTED TERMS IN HERBIVOROUS BIRDS (SONG SPARROW)
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

$$D_{HB} = \left(C_{TP} \times IR_{HB} \times P_{TP} \times F_{TP} \times AF_{bio-diet}\right) + \left(C_S \times IR_{S-HB} \times P_S \times AF_{bio-s}\right)$$

Parameter	Definition	Value	Reference
D_{HB}	Dose ingested for herbivorous birds (song sparrow) (mg COPEC/kg BW-day).		
C_{TP}	COPEC concentration in terrestrial plants (mg COPEC/kg WW).	COPEC-specific	Table 3-9
IR_{HB}	Food ingestion rate of herbivorous birds (kg WW/kg BW-day).	1.2	Calculated
P_{TP}	Proportion of terrestrial plants diet that is contaminated (unitless).	1	Professional judgment
F_{TP}	Fraction of diet comprised of terrestrial plants (unitless).	1	Cornell, 2003
$AF_{bio-diet}$	Bioaccessibility adjustment factor to account for bioaccessibility from diet to organism (unitless)	Receptor class-, dietary item- and COPEC-specific	Table 3-18
C_S	COPEC concentration in soil (mg COPEC/kg DW soil).	COPEC-specific	Tables 3-1 and 3-2
IR_{S-HB}	Soil ingestion rate for herbivorous birds (kg DW/kg BW-day).	0.092	DW ingestion rate calculated by converting the WW ingestion rate, assuming 9.3% water content in the diet (water content in seeds; EPA, 2007g), and assuming a song sparrow ingests 8.8% of the dry food intake (based on median soil ingestion rate for dove; EPA, 2003d)
P_S	Proportion of ingested soil that is contaminated (unitless).	1	Professional judgment
AF_{bio-s}	Bioaccessibility adjustment factor to account for bioaccessibility from soil to organism (unitless)	Receptor class- and COPEC-specific	Table 3-18

TABLE 3-13

COPEC DOSE INGESTED TERMS IN INVERTIVOROUS BIRDS (AMERICAN ROBIN)
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

$$D_{IB} = (C_{INV} \times IR_{IB} \times P_{INV} \times F_{INV} \times AF_{bio-diet}) + (C_S \times IR_{S-IB} \times P_S \times AF_{bio\text{-}s})$$

Parameter	Definition	Value	Reference
D_{IB}	Dose ingested for invertivorous birds (American robin) (mg COPEC/kg BW-day).		
C_{INV}	COPEC concentration in soil invertebrates (mg COPEC/kg WW).	COPEC-specific	Tables 3-3 and 3-4
IR_{IB}	Food ingestion rate of invertivorous birds (kg WW/kg BW-day).	0.66	Calculated
P_{INV}	Proportion of soil invertebrates diet that is contaminated (unitless).	1	Professional judgment
F_{INV}	Fraction of diet comprised of soil invertebrates (unitless).	1	EPA, 1993b and 1999a
$AF_{bio-diet}$	Bioaccessibility adjustment factor to account for bioaccessibility from diet to organism (unitless)	Receptor class-, dietary item- and COPEC-specific	Table 3-18
C_S	COPEC concentration in soil (mg COPEC/kg DW soil).	COPEC-specific	Tables 3-1 and 3-2
IR_{S-IB}	Soil ingestion rate for invertivorous birds (kg DW/kg BW-day).	0.008	DW ingestion rate calculated by converting the WW ingestion rate, assuming 71% water content in the diet (based on mean site-specific percent moisture in soil invertebrates), and assuming an American robin ingests 4.2% of the dry food intake (Beyer et al., 1994)
P_S	Proportion of ingested soil that is contaminated (unitless).	1	Professional judgment
AF_{bio-s}	Bioaccessibility adjustment factor to account for bioaccessibility from soil to organism (unitless)	Receptor class- and COPEC-specific	Table 3-18

TABLE 3-14

COPEC DOSE INGESTED TERMS IN CARNIVOROUS BIRDS (AMERICAN KESTREL)
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

$$D_{CB} = \left(C_{INV} \times IR_{CB} \times P_{INV} \times F_{INV} \times AF_{bio-diet}\right) + \left(C_{SM} \times IR_{CB} \times P_{SM} \times F_{SM} \times AF_{bio-diet}\right)$$

Parameter	Definition	Value	Reference
D_{CB}	Dose ingested for carnivorous birds (American kestrel) (mg COPEC/kg BW-day).		
C_{INV}	COPEC concentration in soil invertebrates (mg COPEC/kg WW).	COPEC-specific	Tables 3-3 and 3-4
IR_{CB}	Food ingestion rate of carnivorous birds (kg WW/kg BW-day).	0.48	Calculated
P_{INV}	Proportion of soil invertebrates diet that is contaminated (unitless).	1	Professional judgment
F_{INV}	Fraction of diet comprised of soil invertebrates (unitless).	0.5	EPA, 1993b and 1999a
$AF_{bio-diet}$	Bioaccessibility adjustment factor to account for bioaccessibility from diet to organism (unitless)	Receptor class-, dietary item- and COPEC-specific	Table 3-18
C_{SM}	COPEC concentration in small mammals (mg COPEC/kg WW).	COPEC-specific	Tables 3-5 and 3-6
P_{SM}	Proportion of small mammals diet that is contaminated (unitless).	1	Professional judgment
F_{SM}	Fraction of diet comprised of small mammals (unitless).	0.5	EPA, 1993b and 1999a

TABLE 3-15

COPEC DOSE INGESTED TERMS IN HERBIVOROUS MAMMALS (DEER MOUSE)
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

$$D_{HM} = (C_{TP} \times IR_{HM} \times P_{TP} \times F_{TP} \times AF_{bio-diet}) + (C_S \times IR_{S-HM} \times P_S \times AF_{bio-s})$$

Parameter	Definition	Value	Reference
D_{HM}	Dose ingested for herbivorous mammals (deer mouse) (mg COPEC/kg BW-day).		
C_{TP}	COPEC concentration in terrestrial plants (mg COPEC/kg WW).	COPEC-specific	Table 3-9
IR_{HM}	Food ingestion rate of herbivorous mammals (kg WW/kg BW-day).	0.61	Calculated
P_{TP}	Proportion of terrestrial plants diet that is contaminated (unitless).	1	Professional judgment
F_{TP}	Fraction of diet comprised of terrestrial plants (unitless).	1	Merritt, 1987
$AF_{bio-diet}$	Bioaccessibility adjustment factor to account for bioaccessibility from diet to organism (unitless)	Receptor class-, dietary item- and COPEC-specific	Table 3-18
C_S	COPEC concentration in soil (mg COPEC/kg DW soil).	COPEC-specific	Tables 3-1 and 3-2
IR_{S-HM}	Soil ingestion rate for herbivorous mammals (kg DW/kg BW-day).	0.011	DW ingestion rate calculated by converting the WW ingestion rate, assuming 9.3% water content in the diet (water content in seeds; EPA, 2007g), and assuming a deer mouse ingests 2% of the dry food intake (based on white-footed mouse data; Beyer et al., 1994)
P_S	Proportion of ingested soil that is contaminated (unitless).	1	Professional judgment
AF_{bio-s}	Bioaccessibility adjustment factor to account for bioaccessibility from soil to organism (unitless)	Receptor class- and COPEC-specific	Table 3-18

TABLE 3-16

COPEC DOSE INGESTED TERMS IN INVERTIVOROUS SMALL MAMMALS (SHORT-TAILED SHREW) ELY COPPER MINE SUPERFUND SITE VERSHIRE, VT

$$D_{ISM} = \left(C_{INV} \times IR_{ISM} \times P_{INV} \times F_{INV} \times AF_{bio-diet}\right) + \left(C_S \times IR_{S-ISM} \times P_S \times AF_{bio-s}\right)$$

Parameter	Definition	Value	Reference
D_{ISM}	Dose ingested for invertivorous small mammals (short-tailed shrew) (mg COPEC/kg BW-day).		
C_{INV}	COPEC concentration in soil invertebrates (mg COPEC/kg WW).	COPEC-specific	Tables 3-3 and 3-4
IR_{ISM}	Food ingestion rate of invertivorous small mammals (kg WW/kg BW-day).	0.53	Calculated
P_{INV}	Proportion of soil invertebrates diet that is contaminated (unitless).	1	Professional judgment
F_{INV}	Fraction of diet comprised of soil invertebrates (unitless).	1	Merritt, 1987
$AF_{bio-diet}$	Bioaccessibility adjustment factor to account for bioaccessibility from diet to organism (unitless)	Receptor class-, dietary item- and COPEC-specific	Table 3-18
C_S	COPEC concentration in soil (mg COPEC/kg DW soil).	COPEC- specific	Tables 3-1 and 3-2
IR_{S-ISM}	Soil ingestion rate for invertivorous small mammals (kg DW/kg BW-day).	0.0046	DW ingestion rate calculated by converting the WW ingestion rate, assuming 71% water content in the diet (based on mean site-specific percent moisture in soil invertebrates), and that a short-tailed shrew ingests 3% of the dry food intake (EPA, 2007g)
P_S	Proportion of ingested soil that is contaminated (unitless).	1	Professional judgment
AF_{bio-s}	Bioaccessibility adjustment factor to account for bioaccessibility from soil to organism (unitless)	Receptor class- and COPEC-specific	Table 3-18

TABLE 3-17

COPEC DOSE INGESTED TERMS IN CARNIVOROUS MAMMALS (MINK)
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

$$D_{CM} = \left(C_{SM} \times IR_{CM} \times P_{SM} \times F_{SM} \times AF_{bio-diet}\right)$$

Parameter	Definition	Value	Reference
D_{CM}	Dose ingested for carnivorous mammals (mink) (mg COPEC/kg BW-day).		
C_{SM}	COPEC concentration in small mammals (mg COPEC/kg WW).	COPEC-specific	Tables 3-5 and 3-6
IR_{CM}	Food ingestion rate of carnivorous mammals (kg WW/kg BW-day).	0.11	Calculated
P_{SM}	Proportion of small mammals diet that is contaminated (unitless).	1	Professional judgment
F_{SM}	Fraction of diet comprised of small mammals (unitless).	1	EPA, 1993b and Sample and Suter, 1994
$AF_{bio-diet}$	Bioaccessibility adjustment factor to account for bioaccessibility from diet to organism (unitless)	Receptor class-, dietary item- and COPEC-specific	Table 3-18

TABLE 3-18
BIOACCESSIBILITY VALUES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Avian			Mammal		
	Plants	Animals	Soil	Plants	Animals	Soil
Aluminum	100% *	100% *	100% *	100% *	100% *	100% *
Antimony	100%	NE	3.9%	100%	NE	3.9%
Arsenic	100%	100%	56%	100%	100%	11%
Cadmium	7.1%	100%	61%	54%	54%	61%
Chromium	100%	100%	4.2%	8.6%	8.6%	4.2%
Cobalt	100%	NE	24.7%	100%	NE	24.7%
Copper	1.3%	53%	44.4%	100%	100%	44.4%
Iron	100% *	100% *	100% *	100% *	100% *	100% *
Lead	43%	43%	27.9%	100%	100%	10%
Manganese	100% *	100% *	100% *	100% *	100% *	100% *
Mercury	100%	NE	0.03%	25%	NE	1.7%
Molybdenum	100% *	NE	100% *	100%	NE	100%
Nickel	100%	NE	23.3%	100%	NE	23.3%
Selenium	100% *	NE	100%	100% *	NE	100%
Silver	100% *	100% *	100% *	100%	100%	100%
Strontium	100% *	NE	100% *	100% *	NE	100% *
Thallium	100% *	NE	100% *	100%	NE	100%
Vanadium	100% *	NE	100% *	100%	NE	100%
Zinc	4.0%	100%	100%	100%	100%	100%

Source: URS, 2006 with the exception of *.

*Not available in URS, 2006; therefore, default of 100%.

NE = Not evaluated. Either not detected or not a COPEC within the medium.

TABLE 3-19
REASONABLE MAXIMUM EXPOSURE (RME) ESTIMATED DAILY INTAKES - TRANSITION ZONE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Estimated Daily Intakes					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	1176	260	64.0	144	186	2.94
Antimony	0.0533	<0.001	ND	0.0255	<0.001	ND
Arsenic	0.263	0.0128	0.262	0.0625	0.00144	0.120
Cadmium	0.130	0.731	0.552	0.284	0.318	0.0713
Chromium	2.46	1.93	1.01	0.123	0.142	0.0122
Cobalt	0.683	0.0437	ND	0.152	0.0251	ND
Copper	31.9	17.8	6.19	18.6	24.4	0.621
Iron	5357	942	223	665	652	22.0
Lead	4.02	0.211	0.165	1.98	0.0435	0.176
Manganese	65.3	25.4	11.6	20.1	19.7	1.59
Mercury	0.0436	<0.001	ND	0.00557	<0.001	ND
Molybdenum	0.787	0.0400	ND	0.221	0.0230	ND
Nickel	1.73	0.0431	ND	0.687	0.0248	ND
Selenium	2.10	0.127	ND	0.498	0.0732	ND
Silver	0.396	0.690	0.240	0.0692	0.547	ND
Strontium	9.82	0.216	ND	4.03	0.124	ND
Thallium	0.219	0.0189	ND	0.0266	0.0109	ND
Vanadium	5.75	0.473	ND	0.809	0.272	ND
Zinc	19.2	64.0	30.5	55.4	51.1	3.52

ND = Not detected.

TABLE 3-20
CENTRAL TENDENCY EXPOSURE (CTE) ESTIMATED DAILY INTAKES - TRANSITION ZONE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Estimated Daily Intakes					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	1074	175	35.5	132	119	2.55
Antimony	0.0420	<0.001	ND	0.0201	<0.001	ND
Arsenic	0.230	0.0112	0.252	0.0547	0.00126	0.116
Cadmium	0.118	0.447	0.286	0.264	0.194	0.0311
Chromium	1.84	1.02	0.630	0.0918	0.0766	0.0104
Cobalt	0.503	0.0322	ND	0.112	0.0185	ND
Copper	27.5	12.2	4.20	17.2	16.2	0.553
Iron	4022	593	118	499	397	12.8
Lead	2.38	0.111	0.105	1.37	0.0228	0.112
Manganese	63.0	19.9	8.44	19.4	15.3	1.03
Mercury	0.0374	<0.001	ND	0.00478	<0.001	ND
Molybdenum	0.532	0.0271	ND	0.150	0.0156	ND
Nickel	1.63	0.0400	ND	0.649	0.0230	ND
Selenium	1.41	0.0853	ND	0.335	0.0490	ND
Silver	0.269	0.680	0.240	0.0471	0.542	ND
Strontium	6.43	0.141	ND	2.64	0.0812	ND
Thallium	0.134	0.0116	ND	0.0163	0.00669	ND
Vanadium	4.55	0.374	ND	0.640	0.215	ND
Zinc	14.4	43.2	22.7	46.0	34.5	3.37

ND = Not detected.

TABLE 3-21
REASONABLE MAXIMUM EXPOSURE (RME) ESTIMATED DAILY INTAKES - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Estimated Daily Intakes					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	881	76.1	7.13	108	43.7	3.27
Arsenic	0.232	0.0112	ND	0.0551	0.00127	ND
Cadmium	0.0636	0.00188	ND	0.165	0.00108	ND
Chromium	1.55	0.0108	0.344	0.0772	0.00618	0.01
Cobalt	0.265	0.0170	ND	0.0589	0.00975	ND
Copper	0.916	5.32	2.45	3.63	7.99	0.472
Iron	1650	161	36.7	205	96.9	13.6
Lead	2.01	0.0892	ND	1.20	0.0184	ND
Manganese	516	26.77	3.47	159	16.2	1.00
Mercury	0.0424	<0.001	ND	0.00543	<0.001	ND
Molybdenum	0.0882	0.00449	ND	0.0248	0.00258	ND
Nickel	1.47	0.0353	ND	0.589	0.0203	ND
Selenium	0.271	0.0163	ND	0.0650	0.00936	ND
Silver	0.0414	0.00309	ND	0.00724	0.00178	ND
Thallium	0.173	0.0150	ND	0.0210	0.00860	ND
Vanadium	3.52	0.289	ND	0.495	0.166	ND
Zinc	7.01	34.1	20.3	28.6	27.3	3.69

ND = Not detected.

TABLE 3-22
CENTRAL TENDENCY EXPOSURE (CTE) ESTIMATED DAILY INTAKES - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Estimated Daily Intakes					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	711	61.4	6.48	87.1	35.3	2.97
Arsenic	0.195	0.00945	ND	0.0464	0.00107	ND
Cadmium	0.0552	0.00154	ND	0.147	<0.001	ND
Chromium	0.990	0.00686	0.338	0.0493	0.00394	0.0133
Cobalt	0.204	0.0130	ND	0.0453	0.00750	ND
Copper	0.705	5.13	2.32	3.23	7.72	0.410
Iron	1289	128	30.4	160	77.2	11.1
Lead	1.51	0.0618	ND	0.975	0.0127	ND
Manganese	247	14.5	2.88	75.8	9.08	0.758
Mercury	0.0363	<0.001	ND	0.00463	<0.001	ND
Molybdenum	0.0681	0.00346	ND	0.0191	0.00199	ND
Nickel	1.24	0.0286	ND	0.501	0.0164	ND
Selenium	0.236	0.0142	ND	0.0566	0.00814	ND
Silver	0.0226	0.00169	ND	0.00396	<0.001	ND
Thallium	0.131	0.0113	ND	0.0159	0.00651	ND
Vanadium	2.80	0.230	ND	0.394	0.133	ND
Zinc	5.90	33.7	19.6	25.5	27.0	3.44

ND = Not detected.

TABLE 3-23
PHYTOTOXICITY BENCHMARKS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Value (mg/kg)	Comment	Source
Aluminum	NBA		
Antimony	0.5		EPA, 1999a
Arsenic	18		SSL
Cadmium	32		SSL
Chromium	0.018	Chromium VI value	EPA, 1999a
Cobalt	13		SSL
Copper	70		SSL
Iron	NBA		
Lead	120		SSL
Manganese	220		SSL
Mercury	0.349	Mercuric chloride value	EPA, 1999a
Molybdenum	2		Efroymson, et al., 1997b
Nickel	38		SSL
Selenium	0.52		SSL
Silver	560		SSL
Strontium	NBA		
Thallium	0.01		EPA, 1999a
Vanadium	2		Efroymson, et al., 1997b
Zinc	160		SSL

NBA = No benchmark available.
SSL - Soil screening level - plant value.

TABLE 3-24
SOIL INVERTEBRATES BENCHMARKS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Value (mg/kg)	Comment	Source
Aluminum	NBA		
Antimony	78		SSL
Arsenic	0.25		EPA, 1999a
Cadmium	140		SSL
Chromium	0.2		EPA, 1999a
Cobalt	1000	microbe	Efroymson, et al., 1997c
Copper	80		SSL
Iron	200	microbe	Efroymson, et al., 1997c
Lead	1700		SSL
Manganese	450		SSL
Mercury	2.5	Methyl mercury value.	EPA, 1999a
Molybdenum	200	microbe	Efroymson, et al., 1997c
Nickel	280		SSL
Selenium	4.1		SSL
Silver	50	microbe	Efroymson, et al., 1997c
Strontium	NBA		
Thallium	NBA		
Vanadium	20	microbe	Efroymson, et al., 1997c
Zinc	120		SSL

NBA = No benchmark available.
SSL - Soil screening level - soil invertebrate value.

TABLE 3-25
ACUTE AND CHRONIC SURFACE WATER BENCHMARKS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Acute Surface Water Benchmark (µg/L)	Source	Chronic Surface Water Benchmark (µg/L)	Source
Barium	110	Suter and Tsao, 1996	4	EPA, 1999
Cadmium				
VP-1	0.78 [a]	EPA, 2009	0.12 [a]	EPA, 2009
Copper				
VP-1	5.4 [a]	EPA, 2009	3.9 [a]	EPA, 2009
VP-2	5 [a]	EPA, 2009	3.7 [a]	EPA, 2009
Manganese	2,300	Suter and Tsao, 1996	120	Suter and Tsao, 1996
Zinc				
VP-1	52 [a]	EPA, 2009	52 [a]	EPA, 2009
VP-3	42 [a]	EPA, 2009	43 [a]	EPA, 2009

µg/L = Micrograms per liter.

[a]EPA (2009) hardness-dependent. Calculated using sample-specific hardness values as presented in Table 2-11.

TABLE 3-26
AMPHIBIAN TOXICITY REFERENCE VALUES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Common Name	Lifestage	Endpoint	Study Duration	Efffect	Toxicity Value (mg/L)	Source*
Barium	---	---	---	---	---	NBA	---
Cadmium	Northwestern Salamander	larvae (3 month)	NOAEL	---	Growth reduction	0.106	Nebeker, et al., 1995
Copper	Western Toad	larvae	NOAEL	---	Metamorphosis	0.02	Porter and Hakanson, 1976
Manganese	Eastern Narrowmouth Toad	embryo	LC50	7-day	Mortality	1.42	Birge, et al., 1979
Zinc	Western Toad	larvae	NOAEL		Metamorphosis	0.1	Porter and Hakanson, 1976

*All as cited in Pauli, et al., 2000
NBA = No benchmark available.

TABLE 3-27
AMPHIBIAN TOXICITY VALUES BASED ON *P. PROMELAS* TOXICITY DATA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Form	Effect	Endpoint	Exposure Duration	Concentration (µg/L)	Reference*
Barium	---	---	---	---	---	---
Cadmium	Cadmium chloride	LC50	Mortality	4-day	67 D	Erten-Unal, et al., 1998
	Cadmium oxide	LC50	Mortality	4-day	177 D	Gale, et al., 1992
	Cadmium sulfide	LC50	Mortality	4-day	108 D	Gale, et al., 1992
	Nitric acid, Cadmium salt	MATC	Multiple Endpoints	32-day	10 T	Spehar and Fiandt, 1986
	Sulfuric acid, Cadmium salt (1:1)	NOEC	Length and weight	21-day	1.8 T	Welsh, 1996
Copper	Acetic acid, Copper (2+) salt	LC50	Mortality	4-day	140 T	Curtis and Ward, 1981 and Curtis, et al., 1978
	Copper chloride	EC50	Imbalance	4-day	17.4 D	Van Genderen, et al., 2007
	Nitric acid, Copper (2+) salt	MATC	Multiple Endpoints	32-day	6.2 T	Spehar and Fiandt, 1986
	Sulfuric acid Copper (2+) salt (1:1)	MATC	Dry weight	30-day	2.9 T	Besser, et al., 2005
Manganese	Sulfuric acid, Manganese (2+) salt (1:1)	MATC	Decreased length and weight	28-day	1770 T	Kimball, 1978
Zinc	Acetic acid, Zinc salt	NOEC	Mortality	8-day	150 T	Popken, 1990
	Sulfuric acid, Zinc salt (1:1)	MATC	Growth	7-day	183 T	Norberg-King, 1989
	Zinc chloride	NOEL	Growth	7-day	300 T	Diamond, et al., 2006
	Zinc oxide	LC50	Mortality	4-day	2246000 T	Gale, et al., 1992
	Zinc sulfide	LC50	Mortality	4-day	1826000 T	Erten-Unal, et al., 1998

*All as cited in EcoTox (EPA, 2007h accessed January through May 2011).

D = Dissolved

EC50 = Effect concentration - 50% of the population

LC50 = Lethal concentration - 50% of the population

MATC = Maximum acceptable toxicant concentration

NBA = No benchmark available.

NOEC = No observed effect concentration

T = Total recoverable

TABLE 3-28
AVIAN TOXICITY REFERENCE VALUES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	NOAEL (mg/kg-day)	LOAEL (mg/kg-day)	Test Species	Source
Aluminum	110	550	Ringed dove	Sample, et al., 1996
Antimony	---	---	---	---
Arsenic	5.5	22	Mallard	Elizabeth Mine; Stanley, et al., 1994
Cadmium	1.9	21.1	Mallard	Elizabeth Mine; White and Finley, 1978
Chromium	37.7	75.4	Chicken	Elizabeth Mine; Meluzzi, et al., 1996
Cobalt	7.61	38.1	multiple	Elizabeth Mine; EPA, 2005g
Copper	33	62	Chicken	Elizabeth Mine; Mehring, et al., 1960 as interpreted by Sample, et al., 1996
Iron	---	---	---	---
Lead	7.4	37	Ringed dove	Elizabeth Mine; Kendall and Scanlon, 1981
Manganese	977	4885	Japanese quail	Elizabeth Mine; Laskey and Edens, 1985
Mercury	0.45	0.91	Japanese quail	Elizabeth Mine; Hill and Schaffer, 1976
Molybdenum	7.1	35.3	Chicken	Elizabeth Mine; Lepore and Miller, 1965
Nickel	80	107	Mallard	Elizabeth Mine; NOAEL - Eastin and O'Shea, 1981 and LOAEL - Cain and Pafford, 1981
Selenium	0.4/1.6	0.8/3.2	Mallard	Elizabeth Mine; Heinz, et al., 1989. Herbivorous/Invertivorous and carnivorous bird. Latter adjusted for sensitivity of carnivorous birds
Silver	14.5	43.6	Turkey poult	Elizabeth Mine; Jensen, et al., 1974
Strontium	---	---	---	---
Thallium	0.35	1.75	Starling	EPA, 1999a
Vanadium	11.38	56.9	Mallard	Elizabeth Mine; White and Dieter, 1978
Zinc	54.4	131	Chicken	Elizabeth Mine; NOAEL - NAS, 1994 and LOAEL - Stahl, et al., 1990

TABLE 3-29
MAMMALIAN TOXICITY REFERENCE VALUES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	NOAEL (mg/kg-day)	LOAEL (mg/kg-day)	Test Species	Source
Aluminum	3.86	19.3	Mouse	Sample, et al., 1996
Antimony	13.3	66.5	multiple	Elizabeth Mine; EPA, 2005a
Arsenic	5.7	11.6	Rat	Elizabeth Mine; Byron, et al., 1967
Cadmium	1.86	9.3	multiple	EPA, 2005e
Chromium	8.8	44.2	Rat	Elizabeth Mine; Anderson, et al., 1997
Cobalt	7.34	36.7	multiple	Elizabeth Mine; EPA, 2005g
Copper	11.7	15.1	Mink	Elizabeth Mine; Aulerich, et al., 1982
Iron	3.15	31.5	Rat	Whittaker, et al., 1994
Lead	34	80	Rat	Elizabeth Mine; NOAEL - Kimmel, et al., 1980 and LOAEL - Azar, et al., 1973
Manganese	88	284	Rat	Elizabeth Mine; Laskey, et al., 1982
Mercury	13.2	56	NOAEL - Mouse and LOAEL - Rat	Elizabeth Mine; NOAEL - Revis, et al., 1989 and LOAEL - Fitzhugh, et al., 1950
Molybdenum	2.6	13	Mouse	Elizabeth Mine; Schroeder and Mitchener, 1971
Nickel	60	80	Rat	Elizabeth Mine; Ambrose, et al., 1976
Selenium	0.35	1.05	Rat	Elizabeth Mine; Rosenfeld and Beath, 1954
Silver	44.4	222	Rat	Elizabeth Mine; Matuk, et al., 1981
Strontium	263	1315	Rat	Sample, et al., 1996
Thallium	0.0148	0.074	Rat	Sample, et al., 1996
Vanadium	5.9	8.3	multiple	Elizabeth Mine; EPA, 2005i
Zinc	160	320	Rat	Elizabeth Mine; Schlicker and Cox, 1968

TABLE 4-1
STATISTICAL COMPARISON OF TRANSITION ZONE AND BACKGROUND CHEMICAL CONCENTRATIONS IN SURFACE SOILS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Arithmetic Mean ± Standard Deviation (mg/kg)		Statistical Analysis Result
	Transition Zone	Background	
Aluminum	11586 ± 9652	7669 ± 4043	NS
Arsenic	2.79 ± 2.65	2.11 ± 0.879	NS
Cadmium	1.38 ± 1.56	0.606 ± 0.465	NS
Chromium	38.0 ± 38.1	20.4 ± 11.0	S
Cobalt	16.3 ± 17.4	6.60 ± 4.35	S
Copper	665 ± 899	15.3 ± 10.1	S
Iron	43203 ± 42898	13852 ± 8528	S
Lead	49.6 ± 134	27.7 ± 22.9	NS
Manganese	354 ± 704	1386 ± 2202	NS
Mercury	0.138 ± 0.232	0.130 ± 0.0805	NS
Molybdenum	5.08 ± 6.29	3.61 ± 2.96	NS
Nickel	21.5 ± 13.6	15.3 ± 7.87	NS
Selenium	10.7 ± 15.6	1.77 ± 0.584	S
Silver	2.60 ± 3.49	0.394 ± 0.337	S
Thallium	3.59 ± 3.14	2.32 ± 1.83	NS
Vanadium	46.8 ± 37.1	28.8 ± 16.2	S
Zinc	118 ± 133	42.8 ± 20.9	S

Notes:

Shading indicates a statistically significant difference between the transition zone and background where the mean transition zone concentration is greater than background.

NS - Not statistically significantly different.

S - Statistically significantly different.

TABLE 4-2
STATISTICAL COMPARISON OF SITE AND BACKGROUND CHEMICAL CONCENTRATIONS IN SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Arithmetic Mean ± Standard Deviation (mg/kg)		Statistical Analysis Result
	Site	Background	
Aluminum	23.2 ± 10.8	25.0 ± 6.11	NS
Chromium	1.10 ± 0.496	1.09 ± 0.191	NS
Copper	5.03 ± 1.99	3.73 ± 0.971	S
Iron	116 ± 105	101 ± 39.6	NS
Manganese	9.20 ± 6.53	6.39 ± 4.57	NS
Zinc	30.6 ± 4.32	31.3 ± 3.99	NS

Notes:

Shading indicates a statistically significant difference between the site and background where the mean site concentration is greater than background.

NS - Not statistically significantly different.

S - Statistically significant different.

TABLE 4-3
SUMMARY OF SAMPLE-BY-SAMPLE BENCHMARK COMPARISON - PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Chemical	Frequency of Exceedance	Number of Exceedances		
		>=1 and <10	>=10 and <100	>= 100
Transition Zone				
Antimony	30/66	27	3	---
Arsenic	1/140	1	---	---
Cadmium	0/142	---	---	---
Chromium	182/182	---	---	182
Cobalt	70/182	70	---	---
Copper	144/182	89	54	1
Lead	7/182	6	1	---
Manganese	83/182	82	1	---
Mercury	10/172	10	---	---
Molybdenum	68/138	65	3	---
Nickel	13/182	13	---	---
Selenium	162/165	84	71	7
Silver	0/150	---	---	---
Thallium	86/86	10	33	43
Vanadium	182/182	25	156	1
Zinc	33/182	33	---	---
Background				
Arsenic	0/16	---	---	---
Cadmium	0/8	---	---	---
Chromium	16/16	---	1	15
Cobalt	2/16	2	---	---
Copper	0/16	---	---	---
Lead	0/16	---	---	---
Manganese	11/16	9	2	---
Mercury	0/16	---	---	---
Molybdenum	0/4	---	---	---
Nickel	0/16	---	---	---
Selenium	16/16	16	---	---
Silver	0/4	---	---	---
Thallium	7/7	---	1	6
Vanadium	16/16	5	11	---
Zinc	0/16	---	---	---

TABLE 4-4
SUMMARY OF SAMPLE-BY-SAMPLE BENCHMARK COMPARISON - SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Chemical	Frequency of Exceedance	Number of Exceedances		
		>=1 and <10	>=10 and <100	>= 100
Transition Zone				
Antimony	0/66	---	---	---
Arsenic	140/140	86	54	---
Cadmium	0/142	---	---	---
Chromium	182/182	---	38	144
Cobalt	0/182	---	---	---
Copper	142/182	89	53	---
Iron	182/182	---	58	124
Lead	1/182	1	---	---
Manganese	34/182	33	1	---
Mercury	1/172	1	---	---
Molybdenum	0/138	---	---	---
Nickel	0/182	---	---	---
Selenium	86/165	76	10	---
Silver	0/150	---	---	---
Vanadium	157/182	156	1	---
Zinc	59/182	58	1	---
Background				
Arsenic	16/16	12	4	---
Cadmium	0/8	---	---	---
Chromium	16/16	1	5	10
Cobalt	0/16	---	---	---
Copper	0/16	---	---	---
Iron	16/16	2	10	4
Lead	0/16	---	---	---
Manganese	10/16	8	2	---
Mercury	0/16	---	---	---
Molybdenum	0/4	---	---	---
Nickel	0/16	---	---	---
Selenium	0/16	---	---	---
Silver	0/4	---	---	---
Vanadium	11/16	11	---	---
Zinc	0/16	---	---	---

TABLE 4-5
REASONABLE MAXIMUM EXPOSURE WILDLIFE HAZARD QUOTIENTS - TRANSITION ZONE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	10.7	2.36	0.582	4.65	5.99	0.0948	2.14	0.473	0.116	0.930	1.20	0.0190
Antimony	NTV	NTV	ND	0.00192	<0.001	ND	NTV	NTV	ND	<0.001	<0.001	ND
Arsenic	0.0478	0.00232	0.0476	0.0110	<0.001	0.0211	0.0120	<0.001	0.0119	0.00539	<0.001	0.0103
Cadmium	0.0682	0.385	0.291	0.153	0.171	0.0383	0.00614	0.0346	0.0262	0.0305	0.0342	0.00766
Chromium	0.0653	0.0512	0.0267	0.0139	0.0161	0.00139	0.0327	0.0256	0.0133	0.00277	0.00321	<0.001
Cobalt	0.0897	0.00574	ND	0.0207	0.00342	ND	0.0179	0.00115	ND	0.00414	<0.001	ND
Copper	0.967	0.539	0.187	1.59	2.08	0.0531	0.515	0.287	0.100	1.23	1.61	0.0411
Iron	NTV	NTV	NTV	21.1	20.7	0.698	NTV	NTV	NTV	2.11	2.07	0.0698
Lead	0.543	0.0285	0.0223	0.0584	0.00128	0.00518	0.109	0.00570	0.00446	0.0248	<0.001	0.00220
Manganese	0.0668	0.0260	0.0119	0.228	0.224	0.0180	0.0134	0.00519	0.00238	0.0707	0.0694	0.00559
Mercury	0.0968	<0.001	ND	<0.001	<0.001	ND	0.0479	<0.001	ND	<0.001	<0.001	ND
Molybdenum	0.111	0.00564	ND	0.0851	0.00885	ND	0.0223	0.00113	ND	0.0170	0.00177	ND
Nickel	0.0216	<0.001	ND	0.0115	<0.001	ND	0.0162	<0.001	ND	0.00859	<0.001	ND
Selenium	5.25	0.0796	ND	1.42	0.209	ND	2.62	0.0398	ND	0.474	0.0697	ND
Silver	0.0273	0.0476	0.0166	0.00156	0.0123	ND	0.00908	0.0158	0.00550	<0.001	0.00246	ND
Strontium	NTV	NTV	ND	0.0153	<0.001	ND	NTV	NTV	ND	0.00306	<0.001	ND
Thallium	0.625	0.0541	ND	1.80	0.736	ND	0.125	0.0108	ND	0.359	0.147	ND
Vanadium	0.506	0.0416	ND	0.137	0.0461	ND	0.101	0.00832	ND	0.0975	0.0328	ND
Zinc	0.353	1.18	0.560	0.346	0.319	0.0220	0.147	0.489	0.233	0.173	0.160	0.0110

Note: Shading indicates HQ greater than 1.0.

ND = Not detected.

NTV = No TRV available.

TABLE 4-6
CENTRAL TENDENCY EXPOSURE WILDLIFE HAZARD QUOTIENTS - TRANSITION ZONE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	9.76	1.59	0.322	4.25	3.85	0.0822	1.95	0.318	0.0645	0.849	0.770	0.0164
Antimony	NTV	NTV	ND	0.00151	<0.001	ND	NTV	NTV	ND	<0.001	<0.001	ND
Arsenic	0.0418	0.00203	0.0458	0.00959	<0.001	0.0203	0.0104	<0.001	0.0115	0.00471	<0.001	0.00996
Cadmium	0.0620	0.235	0.151	0.142	0.104	0.0167	0.00558	0.0212	0.0136	0.0284	0.0209	0.00334
Chromium	0.0489	0.0269	0.0167	0.0104	0.00871	0.00119	0.0245	0.0135	0.00835	0.00208	0.00173	<0.001
Cobalt	0.0661	0.00423	ND	0.0152	0.00252	ND	0.0132	<0.001	ND	0.00305	<0.001	ND
Copper	0.834	0.368	0.127	1.47	1.38	0.0473	0.444	0.196	0.0678	1.14	1.07	0.0366
Iron	NTV	NTV	NTV	15.8	12.6	0.407	NTV	NTV	NTV	1.58	1.26	0.0407
Lead	0.322	0.0150	0.0142	0.0401	<0.001	0.00330	0.0644	0.00299	0.00284	0.0171	<0.001	0.00140
Manganese	0.0645	0.0203	0.00864	0.220	0.174	0.0117	0.0129	0.00407	0.00173	0.0682	0.0539	0.00362
Mercury	0.0832	<0.001	ND	<0.001	<0.001	ND	0.0411	<0.001	ND	<0.001	<0.001	ND
Molybdenum	0.0750	0.00381	ND	0.0575	0.00599	ND	0.0151	<0.001	ND	0.0115	0.00120	ND
Nickel	0.0203	<0.001	ND	0.0108	<0.001	ND	0.0152	<0.001	ND	0.00811	<0.001	ND
Selenium	3.52	0.0533	ND	0.956	0.140	ND	1.76	0.0267	ND	0.319	0.0467	ND
Silver	0.0186	0.0469	0.0166	0.00106	0.0122	ND	0.00618	0.0156	0.00550	<0.001	0.00244	ND
Strontium	NTV	NTV	ND	0.0100	<0.001	ND	NTV	NTV	ND	0.00200	<0.001	ND
Thallium	0.384	0.0333	ND	1.10	0.452	ND	0.0769	0.00665	ND	0.221	0.0904	ND
Vanadium	0.400	0.0329	ND	0.108	0.0365	ND	0.0799	0.00657	ND	0.0771	0.0259	ND
Zinc	0.265	0.794	0.418	0.287	0.215	0.0211	0.110	0.330	0.173	0.144	0.108	0.0105

Note: Shading indicates HQ greater than 1.0.

ND = Not detected.
NTV = No TRV available.

TABLE 4-7
REASONABLE MAXIMUM EXPOSURE WILDLIFE HAZARD QUOTIENTS - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	8.01	0.691	0.0648	3.48	1.41	0.105	1.60	0.138	0.0130	0.697	0.282	0.0211
Arsenic	0.0421	0.00204	ND	0.00967	<0.001	ND	0.0105	<0.001	ND	0.00475	<0.001	ND
Cadmium	0.0335	<0.001	ND	0.0886	<0.001	ND	0.00302	<0.001	ND	0.0177	<0.001	ND
Chromium	0.0412	<0.001	0.00914	0.00877	<0.001	0.00154	0.0206	<0.001	0.00457	0.00175	<0.001	<0.001
Cobalt	0.0348	0.00223	ND	0.00803	0.00133	ND	0.00696	<0.001	ND	0.00161	<0.001	ND
Copper	0.0277	0.161	0.0744	0.310	0.683	0.0404	0.0148	0.0858	0.0396	0.240	0.529	0.0313
Iron	NTV	NTV	NTV	6.50	3.08	0.433	NTV	NTV	NTV	0.650	0.308	0.0433
Lead	0.271	0.0121	ND	0.0354	<0.001	ND	0.0543	0.00241	ND	0.0151	<0.001	ND
Manganese	0.528	0.0274	0.00355	1.80	0.184	0.0113	0.106	0.00548	<0.001	0.559	0.0571	0.00351
Mercury	0.0943	<0.001	ND	<0.001	<0.001	ND	0.0466	<0.001	ND	<0.001	<0.001	ND
Molybdenum	0.0124	<0.001	ND	0.00954	<0.001	ND	0.00250	<0.001	ND	0.00191	<0.001	ND
Nickel	0.0184	<0.001	ND	0.00982	<0.001	ND	0.0137	<0.001	ND	0.00736	<0.001	ND
Selenium	0.678	0.0102	ND	0.186	0.0267	ND	0.339	0.00509	ND	0.0619	0.00892	ND
Silver	0.00285	<0.001	ND	<0.001	<0.001	ND	<0.001	<0.001	ND	<0.001	<0.001	ND
Thallium	0.494	0.0427	ND	1.42	0.581	ND	0.0988	0.00855	ND	0.284	0.116	ND
Vanadium	0.309	0.0254	ND	0.0839	0.0282	ND	0.0618	0.00508	ND	0.0596	0.0200	ND
Zinc	0.129	0.626	0.373	0.179	0.170	0.0231	0.0535	0.260	0.155	0.0894	0.0852	0.0115

Note: Shading indicates HQ greater than 1.0.

ND = Not detected.

NTV = No TRV available.

TABLE 4-8
CENTRAL TENDENCY EXPOSURE WILDLIFE HAZARD QUOTIENTS - BACKGROUND
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Aluminum	6.46	0.558	0.0589	2.81	1.14	0.0958	1.29	0.112	0.0118	0.562	0.228	0.0192
Arsenic	0.0354	0.00172	ND	0.00813	<0.001	ND	0.00886	<0.001	ND	0.00400	<0.001	ND
Cadmium	0.0291	<0.001	ND	0.0792	<0.001	ND	0.00262	<0.001	ND	0.0158	<0.001	ND
Chromium	0.0263	<0.001	0.00898	0.00560	<0.001	0.00152	0.0131	<0.001	0.00449	0.00111	<0.001	<0.001
Cobalt	0.0268	0.00171	ND	0.00618	0.00102	ND	0.00535	<0.001	ND	0.00124	<0.001	ND
Copper	0.0214	0.155	0.0703	0.276	0.660	0.0351	0.0114	0.0827	0.0374	0.214	0.511	0.0272
Iron	NTV	NTV	NTV	5.08	2.45	0.353	NTV	NTV	NTV	0.508	0.245	0.0353
Lead	0.204	0.00835	ND	0.0287	<0.001	ND	0.0408	0.00167	ND	0.0122	<0.001	ND
Manganese	0.253	0.0148	0.00295	0.862	0.103	0.00861	0.0505	0.00296	<0.001	0.267	0.0320	0.00267
Mercury	0.0806	<0.001	ND	<0.001	<0.001	ND	0.0398	<0.001	ND	<0.001	<0.001	ND
Molybdenum	0.00959	<0.001	ND	0.00736	<0.001	ND	0.00193	<0.001	ND	0.00147	<0.001	ND
Nickel	0.0155	<0.001	ND	0.00836	<0.001	ND	0.0116	<0.001	ND	0.00627	<0.001	ND
Selenium	0.590	0.00885	ND	0.162	0.0233	ND	0.295	0.00443	ND	0.0539	0.00775	ND
Silver	0.00156	<0.001	ND	<0.001	<0.001	ND	<0.001	<0.001	ND	<0.001	<0.001	ND
Thallium	0.374	0.0323	ND	1.07	0.440	ND	0.0747	0.00647	ND	0.215	0.0880	ND
Vanadium	0.246	0.0203	ND	0.0668	0.0225	ND	0.0492	0.00405	ND	0.0475	0.0160	ND
Zinc	0.108	0.619	0.361	0.159	0.169	0.0215	0.0450	0.257	0.150	0.0795	0.0843	0.0107

Note: Shading indicates HQ greater than 1.0.

ND = Not detected.

NTV = No TRV available.

TABLE 4-9
REASONABLE MAXIMUM EXPOSURE WILDLIFE HAZARD QUOTIENTS - TRANSITION ZONE INCREMENTAL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Transition Zone

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Copper	0.967	0.539	0.187	1.59	2.08	0.0531	0.515	0.287	0.100	1.23	1.61	0.0411
Iron	NTV	NTV	NTV	21.1	20.7	0.698	NTV	NTV	NTV	2.11	2.07	0.0698
Selenium	5.25	0.0796	ND	1.42	0.209	ND	2.62	0.0398	ND	0.474	0.0697	ND
Zinc	0.353	1.18	0.560	0.346	0.319	0.0220	0.147	0.489	0.233	0.173	0.160	0.0110

Background

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Copper	0.0277	0.161	0.0744	0.310	0.683	0.0404	0.0148	0.0858	0.0396	0.240	0.529	0.0313
Iron	NTV	NTV	NTV	6.50	3.08	0.433	NTV	NTV	NTV	0.650	0.308	0.0433
Selenium	0.678	0.0102	ND	0.186	0.0267	ND	0.339	0.00509	ND	0.0619	0.00892	ND
Zinc	0.129	0.626	0.373	0.179	0.170	0.0231	0.0535	0.260	0.155	0.0894	0.0852	0.0115

Incremental

COPEC	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Copper	NC	NC	NC	1.28	1.40	NC	NC	NC	NC	0.991	1.08	NC
Iron	NTV	NTV	NTV	14.6	17.6	NC	NTV	NTV	NTV	1.46	1.76	NC
Selenium	4.57	NC	ND	1.24	NC	ND	2.29	NC	ND	NC	NC	ND
Zinc	NC	0.550	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Note: Shading indicates HQ greater than 1.0.

NC = Not calculated if transition zone HQ was less than 1.

ND = Not detected.

NTV = No TRV available.

TABLE 4-10
CENTRAL TENDENCY EXPOSURE WILDLIFE HAZARD QUOTIENTS - TRANSITION ZONE INCREMENTAL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Transition Zone												
	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
COPEC	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Copper	0.834	0.368	0.127	1.47	1.38	0.0473	0.444	0.196	0.0678	1.14	1.07	0.0366
Iron	NTV	NTV	NTV	15.8	12.6	0.407	NTV	NTV	NTV	1.58	1.26	0.0407
Selenium	3.52	0.0533	ND	0.956	0.140	ND	1.76	0.0267	ND	0.319	0.0467	ND

Background												
	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
COPEC	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Iron	NTV	NTV	NTV	5.08	2.45	0.353	NTV	NTV	NTV	0.508	0.245	0.0353
Selenium	0.590	0.00885	ND	0.162	0.0233	ND	0.295	0.00443	ND	0.0539	0.00775	ND

Incremental												
	Hazard Quotients - NOAEL						Hazard Quotients - LOAEL					
COPEC	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink	Song Sparrow	American Robin	American Kestrel	Deer Mouse	Short-Tailed Shrew	Mink
Copper	NC	NC	NC	1.20	0.725	NC	NC	NC	NC	0.926	0.562	NC
Iron	NTV	NTV	NTV	10.8	10.2	NC	NTV	NTV	NTV	1.08	1.02	NC
Selenium	2.93	NC	ND	NC	NC	ND	1.47	NC	ND	NC	NC	ND

Note: Shading indicates HQ greater than 1.0.

NC = Not calculated if transition zone HQ was less than 1.

ND = Not detected.

NTV = No TRV available.

TABLE 4-11
MODELING-BASED INCREMENTAL RISK SUMMARY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Receptor	Scenario	HQ(s)	Driver Pathway(s)
Copper	Deer Mouse	RME and CTE - NOAEL only	1.2 to 1.3	Plant
	Short-Tailed Shrew	RME NOAEL and LOAEL	1.1 to 1.4	Soil Invertebrate
Iron	Deer Mouse	All	1.1 to 15	Soil
	Short-Tailed Shrew	All but CTE LOAEL	1.8 to 18	Soil and Soil Invertebrate
Selenium	Song Sparrow	All	1.5 to 4.6	Soil
	Deer Mouse	RME NOAEL only	1.2	Soil and Plant

Note: Includes only information pertaining to incremental HQs of 1.0 or greater.

TABLE 4-12
ACUTE HAZARD QUOTIENTS FOR SURFACE WATER COPECS - VERNAL POOLS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Units	Surface Water Concentration					Acute Surface Water Benchmark	Source	Acute HQs				
		VP-1	VP-2	VP-3	VP-3 DUP	VP-4			VP-1	VP-2	VP-3	VP-3 DUP	VP-4
Barium	µg/L	24.3	12.6	13.8	13.0	16.1	110	Suter and Tsao, 1996	0.221	0.115	0.125	0.118	0.146
Cadmium	µg/L	0.360	ND	ND	ND	ND	0.78 [a]	EPA, 2009	0.462	---	---	---	---
Copper	µg/L	145	4.70	NE	NE	ND		EPA, 2009	26.9	0.940	---	---	---
VP-1	µg/L	---	---	---	---	---	5.4 [a]	EPA, 2009	---	---	---	---	---
VP-2	µg/L	---	---	---	---	---	5 [a]	EPA, 2009	---	---	---	---	---
Manganese	µg/L	184	NE	NE	NE	NE	2300	Suter and Tsao, 1996	0.0800	---	---	---	---
Zinc	µg/L	77.6	NE	68.9	NE	NE		Suter and Tsao, 1996	1.49	---	1.64	---	---
VP-1	µg/L	---	---	---	---	---	52 [a]	EPA, 2009	---	---	---	---	---
VP-3	µg/L	---	---	---	---	---	42 [a]	EPA, 2009	---	---	---	---	---

Shading indicates concentration exceeds the aquatic life benchmark.

ND = Not detected.

NE = Not evaluated.

[a]Hardness-dependent. See Tables 2-11 and 3-25.

TABLE 4-13
CHRONIC HAZARD QUOTIENTS FOR SURFACE WATER COPECS - VERNAL POOLS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Units	Surface Water Concentration					Chronic Surface Water Benchmark	Source	Chronic HQs				
		VP-1	VP-2	VP-3	VP-3 DUP	VP-4			VP-1	VP-2	VP-3	VP-3 DUP	VP-4
Barium	µg/L	24.3	12.6	13.8	13.0	16.1	4	EPA, 1999a	6.08	3.15	3.45	3.25	4.03
Cadmium	µg/L	0.360	ND	ND	ND	ND	0.12 [a]	EPA, 2009	3.00	---	---	---	---
Copper	µg/L	145	4.70	NE	NE	ND			37.2	1.27	---	---	---
VP-1	µg/L	---	---	---	---	---	3.9 [a]	EPA, 2009	---	---	---	---	---
VP-2	µg/L	---	---	---	---	---	3.7 [a]		---	---	---	---	---
Manganese	µg/L	184	NE	NE	NE	NE	120	Suter and Tsao, 1996	1.53	---	---	---	---
Zinc	µg/L	77.6	NE	68.9	NE	NE		EPA, 2009	1.49	---	1.60	---	---
VP-1	µg/L	---	---	---	---	---	52 [a]		---	---	---	---	---
VP-3	µg/L	---	---	---	---	---	43 [a]		---	---	---	---	---

Shading indicates concentration exceeds the aquatic life benchmark.

ND = Not detected.

NE = Not evaluated.

[a]Hardness-dependent. See Tables 2-11 and 3-25.

TABLE 4-14
AMPHIBIAN HAZARD QUOTIENTS FOR SURFACE WATER COPECS - VERNAL POOLS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Units	Surface Water Concentration					Amphibian	Source	HQs				
		VP-1	VP-2	VP-3	VP-3 DUP	VP-4	TRV		VP-1	VP-2	VP-3	VP-3 DUP	VP-4
Barium	µg/L	24.3	12.6	13.8	13.0	16.1	NBA	---	---	---	---	---	---
Cadmium	µg/L	0.360	ND	ND	ND	ND	0.106	Nebeker et al., 1995	3.40	---	---	---	---
Copper	µg/L	145	4.7	NE	NE	ND	0.02	Porter and Hakanson, 1976	7250	235	---	---	---
Manganese	µg/L	184	NE	NE	NE	NE	1.42	Birge et al., 1979	130	---	---	---	---
Zinc	µg/L	77.6	NE	68.9	NE	NE	0.1	Porter and Hakanson, 1976	776	---	689	---	---

Shading indicates concentration exceeds the amphibian benchmark.

NBA = No benchmark available.

ND = Not detected.

NE = Not evaluated.

TABLE 4-15
AMPHIBIAN HAZARD QUOTIENTS FOR SURFACE WATER COPECS IN VERNAL POOL 1 BASED ON *P. PROMELAS* TOXICITY DATA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Form	TRV (µg/L)	Surface Water Concentration* (µg/L)			HQ		
			VP-1	VP-2	VP-3	VP-1	VP-2	VP-3
Barium	---	---	24.3	NE	NE	NBA	NBA	NBA
Cadmium	Cadmium chloride	67 D	0.360	NE	NE	0.00537	NE	NE
	Cadmium oxide	177 D	0.360	NE	NE	0.00203	NE	NE
	Cadmium sulfide	108 D	0.360	NE	NE	0.00333	NE	NE
	Nitric acid, Cadmium salt	10 T	0.390	NE	NE	0.0390	NE	NE
	Sulfuric acid, Cadmium salt (1:1)	1.8 T	0.390	NE	NE	0.217	NE	NE
Copper	Acetic acid, Copper (2+) salt	140 T	171	5.70	NE	1.22	0.0407	NE
	Copper chloride	17.4 D	145	4.70	NE	8.33	0.270	NE
	Nitric acid, Copper (2+) salt	6.2 T	171	5.70	NE	27.6	0.919	NE
	Sulfuric acid copper (2+) salt (1:1)	2.9 T	171	5.70	NE	59.0	1.97	NE
Manganese	Sulfuric acid, Manganese (2+) salt (1:1)	1770 T	188	NE	NE	0.106	NE	NE
Zinc	Acetic acid, Zinc salt	150 T	70.2	NE	10.3	0.468	NE	0.0687
	Sulfuric acid, Zinc salt (1:1)	183 T	70.2	NE	10.3	0.384	NE	0.0563
	Zinc chloride	300 T	70.2	NE	10.3	0.234	NE	0.0343
	Zinc oxide	2246000 T	70.2	NE	10.3	<0.001	NE	<0.001
	Zinc sulfide	1826000 T	70.2	NE	10.3	<0.001	NE	<0.001

*Note that concentration presented is dissolved or total, depending upon the TRV value.

Shading indicates concentration exceeds the amphibian benchmark.

D = Dissolved

NBA = No benchmark available.

NE = Not evaluated.

T = Total recoverable

TABLE 4-16

SUMMARY OF MAJOR UNCERTAINTIES PER ASSESSMENT ENDPOINT AS IDENTIFIED BY RECEPTOR
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Receptor	Qualitative Description of Uncertainty	Potential Effect on Risk
Terrestrial Plants	Generic phytotoxicity values do not account for differences in bioavailability due to varying pH or other soil chemistry parameters. However, most studies administer metals to soil dissolved in solution, likely enhancing bioavailability.	Small overestimation of risk
	Toxicity values are generally based on crop plants. Differences in sensitivities between these and indigenous plants is unknown.	Unknown effect on risk
	Different authors apply different uncertainty factors to plant studies, making the range of benchmarks wide. Generally, the more conservative of the available benchmarks were used.	Moderate overestimation of risk
	Overall potential effect on ecological risk = Moderate overestimation	
Soil Invertebrates	Toxicity values are generally based on earthworms and soil microbes. Differences between the species used in the studies and those found on site may result in differing potentials for risk.	Unknown effect on risk
	Toxicity-based literature-derived soil benchmarks are generic but conservative values that do not consider site-specific factors (pH, TOC, etc.) that may affect bioavailability of COPECs in site soils.	Moderate overestimation of risk
	Overall potential effect on ecological risk = Moderate overestimation	
Modeled Receptors – Cross Cutting Uncertainties	Some of the exposure parameters used in food chain modeling (i.e., body weight, ingestion rates) represented average and species-specific values, but were not site-specific.	Minimal effect on risk
	The TRVs were conservative (usually dissolved salts) and not species-specific.	Large overestimate of risk
	HQs were calculated only for individual COPECs, without considering the potential for cumulative risk from multiple COPECs, synergism, or antagonism.	Unknown effect on risk
	Ingestion was the only route evaluated.	Small underestimation of risk
	Overall potential effect on ecological risk = Slight overestimation	
• Herbivorous Birds	Plant concentrations were estimated using approaches that estimate concentration in the vegetative parts of the plant for all COPECs with the exception of Al, Fe, Mo, Sr, and Tl. Reproductive-based estimators tend to be lower.	Up to large overestimation of risk
	Overall potential effect on ecological risk = Up to large overestimation	
• Invertivorous Birds	Soil invertebrates were collected from areas that included the barren areas where contamination may be higher than in the transition zones.	Slight overestimation of risk
	Overall potential effect on ecological risk = Slight overestimation	
• Carnivorous Birds	It was assumed that the kestrel could obtain 100% of its diet from the Site.	Moderate overestimation of risk
	Small mammals were collected from areas that included the barren areas where contamination may be higher than in the transition zones.	Slight overestimation of risk
	Overall potential effect on ecological risk = Moderate overestimation	

TABLE 4-16, CONTINUED

SUMMARY OF MAJOR UNCERTAINTIES PER ASSESSMENT ENDPOINT AS IDENTIFIED BY RECEPTOR
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Receptor	Qualitative Description of Uncertainty	Potential Effect on Risk
• Herbivorous Mammals	Plant concentrations were estimated using approaches that estimate concentration in the vegetative parts of the plant for all COPECs with the exception of Al, Fe, Mo, Sr, and Tl. Reproductive-based estimators tend to be lower.	Up to large overestimation of risk
	Overall potential effect on ecological risk = Up to large overestimation	
• Invertivorous Mammals	Soil invertebrates were collected from areas that included the barren areas where contamination may be higher than in the transition zones.	Slight overestimation of risk
	Overall potential effect on ecological risk = Slight overestimation	
• Carnivorous Mammals	It was assumed that the mink could obtain 100% of its diet from terrestrial-based prey at the Site.	Large overestimation of risk
	Small mammals were collected from areas that included the barren areas where contamination may be higher than in the transition zones.	Slight overestimation of risk
	Overall potential effect on ecological risk = Large overestimation	
Vernal Pool Aquatic Community	Only one sample per vernal pool was available to assess risk. Water levels and chemistry vary by season and one sample unlikely represents the full range of vernal pool surface water concentrations.	Unknown effect on risk
	Toxicity-based surface water benchmarks from the literature represented generic but conservative values protective of a small fraction of the most sensitive species.	Moderate overestimation of risk
	HQs were calculated only for individual COPECs, without considering the potential for cumulative risk from multiple COPECs, synergism, or antagonism.	Unknown effect on risk
	The surface water benchmarks do not account for low pH surface water or pore water that may affect benthic invertebrates at certain items of the year independent from the COPEC levels in the substrate.	Moderate underestimation of risk
	Overall potential effect on ecological risk = Slight underestimation	
Vernal Pool Amphibian Community	Only one sample per vernal pool was available to assess risk. Water levels and chemistry vary by season and one sample unlikely represents the full range of vernal pool surface water concentrations.	Unknown effect on risk
	HQs were calculated only for individual COPECs, without considering the potential for cumulative risk from multiple COPECs, synergism, or antagonism.	Unknown effect on risk
	Amphibian toxicity values were based on the most conservative value from a small dataset.	Unknown effect on risk
	Fathead minnow toxicity was correlated to wood frog larvae toxicity observed in the onsite pond complex (EPA, c10a). Applicability to vernal pools and other species is unknown.	Unknown effect on risk
	Overall potential effect on ecological risk = Unknown	

TABLE 4-17
BARREN AND TRANSITION ZONE SUMMARY STATISTICS COMPARISON
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC	Transition Zone			Barren		
	Range of Detected Concentrations (mg/kg)	Average Concentration (mg/kg)	Standard Deviation (mg/kg)	Range of Detected Concentrations (mg/kg)	Average Concentration (mg/kg)	Standard Deviation (mg/kg)
Aluminum	940 - 100000	11586	9652	860 - 20000	7527	4297
Antimony	0.0480 - 8.10	7.22	7.87	0.0520 - 4.60	7.40	7.66
Arsenic	0.480 - 22.0	2.79	2.65	0.360 - 23.0	2.91	3.03
Cadmium	0.0170 - 7.20	1.38	1.56	0.0830 - 8.50	1.27	1.46
Chromium	2.50 - 440	38.0	38.1	3.80 - 78.0	30.5	15.5
Cobalt	1.80 - 120	16.3	17.4	2.20 - 200	21.4	32.3
Copper	16.0 - 7850	665	899	7.50 - 23000	1471	2452
Iron	2400 - 300000	43203	42898	2900 - 210000	71842	54474
Lead	0.720 - 1700	49.6	134	1.80 - 680	42.8	92.4
Manganese	29.0 - 8380	354	704	17.0 - 1200	199	192
Mercury	0.00700 - 2.80	0.138	0.232	0.00600 - 0.840	0.105	0.132
Molybdenum	0.200 - 27.0	5.08	6.29	0.330 - 69.0	7.56	10.2
Nickel	3.60 - 110	21.5	13.6	1.10 - 46.0	15.6	9.29
Selenium	0.420 - 83.0	10.7	15.6	0.580 - 170	23.7	25.8
Silver	0.110 - 22.0	2.60	3.49	0.0790 - 23.0	3.80	4.56
Strontium	1.20 - 107	17.6	24.2	2.20 - 6.50	4.12	1.75
Thallium	0.0200 - 16.0	3.59	3.14	0.100 - 14.0	4.59	3.02
Vanadium	5.20 - 400	46.8	37.1	7.90 - 180	48.3	28.1
Zinc	24.0 - 1500	118	133	10.0 - 860	137	125

mg/kg = Milligrams per kilogram.

TABLE 4-18

SCORING SHEET FOR EVIDENCE OF HARM AND MAGNITUDE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Measurement Endpoint	Weighting Score	Evidence of Harm	Magnitude
Phytotoxicity	Low	Unlikely – Ag	---
		Undetermined – Cr, Co, Se, V	---
		Possible – Sb and Zn Cu	Low High
Soil invertebrates	Low	Unlikely – Sb, Co, and Ag	---
		Undetermined – Cr, Fe, and V	---
		Possible – Zn Cu and Se	Low High
Song Sparrow*	Low-Moderate	Unlikely – All but Se	---
		Possible – Se	Low
American Robin*	Moderate	Unlikely – All COPECs	---
American Kestrel*	Moderate	Unlikely – All COPECs	---
Deer Mouse*	Low-Moderate	Unlikely – All but Cu and Fe	---
		Undetermined – Cu	---
		Possible – Fe	High
Short-tailed Shrew*	Moderate	Unlikely – All but Cu and Fe	
		Undetermined –Cu	
		Possible – Fe	Low
Mink*	Moderate	Unlikely – All COPECs	---
Surface water comparison to aquatic life benchmarks	Low	Possible – All VPs: Ba VP-1 – Cd and Mn VP-2 – Cu VP- 1 – Cu and Zn VP-3 – Zn	Low Low High
Surface water comparison to amphibian toxicity values	Low	VP-1: Possible – Cd Cu, Mn, and Zn VP-2 – Cu VP-3 – Zn	Low High
Surface water comparison to *P. promelas* toxicity values	Low-Moderate	VP-1: Unlikely – Cd and Mn VP-3 – ZN VP-2: Possible – Cu	--- Low
		VP-1: Possible – Cu	High

--- = Not applicable.

Adapted from: Menzie et al., 1996.

*Evidence of Harm/Magnitude assignments for soil-based exposures for only COPECs with concentrations significantly different from background and incremental risk calculations.

TABLE 4-19

CONCURRENCE OF ENDPOINTS – SOIL EXPOSURES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC: Antimony

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High					
Possible/Low	PT				
Undetermined					
Unlikely	SI	DM	STS, MI		

DM = Deer mouse
MI = Mink
PT = Phytotoxicity
SI = Soil invertebrate toxicity
STS = Short-tailed shrew

COPEC: Copper

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High	PT, SI				
Possible/Low					
Undetermined		DM	STS		
Unlikely		SS	AR, AK, MI		

AK = American kestrel
AR = American robin
DM = Deer mouse
MI = Mink
PT = Phytotoxicity
SI = Soil invertebrate toxicity
SS = Song sparrow
STS = Short-tailed shrew

TABLE 4-19, CONTINUED

CONCURRENCE OF ENDPOINTS – SOIL EXPOSURES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC: Iron

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High		DM			
Possible/Low			STS		
Undetermined	SI				
Unlikely			MI		

DM = Deer mouse
MI = Mink
SI = Soil invertebrate toxicity
STS = Short-tailed shrew

COPEC: Selenium

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High	SI				
Possible/Low		SS			
Undetermined	PT				
Unlikely		DM	AR, AK, STS, MI		

PT = Phytotoxicity
SI = Soil invertebrate toxicity
SS = Song sparrow
AR = American robin
AK = American kestrel
DM = Deer mouse
STS = Short-tailed shrew
MI = Mink

TABLE 4-19, CONTINUED

CONCURRENCE OF ENDPOINTS – SOIL EXPOSURES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

COPEC: Zinc

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High					
Possible/Low	PT, SI				
Undetermined					
Unlikely		SS, DM	AR, AK, STS, MI		

AK = American kestrel
AR = American robin
DM = Deer mouse
MI = Mink
PT = Phytotoxicity
SI = Soil invertebrate toxicity
SS = Song sparrow
STS = Short-tailed shrew

Vernal Pool 1

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High	AC – Cu & Zn AA – Cu, Mn, & Zn	AP – Cu			
Possible/Low	AC – Ba, Cd, & Mn AA – Cd				
Undetermined					
Unlikely		AP – Cd, Mn, & Zn			

AC = Aquatic community
AA = Amphibian population – amphibian toxicity value
AP = Amphibian population – *P. promelas* value

TABLE 4-19, CONTINUED

CONCURRENCE OF ENDPOINTS – SOIL EXPOSURES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Vernal Pool 2

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High	AA – Cu				
Possible/Low	AC – Ba & Cu	AP – Cu			
Undetermined					
Unlikely					

AC = Aquatic community
AA = Amphibian population – amphibian toxicity value
AP = Amphibian population – *P. promelas* value

Vernal Pool 3

Weighting factor (increasing confidence or weight) →

Harm/Magnitude	Low	Low-Moderate	Moderate	Moderate-High	High
Possible/High	AC – Zn AA – Zn				
Possible/Low	AC – Ba				
Undetermined					
Unlikely		AP – Zn			

AC = Aquatic community
AA = Amphibian population – amphibian toxicity value
AP = Amphibian population – *P. promelas* value

TABLE 4-20

SUMMARY OF THE EVIDENCE FOR ECOLOGICAL RISK IN THE TERRESTRIAL HABITATS (INCLUDING VERNAL POOLS) OF THE ELY MINE SITE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Receptor Group	Measurement Endpoint	WOE	HQ Summary	Major Uncertainties	Comment	*Overall Risk Conclusion*
Terrestrial Plants	Compare soil concentrations to phytotoxicity benchmarks	L	It was concluded that adverse effects are possible due to concentrations of Sb, Cu, and Zn. The magnitude of exceedance was moderate for Sb and Zn, and high for Cu.	Risks are likely moderately overestimated because of the high bioavailability of the inorganics used to develop benchmarks and the use of uncertainty factors in some benchmarks.	If the Sb benchmark without the UF of 10 is used as in the Efroymson et al. (1997b) document, only 3 of 66 detected concentrations would exceed the benchmark. However, these benchmarks were developed as screening values and the weight associated with these benchmarks is low.	***Risks to the vegetative community may be possible due to concentrations of copper, and to a lesser extent, zinc.***
Soil Invertebrates	Compare soil invertebrate to microbe benchmarks	L	It was concluded that adverse effects are possible due to concentrations of Cu, Se, and Zn. The magnitude of exceedance was moderate for Zn and high for Cu and Se.	Risks are likely moderately overestimated because of the conservatism inherent in the benchmarks used to evaluate risk.	A range of benchmarks is available for Se. If the least conservative value is used, only three concentrations would exceed benchmark (max HQ = 1.2). However, these benchmarks were developed as screening values and the weight associated with these benchmarks is low.	***Risks to the soil invertebrate community may be possible due to concentrations of copper, and to a lesser extent, zinc.***
Herbivorous Birds	Compare modeled intakes to TRVs	L-M	It was concluded, with a high level of confidence, that adverse effects are possible due to concentrations of Se.	Risks are up to largely overestimated because plant concentrations may be overestimated by up to an order of magnitude.	Selenium was the only COPEC for which effects were noted as possible. The RME NOAEL HQ was only 4.6.	***Population effects are not expected to occur in herbivorous birds at the Ely Mine Site.***
Invertivorous Birds	Compare modeled intakes to TRVs	M	It was concluded that adverse effects are not occurring.	Risks are likely slightly overestimated because some of the prey were caught in areas the barren areas.	No comment.	***Population effects are not expected to occur in invertivorous birds at the Ely Mine Site.***
Carnivorous Birds	Compare modeled intakes to TRVs	M	It was concluded that adverse effects are not occurring.	Risks are likely moderately overestimated because the area use factor was assumed to be 1.	No comment.	***Population effects are not expected to occur in carnivorous birds at the Ely Mine Site.***
Herbivorous Mammals	Compare modeled intakes to TRVs	L-M	It was concluded that adverse effects are possible due to concentrations of Fe.	Risks are up to largely overestimated because plant concentrations may be overestimated by up to an order of magnitude.	The Fe TRVs may be overly conservative. If the next lowest NOAEL/LOAEL pairing, were used, incremental risk for Fe would be <2.	***Population effects are not expected to occur in herbivorous mammals at the Ely Mine Site.***

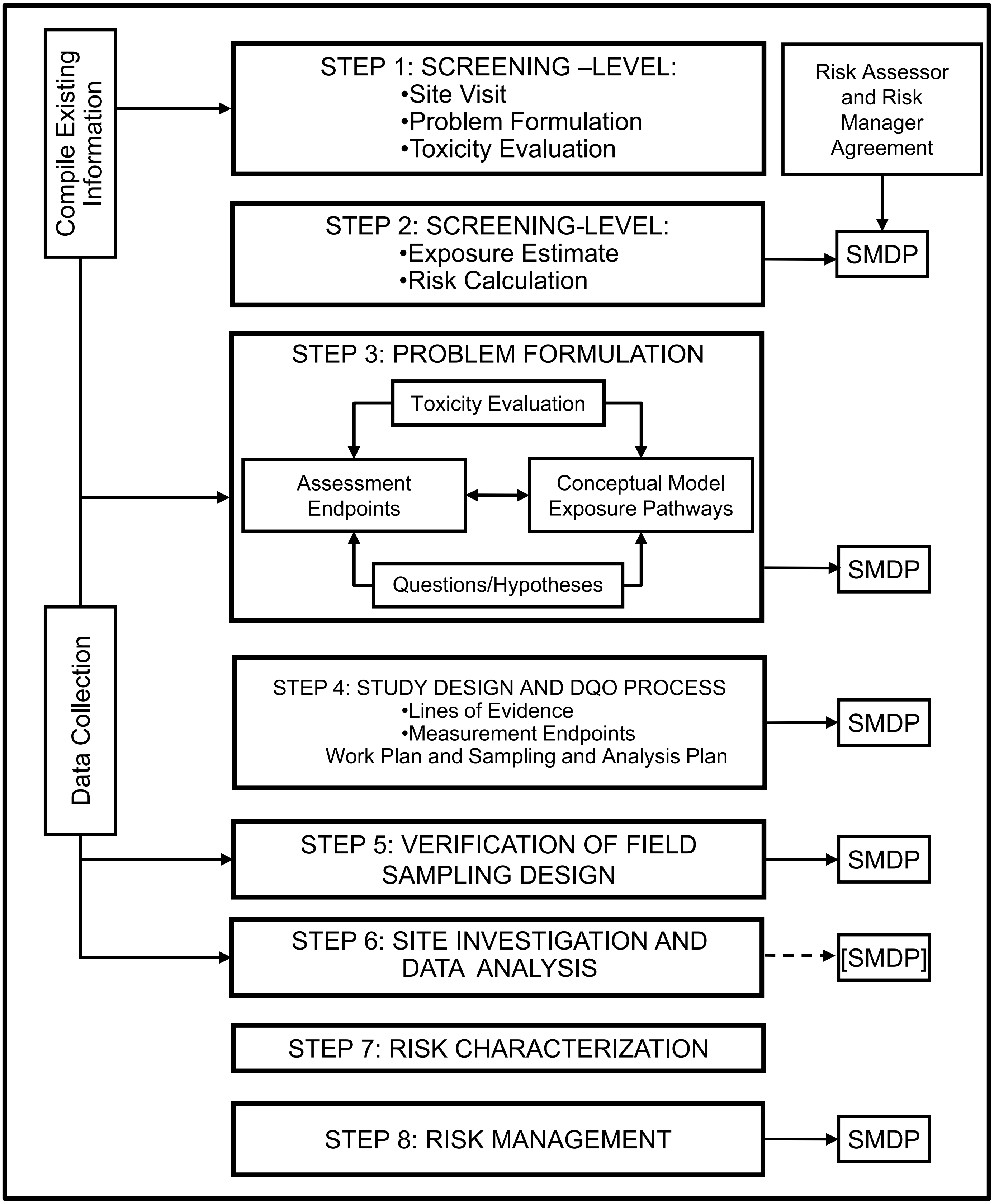
TABLE 4-20, CONTINUED

SUMMARY OF THE EVIDENCE FOR ECOLOGICAL RISK IN THE TERRESTRIAL HABITATS (INCLUDING VERNAL POOLS) OF THE ELY MINE SITE
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Receptor Group	Measurement Endpoint	WOE	HQ Summary	Major Uncertainties	Comment	*Overall Risk Conclusion*
Invertivorous Mammals	Compare modeled intakes to TRVs	M	It was concluded that adverse effects are possible due to concentrations of Fe.	Risks are likely slightly overestimated because some of the prey were caught in areas the barren areas.	The Fe TRVs may be overly conservative. If the next lowest NOAEL/LOAEL pairing, were used, incremental risk for Fe would be <2.	***Population effects are not expected to occur in invertivorous mammals at the Ely Mine Site.***
Carnivorous Mammals	Compare modeled intakes to TRVs	M	It was concluded that adverse effects are not occurring.	Risks are likely up to largely overestimated because it was assumed that the mink could obtain 100% of its diet from terrestrial-based prey within the confines of the Ely Mine Site.	No comment.	***Population effects are not expected to occur in carnivorous mammals at the Ely Mine Site.***
Aquatic Community	Compare surface water concentrations to surface water benchmarks	L	The magnitude of exceedance was low for Zn, moderate for Ba, Cd, and Mn and high for Cu.	Risks are likely slightly underestimated, mainly because the AWQCs do not account for low pH surface water, which increases bioavailability that is likely to occur in the vernal pools.	Given that Ba was one of the only COPEC identified for VPs 2,3, and 4, it is likely that the toxicity value is overly conservative. The Mn toxicity value is a secondary chronic value that results in an HQ of only 1.5. The Zn toxicity values result in a maximum HQ of 1.6.	***Population effects may be possible in VP-1 only due to concentrations of cadmium and copper.***
Amphibian Population	Compare surface water concentrations to amphibian toxicity values	L	The magnitude of exceedance was moderate for Cd and high for Cu, Mn, and Zn.	There are many uncertainties associated with this endpoint; however most are ambiguous as to their effect on risk.	No comment.	***Population effects may be possible in VP-1 only due to concentrations of cadmium, copper, manganese, and zinc.***
	Compare surface water concentrations to *P. promelas* toxicity values	L-M	The magnitude of exceedance was high for Cu.	There are many uncertainties associated with this endpoint; however most are ambiguous as to their effect on risk.	No comment.	

L= Low L-M= Low-Moderate M= Moderate

FIGURES



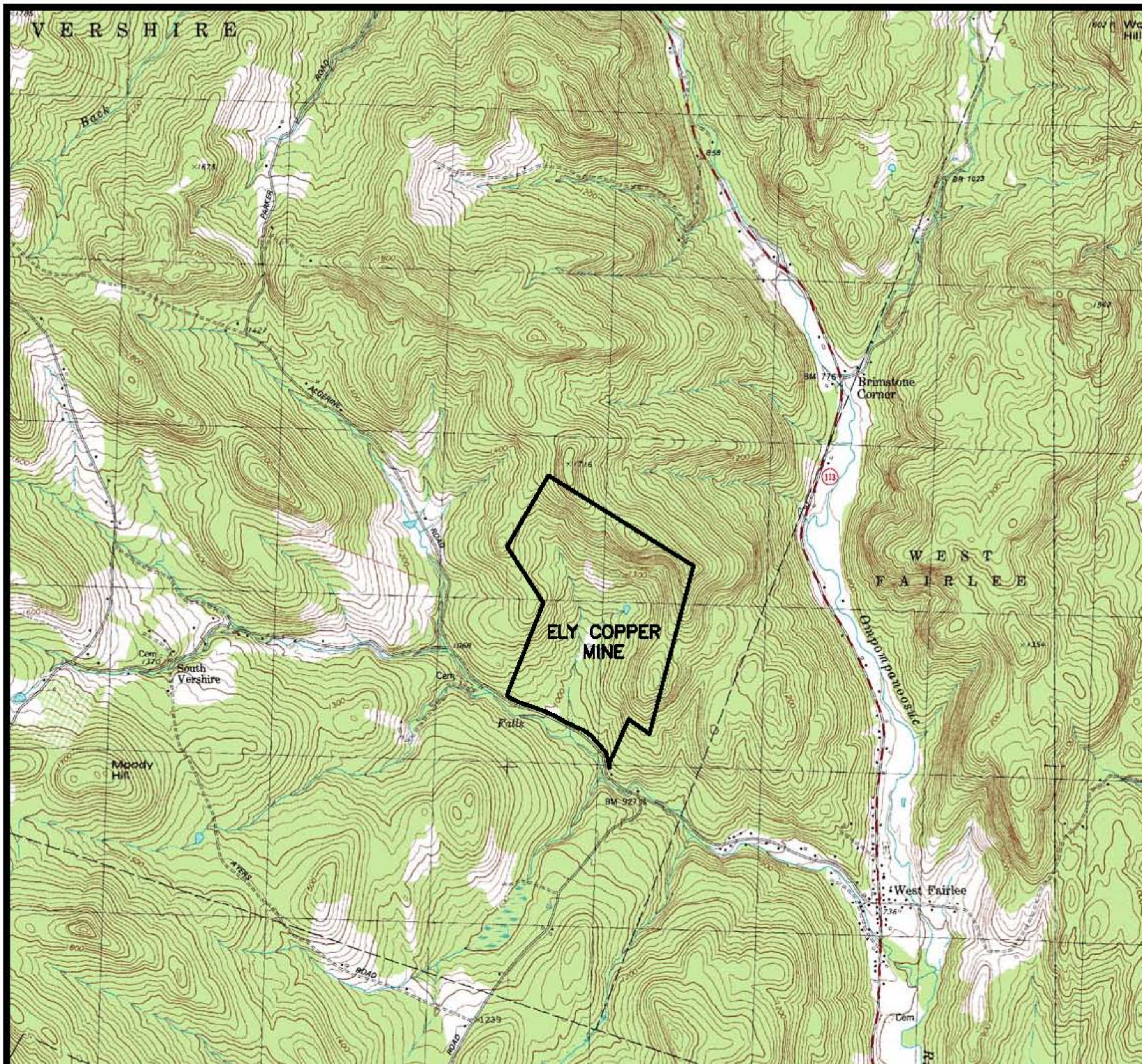
Legend:
SMDP - Scientific/management decision point
[SMDP] - only if change to the sampling and analysis plan is necessary

Source: EPA (U.S. Environmental Protection Agency), Environmental Response Team. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments.* Interim Final. EPA 540-R-97-006.

ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

FIGURE 2-1

GENERIC EIGHT-STEP ECOLOGICAL RISK ASSESSMENT PROCESS FOR SUPERFUND



NORTH

USGS TOPOGRAPHIC MAP

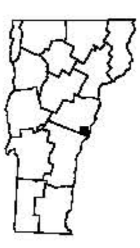
VERSHIRE, VERMONT

1983

APPROXIMATE SCALE
1 INCH = 3,000 FEET

Nobis
Engineering a Sustainable Future

Nobis Engineering, Inc.
18 Chenell Dr.
Concord, NH 03301
Tel (603) 224-4182
Fax (603) 224-2507
www.nobisengineering.com

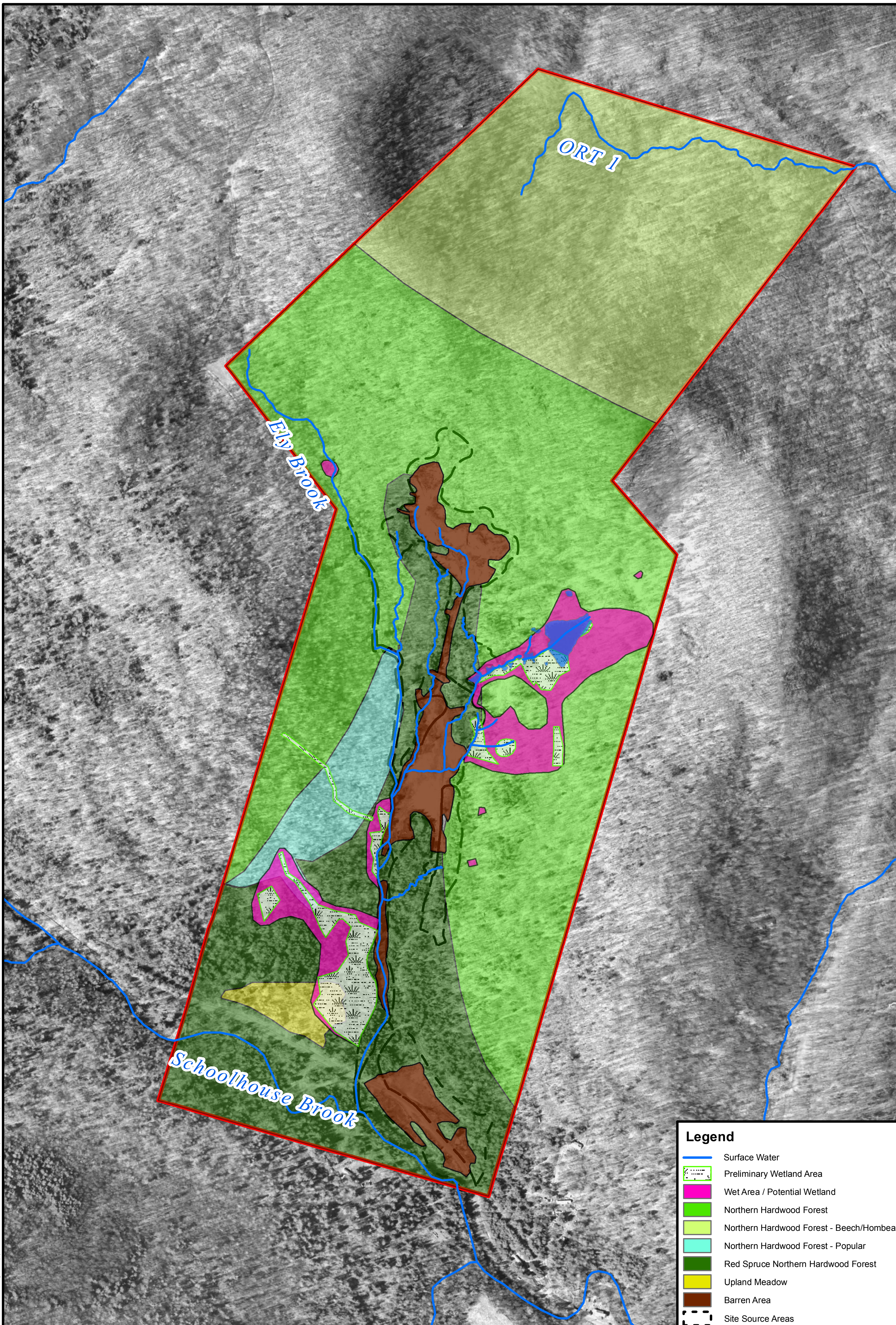


QUADRANGLE LOCATION

FIGURE 2-2

LOCUS PLAN
ELY COPPER MINE
SUPERFUND SITE
VERSHIRE, VERMONT

PROJECT: 80024.00 | OCTOBER 2010



N

Drawn By: JRS | Checked By: AJB

July 13, 2011 | Revision No. 00

APPROXIMATE SCALE
0 250 500 1,000 Feet

NOTE:
Figure was developed from the URS Habitat Assessment report (2005)

FIGURE 2-3

Habitat Map
Ely Copper Mine
Vershire, Vermont

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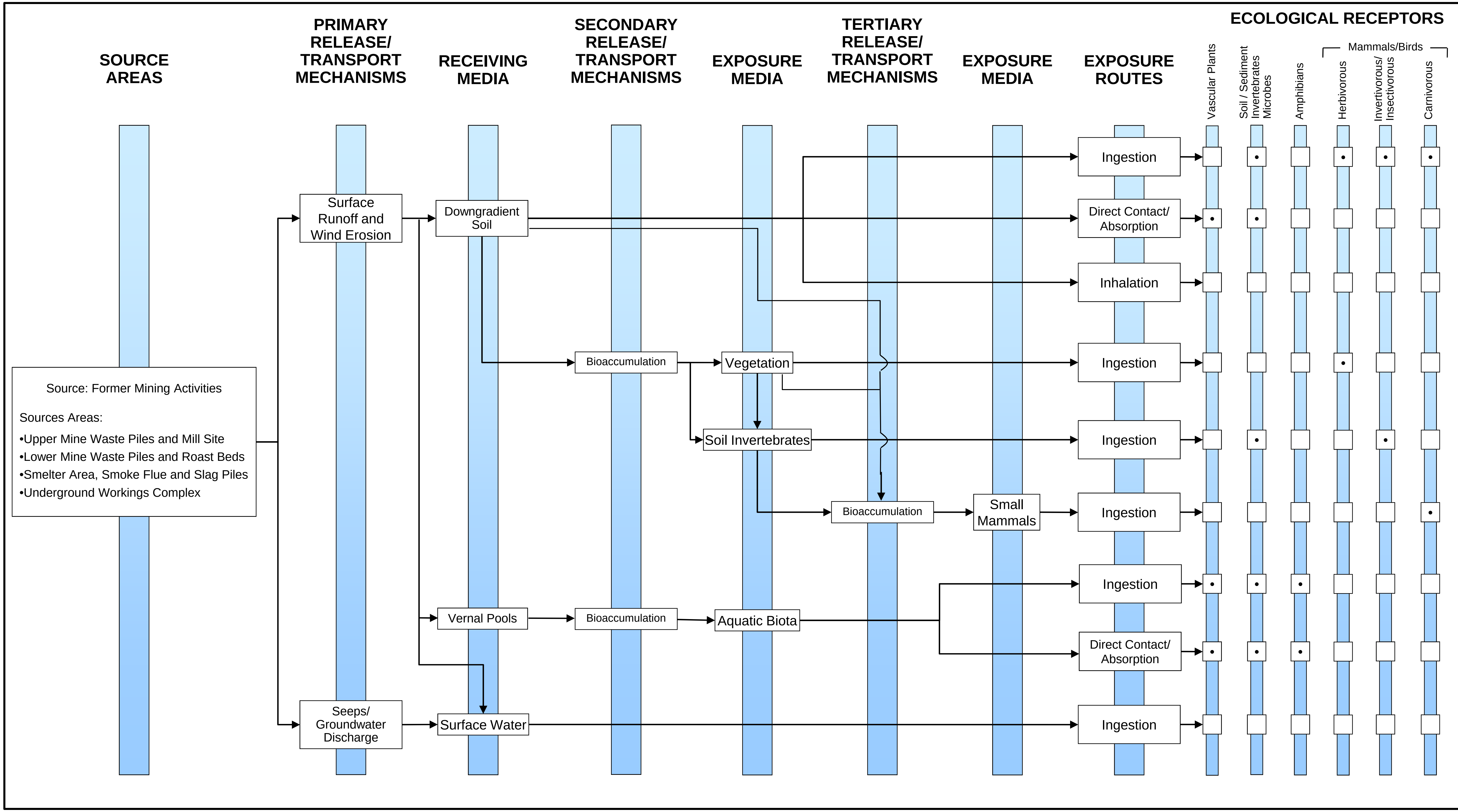
Concord, NH 03301
(603) 224-4182

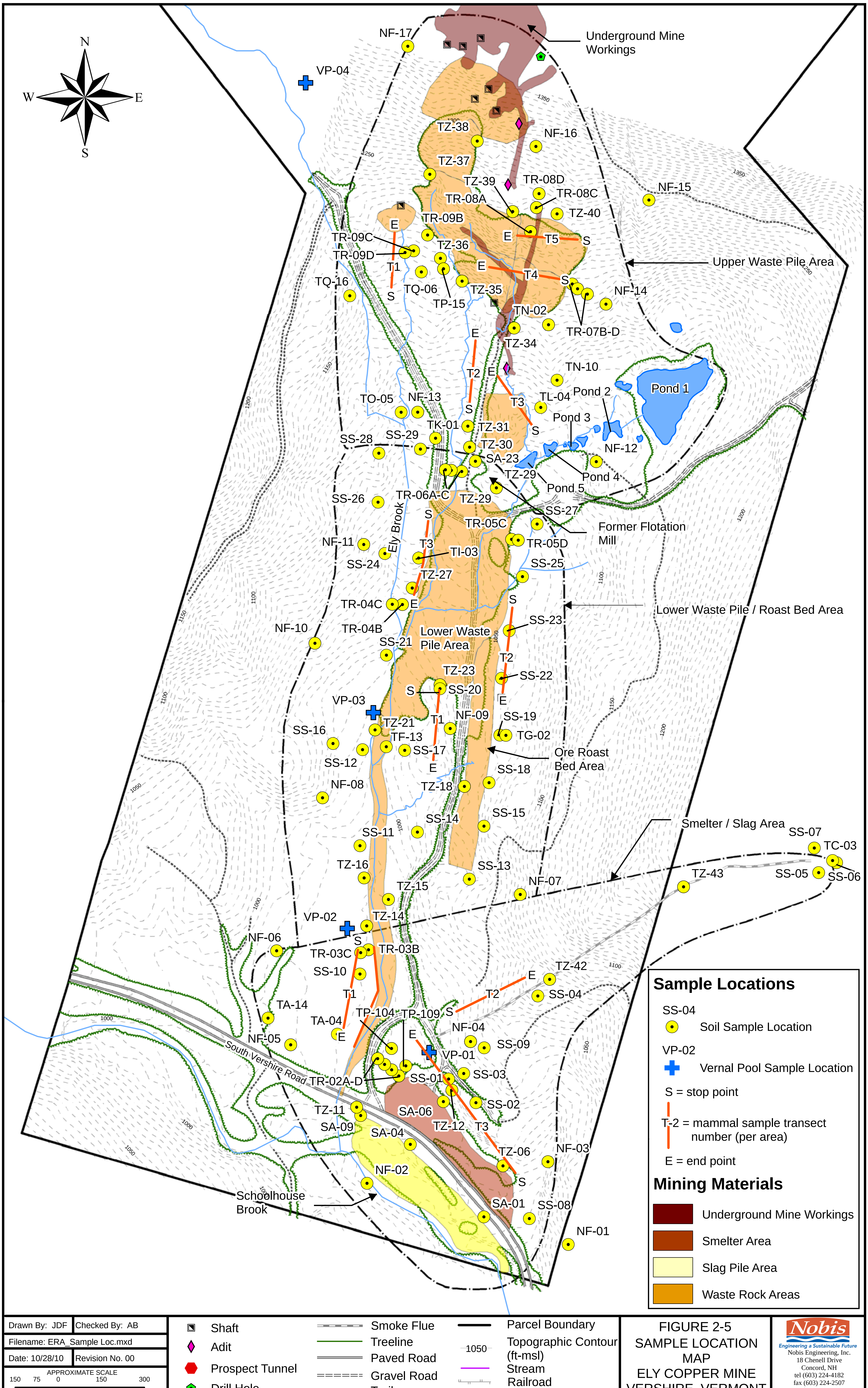
Path: R:\80000 Task Orders\80024 Ely Copper Mine\Technical Data (TD)\GIS\Maps\ERA\2-3 Habitat Map.mxd

FIGURE 2-4
CONCEPTUAL SITE MODEL



• = Complete exposure pathway.

☐ = Incomplete or insignificant exposure pathway.



N
S
E
W
Underground Mine Workings
Upper Waste Pile Area
Pond 1
Pond 2
Pond 3
Pond 4
Pond 5
Former Flotation Mill
Lower Waste Pile / Roast Bed Area
Lower Waste Pile Area
Ely Brook
Ore Roast Bed Area
Smelter / Slag Area
South Vershire Road
Schoolhouse Brook
NF-17
VP-04
NF-16
TZ-38
TZ-37
TZ-39
TR-08D
TR-08C
TR-08A
TZ-40
NF-15
TR-09B
TR-09C
TR-09D
TZ-36
T5
T4
T1
T2
T3
TQ-16
TQ-06
TP-15
TZ-35
NF-14
TN-02
TR-07B-D
TZ-34
TN-10
TL-04
TO-05
NF-13
TK-01
TZ-31
TZ-30
SS-28
SS-29
SA-23
NF-12
TZ-29
TR-06A-C
SS-26
SS-27
TR-05C
TR-05D
NF-11
TI-03
SS-24
SS-25
TZ-27
TR-04C
TR-04B
SS-23
NF-10
SS-21
TZ-23
SS-22
SS-20
VP-03
NF-09
SS-19
TZ-21
TF-13
TG-02
SS-16
SS-17
SS-12
SS-18
NF-08
TZ-18
SS-14
SS-15
SS-11
TZ-16
SS-13
TZ-15
NF-07
SS-07
TC-03
TZ-43
SS-05
SS-06
TZ-14
VP-02
NF-06
TR-03C
TR-03B
SS-10
TZ-42
SS-04
TA-14
TA-04
TP-104
TP-109
NF-04
SS-09
NF-05
VP-01
SS-03
TR-02A-D
SS-01
SS-02
TZ-11
SA-06
SA-09
SA-04
TZ-12
TZ-06
NF-03
NF-02
SA-01
SS-08
NF-01
Sample Locations
SS-04
Soil Sample Location
VP-02
Vernal Pool Sample Location
S = stop point
T-2 = mammal sample transect number (per area)
E = end point
Mining Materials
Underground Mine Workings
Smelter Area
Slag Pile Area
Waste Rock Areas
Drawn By: JDF
Checked By: AB
Filename: ERA_Sample Loc.mxd
Date: 10/28/10
Revision No. 00
APPROXIMATE SCALE
150 75 0 150 300
Feet
Shaft
Adit
Prospect Tunnel
Drill Hole
Smoke Flue
Treeline
Paved Road
Gravel Road
Trail
Parcel Boundary
Topographic Contour (ft-msl)
1050
Stream
Railroad
FIGURE 2-5
SAMPLE LOCATION MAP
ELY COPPER MINE
VERSHIRE, VERMONT
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Concord, NH
tel (603) 224-4182
fax (603) 224-2507
www.nobisengineering.com

Figure 4-1a: Box Plots of Transition Zone and Background Soil Concentrations - Al and Fe

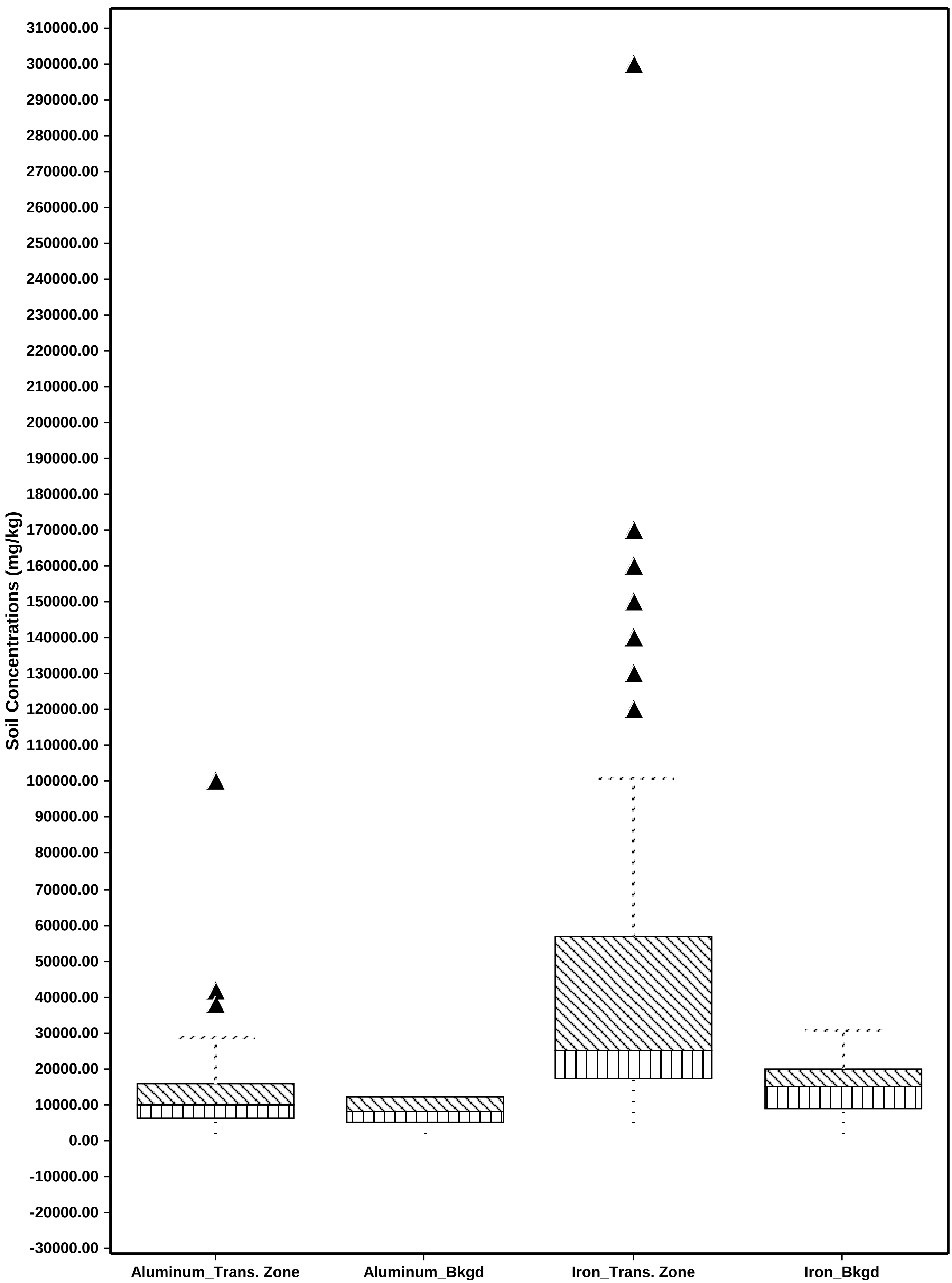


Figure 4-1b: Box Plots of Transition Zone and Background Soil Concentrations - Cu and Mn

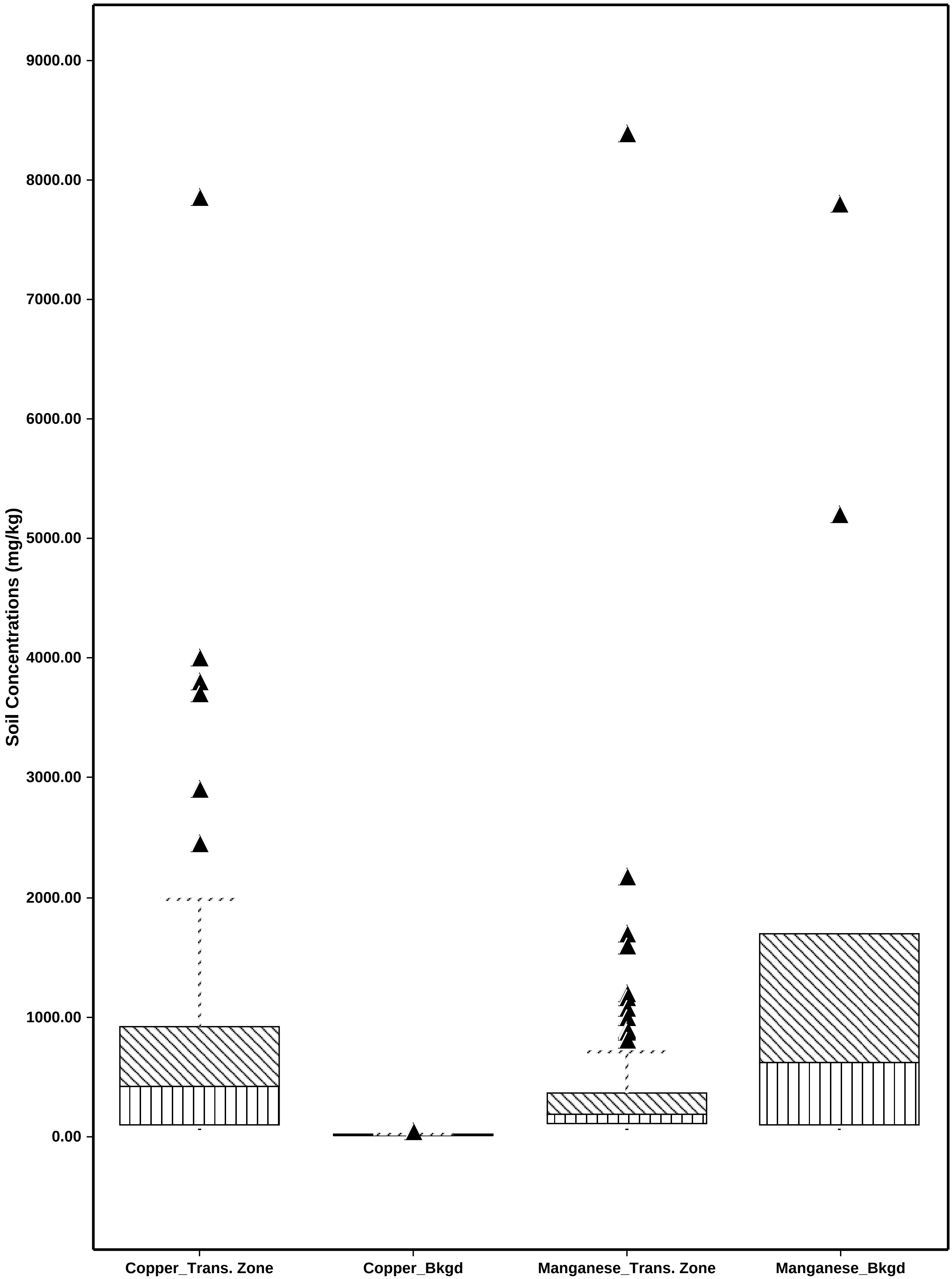


Figure 4-1c: Box Plots of Transition Zone and Background Soil Concentrations - Pb and Zn

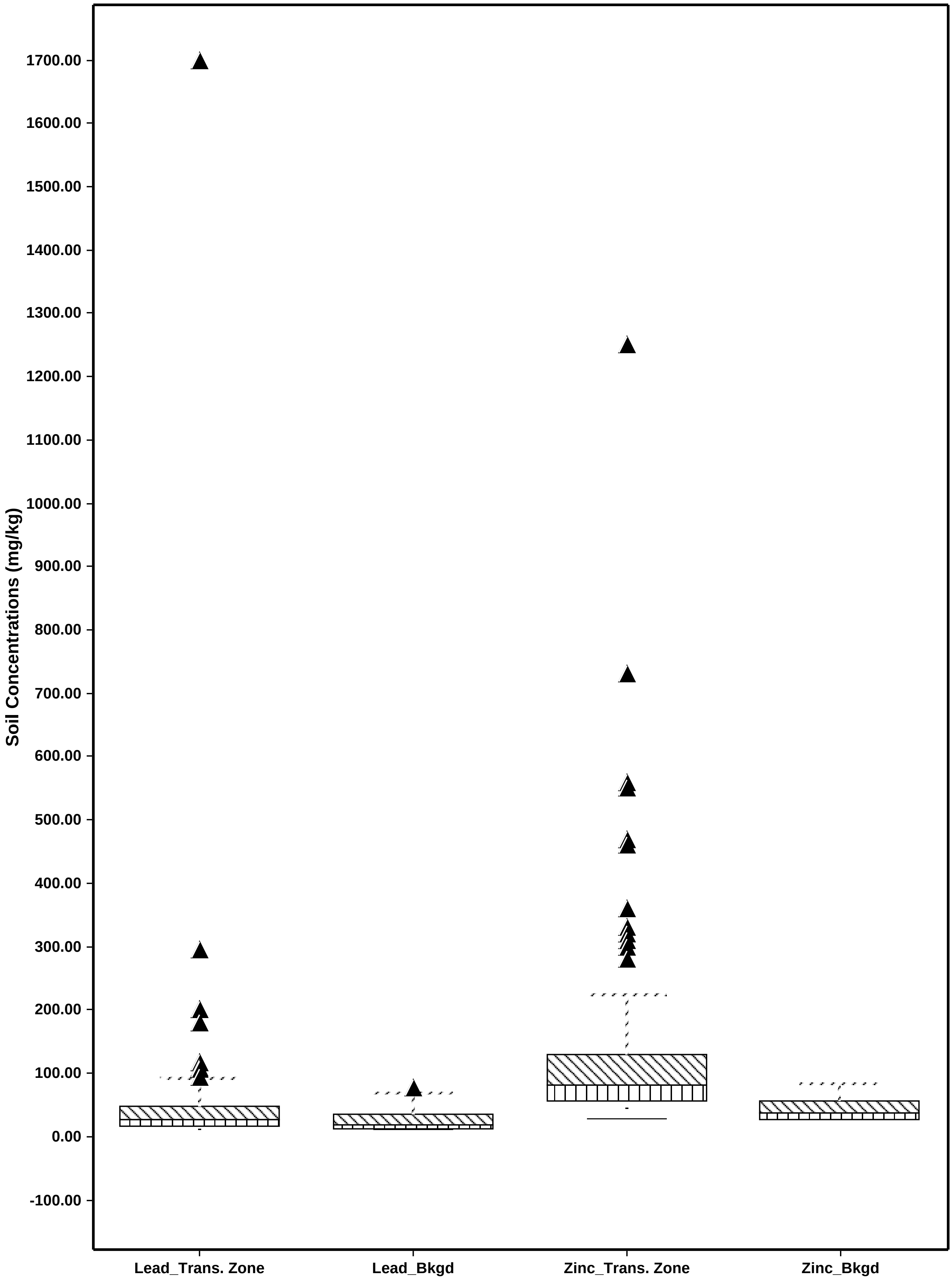


Figure 4-1d: Box Plots of Transition Zone and Background Soil Concentrations - Cr and V

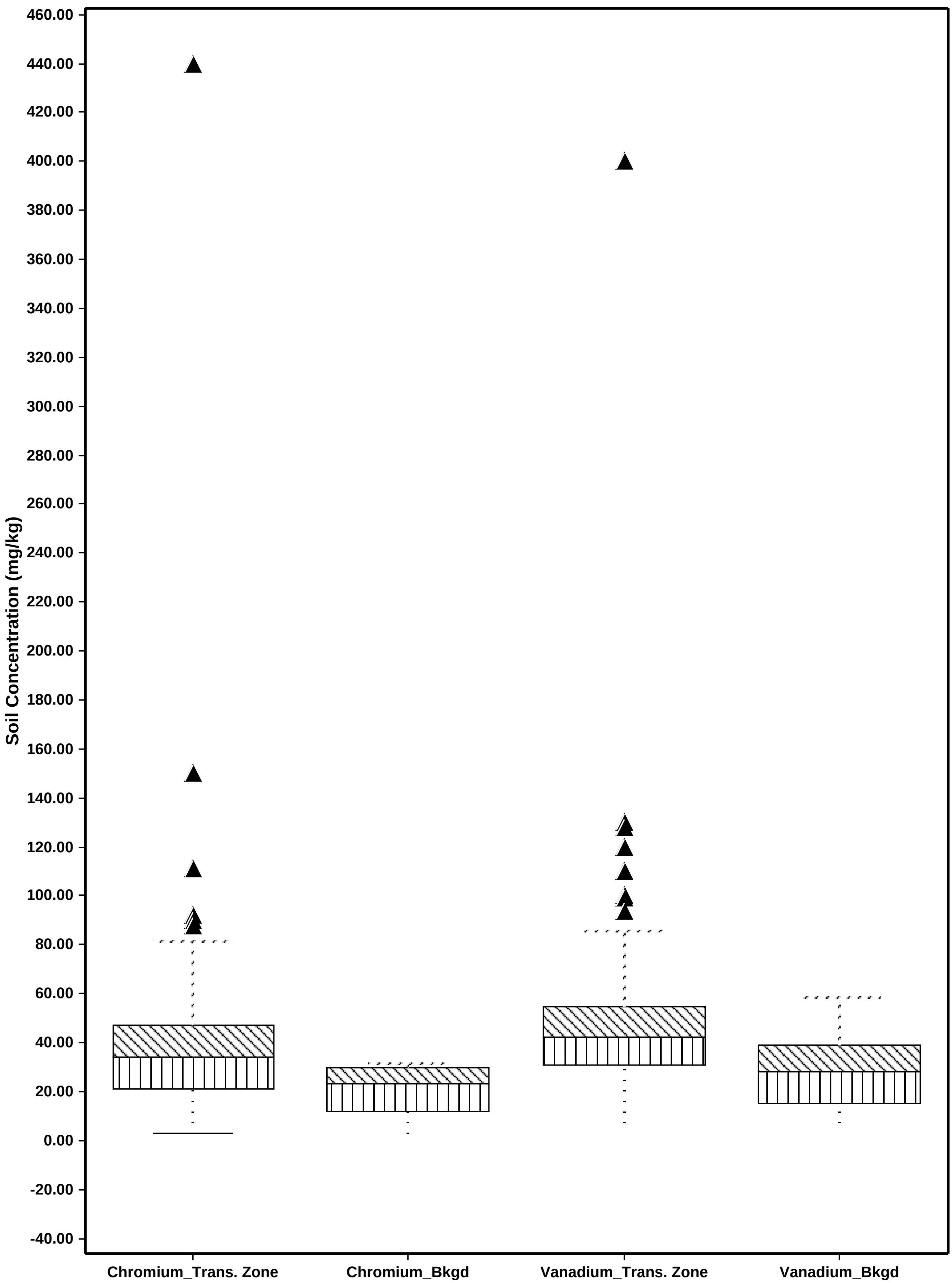


Figure 4-1e: Box Plots of Transition Zone and Background Soil Concentrations - Co and Ni

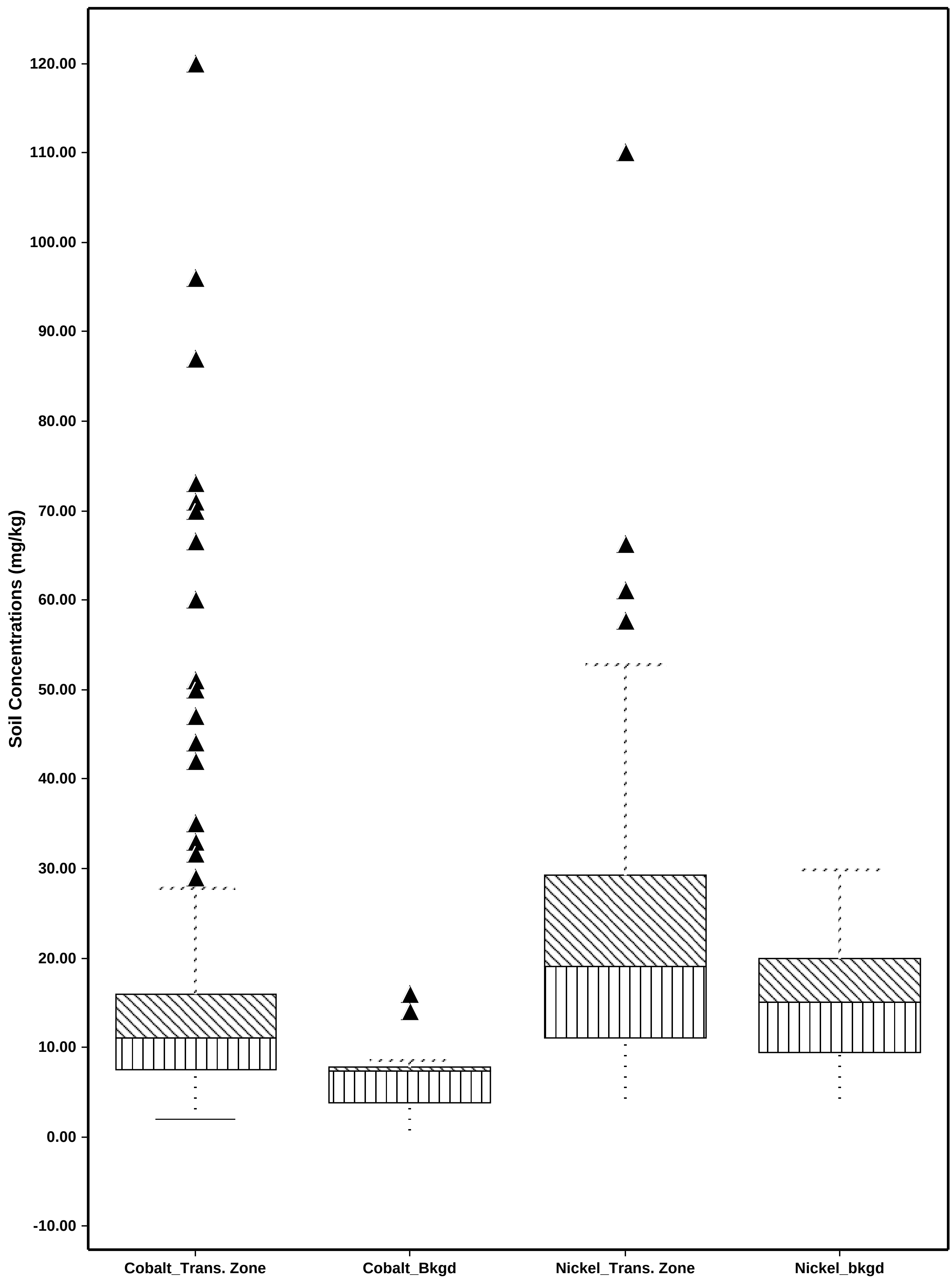


Figure 4-1f: Box Plots of Transition Zone and Background Soil Concentrations - Mo and Se

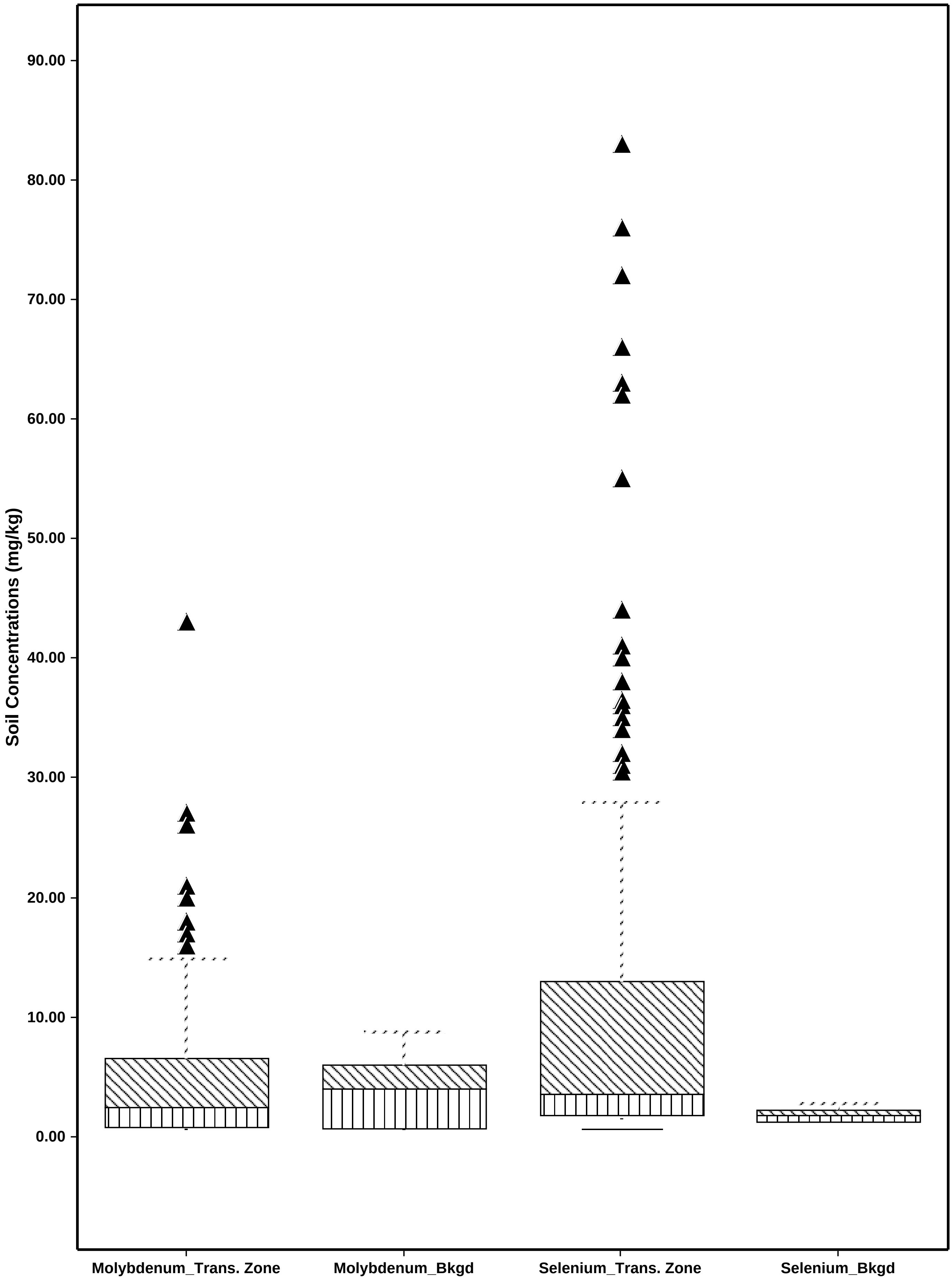


Figure 4-1g: Box Plots of Transition Zone and Background Soil Concentrations - As and Ag

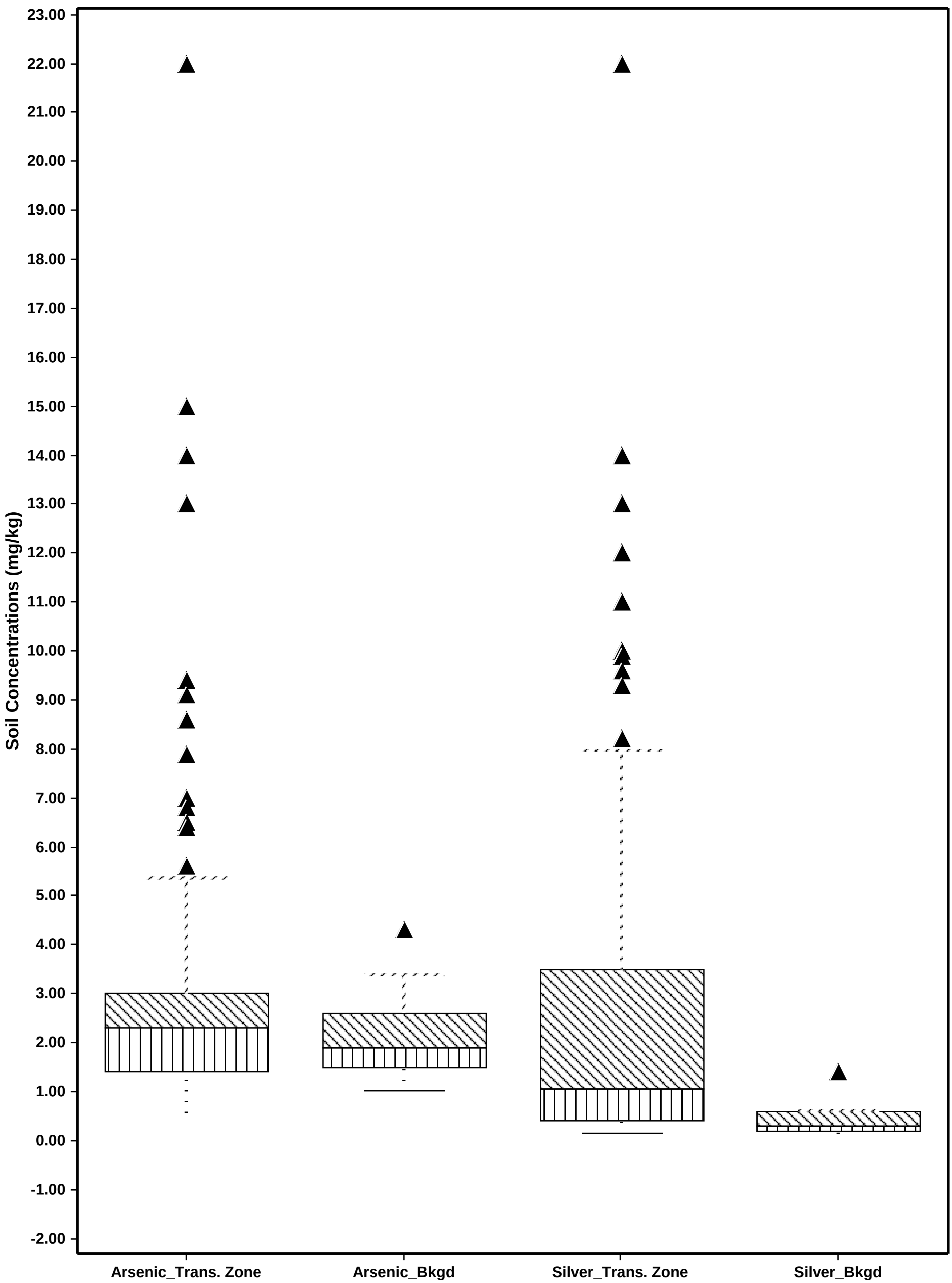


Figure 4-1h: Box Plots of Transition Zone and Background Soil Concentrations - Cd and Tl

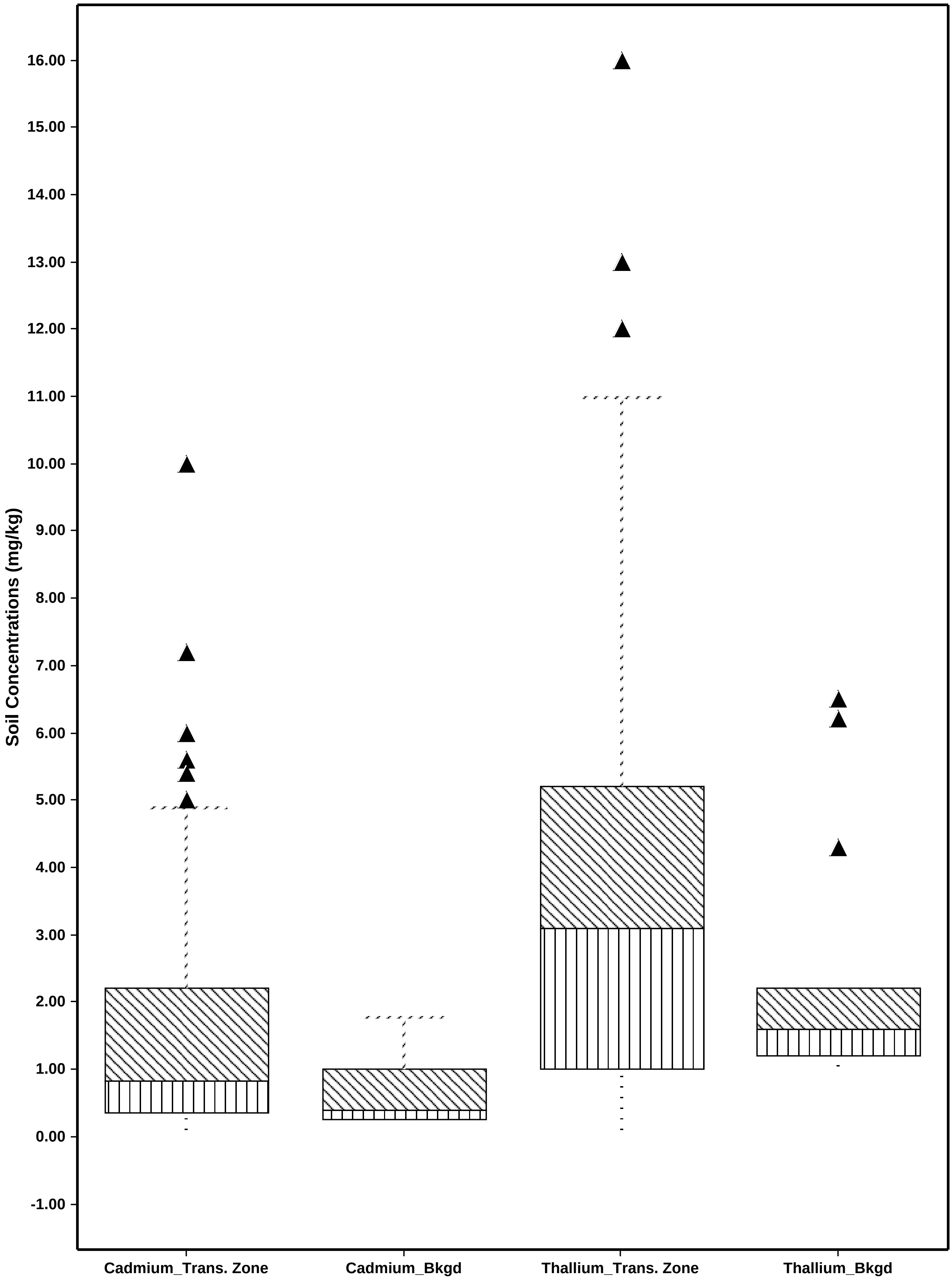
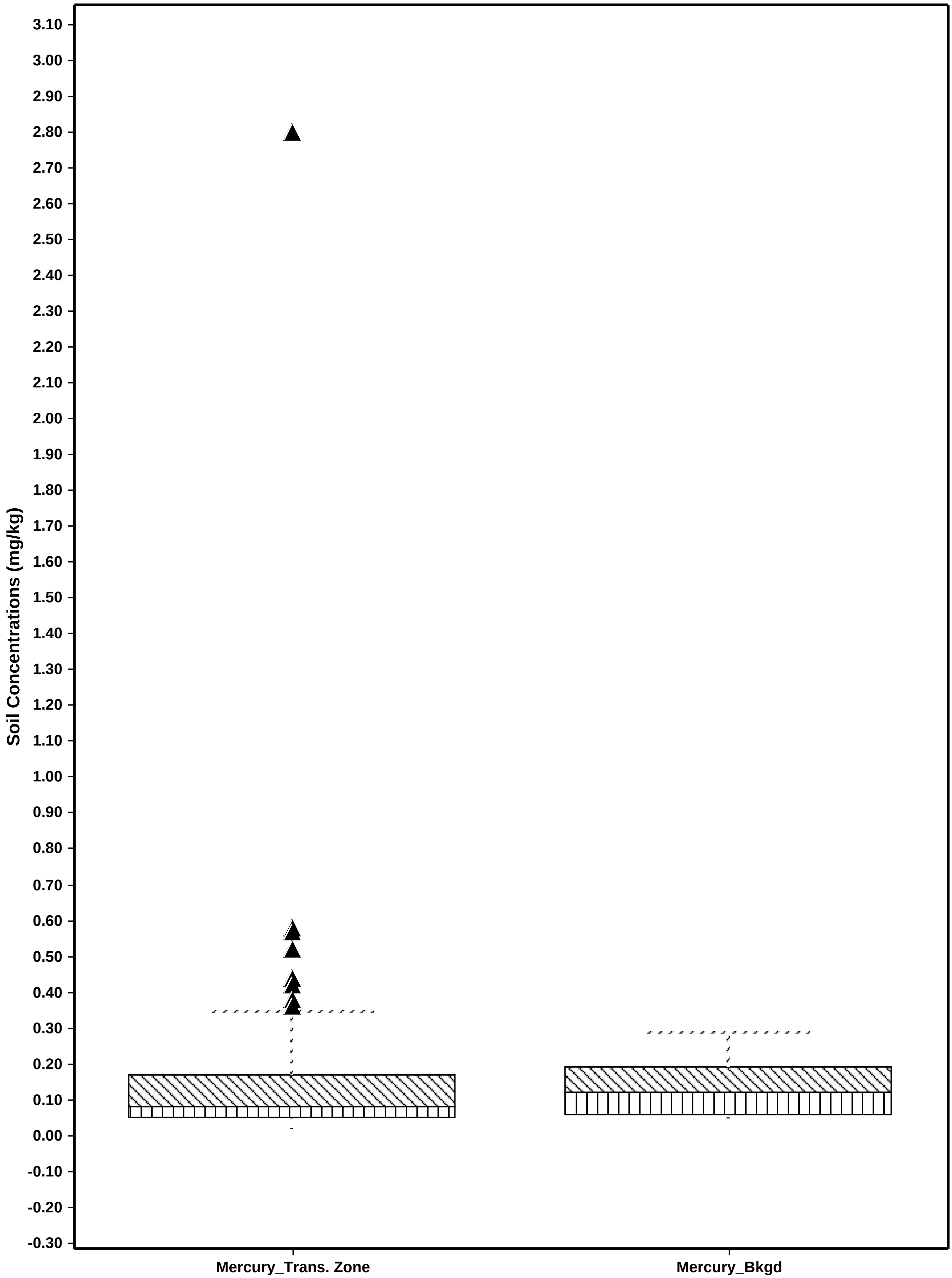


Figure 4-1i: Box Plots of Transition Zone and Background Soil Concentrations - Hg



APPENDIX A

VERNAL POOL PHOTOS

Vernal Pool 1

Portion of Vernal Pool 2

VERNAL POOL PHOTOS

Vernal Pool 3

Vernal Pool 4

APPENDIX B

ENDANGERED AND THREATENED
PLANTS OF VERMONT
Vermont Department of Fish and Wildlife
Nongame and Natural Heritage Program
April 23, 2005

The following species are protected by the Vermont Endangered Species Law (10 V.S.A. Chap. 123). This list is arranged by the species family name, and then within the family name by scientific name. See end of list for key from genus to family.

Scientific Name	Common Name	State Status	Federal Status
APIACEAE - Parsley Family			
Sanicula canadensis	Short-styled snakeroot	T	
Taenidia integerrima	Yellow pimpernel	T	
ARACEAE - Arum Family			
Arisaema dracontium	Green dragon	T	
ASCLEPIADACEAE - Milkweed Family			
Asclepias amplexicaulis	Blunt-leaved milkweed	T	
Asclepias tuberosa	Butterfly-weed	T	
ASPLENIACEAE - Spleenwort Family			
Asplenium montanum	Mountain spleenwort	T	
Asplenium trichomanes-ramosum * (A. viride)	Green spleenwort	T	
ASTERACEAE - Aster Family			
Eupatorium sessilifolium	Sessile-leaved boneset	E	
Helianthus strumosus	Harsh sunflower	T	
Lactuca hirsuta	Hairy lettuce	T	
Omalotheca sylvatica * (Gnaphalium sylvaticum)	Woodland cudweed	E	
Petasites frigidus var. palmatus	Sweet coltsfoot	T	
Polymnia canadensis	White-flowered leafcup	E	
Prenanthes boottii	Boott's rattlesnake-root	E	
Solidago odora	Sweet goldenrod	T	
Solidago ulmifolia	Elm-leaved goldenrod	E	
BETULACEAE - Birch Family			
Betula pumila var. glandulifera	Swamp birch	E	
BLECHNACEAE Chain Fern Family			
Woodwardia virginica	Virginia chain-fern	T	
BORAGINACEAE - Borage Family			
Cynoglossum virginianum var.	Northern wild comfrey	T	

Scientific Name	Common Name	State Status	Federal Status
boreale			
* (C. boreale)			
Hackelia deflexa var. americana	Nodding stickseed	T	
* (H. americana)			
BRASSICACEAE - Mustard Family			
Arabis drummondii	Drummond's rock-cress	E	
Arabis lyrata	Lyre-leaved rock-cress	T	
Braya humilis	Northern rock-cress	T	
Draba cana	Lanceolate cress	T	
* (D. lanceolata)			
Draba glabella	Smooth draba	T	
Neobeckia aquatica	Lake-cress	T	
* (Armoracia lacustris)			
BRYACEAE - Bryum Family			
Plagiobryum zieri	A moss	E	
CAPRIFOLIACEAE - Honeysuckle Family			
Viburnum edule	Squashberry	T	
CARYOPHYLLACEAE - Pink Family			
Minuartia marcescens	Marcescent sandwort	T	
Minuartia rubella	Marble sandwort	T	
CAESALPINACEAE - Caesalpinia Family			
Senna hebecarpa	Wild senna	T	
* (Cassia hebecarpa)			
CISTACEAE - Rockrose Family			
Helianthemum bicknellii	Plains frostweed	T	
Hudsonia tomentosa	Beach heather	E	
Lechea mucronata	Hairy pinweed	E	
* (L. villosa)			
CLUSIACEAE - St. John's-wort Family			
Hypericum ascyron	Great St. John's-wort	T	
* (H. pyramidatum)			
CONVOLVULACEAE - Morning-glory Family			
Calystegia spithamaea	Low bindweed	T	
CORNACEAE - Dogwood Family			
Cornus florida	Flowering dogwood	T	
CRASSULACEAE - Orpine Family			
Sedum rosea	Roseroot	T	

Scientific Name	Common Name	State Status	Federal Status
CUPRESSACEAE - Cyprus Family			
Juniperus horizontalis	Creeping juniper	T	
CYPERACEAE - Sedge Family			
Carex arcta	Contracted sedge	E	
Carex atratiformis	Blackish sedge	T	
Carex buxbaumii	Buxbaum's sedge	E	
Carex capillaris	Capillary sedge	T	
Carex chordorrhiza	Creeping sedge	E	
Carex foenea	Bronze sedge	E	
* (C. aenea)			
Carex garberi	Garber's sedge	T	
Carex livida	Pale sedge	T	
Carex muehlenbergii	Muehlenberg's sedge	T	
* (C. muhlenbergii)			
Carex oligocarpa	Few-fruited sedge	E	
Carex richardsonii	Richardson's sedge	E	
Carex siccata	Hay sedge	E	
* (Carex foenea)			
Carex vaginata	Sheathed sedge	E	
Cyperus diandrus	Low cyperus	E	
Cyperus houghtonii	Houghton's cyperus	T	
Eleocharis pauciflora	Few-flowered spikerush	T	
Fimbristylis autumnalis	Autumn fimbristylis	E	
Rhynchospora capillacea	Capillary beak-rush	T	
Scirpus ancistrochaetus	Barbed-bristle bulrush	E	LE
Scirpus verecundus	Bashful bulrush	E	
DIAPENSIACEAE - Diapensia Family			
Diapensia lapponica	Diapensia	E	
DRYOPTERIDACEAE - Wood Fern Family			
Dryopteris filix-mas	Male fern	T	
Woodsia alpina	Alpine woodsia	E	
EQUISETACEAE - Horsetail Family			
Equisetum palustre	Marsh horsetail	T	
ERICACEAE - Heath Family			
Rhododendron maximum	Great laurel	T	
Vaccinium stamineum	Deerberry	E	
FABACEAE - Pea Family			

Scientific Name	Common Name	State Status	Federal Status
Astragalus canadensis	Canadian milk-vetch	T	
Astragalus robbinsii var. jesupii	Jesup's milk-vetch	E	LE
Crotalaria sagittalis	Rattlebox	T	
Desmodium cuspidatum	Large-bracted tick-trefoil	E	
Desmodium rotundifolium	Prostrate tick-trefoil	T	
Lathyrus maritimus	Beach pea	T	
* (L. japonicus)			
Lathyrus palustris	Marsh vetchling	T	
Lespedeza hirta	Hairy bush-clover	T	
Lespedeza violacea	Violet bush-clover	T	
Lupinus perennis	Wild lupine	E	
FAGACEAE - Oak Family			
Quercus ilicifolia	Scrub oak	E	
Quercus prinoides	Dwarf chinkapin oak	E	
FUMARIACEAE - Fumitory Family			
Corydalis aurea	Golden corydalis	T	
GENTIANACEAE - Gentian Family			
Gentiana andrewsii	Fringe-top closed gentian	T	
Gentianella amarella	Felwort	T	
* (Gentiana amarella)			
Gentianella quinquefolia	Stiff gentian	T	
* (Gentiana quinquefolia)			
HIPPURIDACEAE - Mare's-tail Family			
Hippuris vulgaris	Mare's-tail	E	
HYDROPHYLLACEAE - Waterleaf Family			
Hydrophyllum canadense	Broad-leaved waterleaf	T	
ISOETACEAE - Quillwort Family			
Isoetes engelmannii	Engelmann's quillwort	T	
JUNCACEAE - Rush Family			
Juncus greenei	Greene's rush	E	
Juncus militaris	Soldier rush	E	
Juncus secundus	Secund rush	E	
Juncus torreyi	Torrey's rush	E	
LAMIACEAE - Mint Family			
Agastache nepetoides	Yellow giant hyssop	T	
Agastache scrophulariifolia	Purple giant hyssop	T	
Blephilia hirsuta	Hairy wood-mint	T	
Dracocephalum parviflorum	American dragonhead	T	
Physostegia virginiana	Obedience	T	

Scientific Name	Common Name	State Status	Federal Status
Pycnanthemum incanum	Hoary mountain mint	E	
LENTIBULARIACEAE - Bladderwort Family			
Utricularia resupinata	Northeastern bladderwort	T	
LILIACEAE - Lily Family			
Allium canadense	Wild garlic	T	
Tofieldia glutinosa	Sticky false-asphodel	T	
LYCOPODIACEAE - Clubmoss Family			
Diphasiastrum sitchense * (Lycopodium sitchense)	Alaskan clubmoss	T	
LYGODIACEAE - Curly-grass Family			
Lygodium palmatum	Climbing fern	E	
MELASTOMATACEAE - Melastoma Family			
Rhexia virginica	Virginia meadow-beauty	T	
MONOTROPACEAE - Indian Pipe Family			
Pterospora andromedea	Pinedrops	E	
MORACEAE - Mulberry Family			
Morus rubra	Red mulberry	T	
NYMPHAEACEAE - Water-Lily Family			
Nymphaea leibergii	Pygmy water-lily	E	
ONAGRACEAE - Evening Primrose Family			
Ludwigia polycarpa	Many-fruited false-loosestrife	E	
OPHIOGLOSSACEAE - Adder's-tongue Family			
Botrychium lunaria	Moonwort	E	
ORCHIDACEAE - Orchid Family			
Aplectrum hyemale	Putty-root	T	
Arethusa bulbosa	Arethusa	T	
Calypso bulbosa	Fairy slipper	T	
Corallorhiza odontorhiza	Autumn coral-root	T	
Cypripedium arietinum	Ram's head lady's-slipper	T	
Isotria medeoloides	Small whorled pogonia	E	LT
Isotria verticillata	Large whorled pogonia	T	
Liparis liliifolia	Lily-leaved twayblade	T	
Listera auriculata	Auricled twayblade	E	
Listera australis	Southern twayblade	E	

Scientific Name	Common Name	State Status	Federal Status
Malaxis brachypoda	White adder's mouth	T	
Platanthera flava	Tubercled orchis	T	
Platanthera hookeri	Hooker's orchis	T	
Triphora trianthophora	Three-bird orchid	T	
PINACEAE - Pine Family			
Pinus banksiana	Jack pine	T	
POACEAE - Grass Family			
Ammophila champlainensis	Champlain beach grass		
Calamagrostis stricta ssp. inexpansa	Bentgrass	E	
Glyceria acutiflora	Sharp manna-grass	E	
Hierochloe alpina	Alpine sweet-grass	T	
Oryzopsis pungens	Slender mountain-rice	T	
Panicum flexile	Stiff witch-grass	E	
Sphenopholis nitida	Shiny wedgegrass	E	
Sphenopholis obtusata	Blunt sphenopholis	E	
Sporobolus asper	Rough dropseed	E	
Vulpia octoflora	Eight-flowered fescue	E	
POLEMONIACEAE - Polemonium Family			
Polemonium van-bruntiae	Eastern Jacob’s ladder	T	
POLYGONACEAE - Buckwheat Family			
Polygonum douglasii	Douglas knotweed	E	
PRIMULACEAE - Primula Family			
Primula mistassinica	Bird's-eye primrose	T	
PTERIDACEAE - Maidenhair Fern Family			
Adiantum viridimontanum	Green mountain maidenhair-fern	T	
PYROLACEAE - Wintergreen Family			
Pyrola asarifolia	Bog wintergreen	T	
Pyrola minor	Lesser pyrola	E	
RANUNCULACEAE - Buttercup Family			
Anemone multifida	Early thimbleweed	E	
Hydrastis canadensis	Golden-seal	E	
Ranunculus allegheniensis	Allegheny crowfoot	T	
RHAMNACEAE - Buckthorn Family			
Ceanothus herbaceus	Prairie redroot	E	
ROSACEAE - Rose Family			

Scientific Name	Common Name	State Status	Federal Status
Potentilla pensylvanica var. prectinata	Northern cinquefoil	E	
* (P. p. var. bipinnatifida)			
Prunus americana	Wild plum	T	
Rosa acicularis	Needle-spine rose	E	
RUBIACEAE - Madder Family			
Galium labradoricum	Bog bedstraw	T	
SALICACEAE - Willow Family			
Salix planifolia	Tea-leaved willow	T	
Salix uva-ursi	Bearberry willow	E	
SCHEUCHZERIACEAE - Scheuchzeria Family			
Scheuchzeria palustris ssp. americana	Pod-grass	T	
SCROPHULARIACEAE - Figwort Family			
Castilleja septentrionalis	Pale painted-cup	T	
Veronicastrum virginicum	Culver's-root	E	
SPARGANIACEAE - Bur-reed Family			
Sparganium natans	Lesser bur-reed	T	
* (S. minimum)			
SPHAGNACEAE Sphagnum Family			
Sphagnum nitidum	A peatmoss	E	
* (S. subfulvum)			
VALERIANACEAE - Valerian Family			
Valeriana uliginosa	Marsh valerian	E	
VIOLACEAE - Violet Family			
Viola lanceolata	Lance-leaved violet	T	
XYRIDACEAE - Yellow-eyed Grass Family			
Xyris montana	Northern yellow-eyed grass	T	

* Synonym – indicates a name change from the previous Vermont Endangered and Threatened Species list or an alternative name that may be encountered

KEY TO FAMILY FROM GENUS

GENUS	FAMILY
Adiantum	Pteridaceae
Agastache	Lamiaceae
Allium	Liliaceae
Ammophila	Poaceae
Anemone	Ranunculaceae
Aplectrum	Orchidaceae
Arabis	Brassicaceae
Arethusa	Orchidaceae
Arisaema	Araceae
Asclepias	Asclepiadaceae
Asplenium	Aspleniaceae
Astragalus	Fabaceae
Betula	Betulaceae
Blephilia	Lamiaceae
Botrychium	Ophioglossaceae
Braya	Brassicaceae
Calamagrostis	Poaceae
Calypso	Orchidaceae
Calystegia	Convolvulaceae
Carex	Cyperaceae
Castilleja	Scrophulariaceae
Ceanothus	Rhamnaceae
Corallorrhiza	Orchidaceae
Cornus	Cornaceae
Corydalis	Fumariaceae
Crotalaria	Fabaceae
Cynoglossum	Boraginaceae
Cyperus	Cyperaceae
Cypripedium	Orchidaceae
Desmodium	Fabaceae
Diapensia	Diapensiaceae
Lycopodium	Lycopodiaceae
Draba	Brassicaceae
Dracocephalum	Lamiaceae
Dryopteris	Dryopteridaceae
Eleocharis	Cyperaceae
Equisetum	Equisetaceae
Eupatorium	Asteraceae
Fimbristylis	Cyperaceae
Galium	Rubiaceae
Gentiana	Gentianaceae
Gentianella	Gentianaceae
Glyceria	Poaceae
Hackelia	Boraginaceae
Helianthemum	Cistaceae
Helianthus	Asteraceae
Hierochloe	Poaceae
Hippuris	Hippuridaceae
Hudsonia	Cistaceae
Hydrastis	Ranunculaceae
Hydrophyllum	Hydrophyllaceae
Hypericum	Clusiaceae
Isoetes	Isoetaceae
Isotria	Orchidaceae
Juncus	Juncaceae
Juniperus	Cupressaceae
Lactuca	Asteraceae
Lathyrus	Fabaceae
Lechea	Cistaceae
Lespedeza	Fabaceae
Liparis	Orchidaceae
Listera	Orchidaceae
Ludwigia	Onagraceae
Lupinus	Fabaceae
Lygodium	Schizaeaceae
Malaxis	Orchidaceae
Minuartia	Caryophyllaceae
Morus	Moraceae
Neobeckia	Brassicaceae
Nymphaea	Nymphaeaceae
Omalotheca	Asteraceae
Oryzopsis	Poaceae
Panicum	Poaceae
Petasites	Asteraceae
Physostegia	Lamiaceae
Pinus	Pinaceae
Plagiobryum	Bryaceae
Platanthera	Orchidaceae
Polemonium	Polemoniaceae
Polygonum	Polygonaceae
Polymnia	Asteraceae
Potentilla	Rosaceae
Prenanthes	Asteraceae
Primula	Primulaceae
Prunus	Rosaceae
Pterospora	Monotropaceae
Pycnanthemum	Lamiaceae
Pyrola	Pyrolaceae
Quercus	Fagaceae
Ranunculus	Ranunculaceae
Rhexia	Melastomataceae
Rhododendron	Ericaceae
Rhynchospora	Cyperaceae
Rosa	Rosaceae

GENUS	FAMILY
Salix	Salicaceae
Sanicula	Apiaceae
Scheuchzeria	Scheuchzeriaceae
Scirpus	Cyperaceae

Sedum	Crassulaceae	**Utricularia**	Lentibulariaceae
Senna	Fabaceae	**Vaccinium**	Ericaceae
Solidago	Asteraceae	**Valeriana**	Valerianaceae
Sparganium	Sparganiaceae	**Veronicastrum**	Scrophulariaceae
Sphagnum	Sphagnaceae	**Viburnum**	Caprifoliaceae
Sphenopholis	Poaceae	**Viola**	Violaceae
Sporobolus	Poaceae	**Vulpia**	Poaceae
Taenidia	Apiaceae	**Woodsia**	Dryopteridaceae
Tofieldia	Liliaceae	**Woodwardia**	Blechnaceae
Triphora	Orchidaceae	**Xyris**	Xyridaceae

State Status As per the Vermont Endangered Species Law (10 V.S.A. Chap. 123)

E: Endangered: in immediate danger of becoming extirpated in the state
T: Threatened: with high possibility of becoming endangered in the near future

There are 63 state endangered and 91 state threatened plants in Vermont.

Federal Status As per the Federal Endangered Species Act (P.L. 93-205)

LE: Listed endangered
LT: Listed threatened

For further information on the Vermont Endangered Species Law or endangered and threatened plants and animals in Vermont contact the Nongame and Natural Heritage Program, Vermont Dept. of Fish and Wildlife, 103 South Main St. Waterbury, VT 05671-0501. (802) 241-3700.

Also available from the Nongame and Natural Heritage Program is a list of rare and uncommon plants of Vermont. This list includes both species protected by the Vermont Endangered Species Law and those rare in the state, but not afforded such protection. Also see the link to our program in our Department's web page: **http://www.vtfishandwildlife.com/**

APPENDIX C

Endangered and Threatened Animals of Vermont

Nongame and Natural Heritage Program
Vermont Fish & Wildlife Department
03 February 2008

The species in the following list are protected by **Vermont's Endangered Species Law (10 V.S.A. Chap. 123)**. Those with a federal status of Threatened or Endangered are also protected by the **Federal Endangered Species Act (P.L. 93-205)**.Other species lists, including lists of common species and rare species not protected by Endangered Species Law, can be found on the NNHP website, http://www.vtfishandwildlife.com/wildlife_nongame.cfm.
For further information contact the Nongame and Natural Heritage Program, Vermont Fish & Wildlife Department, 103 South Main St. Waterbury, VT 05671-0501. (802) 241-3700.

Common Name	Scientific Name	State Status	Federal Status
Fishes			
Northern Brook Lamprey	*Ichthyomyzon fossor*	E	
American Brook Lamprey	*Lampetra appendix*	T	
Lake Sturgeon	*Acipenser fulvescens*	E	
Stonecat	*Noturus flavus*	E	
Eastern Sand Darter	*Ammocrypta pellucida*	T	
Channel Darter	*Percina copelandi*	E	
Amphibians			
Boreal Chorus Frog	*Pseudacris maculata* (previously listed as *Pseudacris triseriata*.)	E	
Reptiles			
Spotted Turtle	*Clemmys guttata*	E	
Spiny Softshell (Turtle)	*Apalone spinifera*	T	
Common Five-lined Skink	*Plestiodon fasciatus* Synonym(s): *Eumeces fasciatus*	E	
Eastern Racer	*Coluber constrictor*	T	
Eastern Ratsnake	*Pantherophis alleghaniensis* Synonym(s): *Elaphe obsoleta, Elaphe alleghaniensis*	T	
Timber Rattlesnake	*Crotalus horridus*	E	
Mammals			
Eastern Small-footed Bat	*Myotis leibii*	T	
Indiana Bat	*Myotis sodalis*	E	LE
Canadian Lynx	*Lynx canadensis*	E	LT

Common Name	Scientific Name	State Status	Federal Status
Eastern Mountain Lion	*Puma concolor couguar* Synonym(s): *Felis concolor couguar*	E	LE
American Marten	*Martes americana*	E	
Birds			
Spruce Grouse	*Falcipennis canadensis*	E	
Bald Eagle	*Haliaeetus leucocephalus*	E	
Upland Sandpiper	*Bartramia longicauda*	E	
Black Tern	*Chlidonias niger*	E	
Common Tern	*Sterna hirundo*	E	
Migrant Loggerhead Shrike	*Lanius ludovicianus migrans*	E	
Sedge Wren	*Cistothorus platensis*	E	
Henslow's Sparrow	*Ammodramus henslowii*	E	
Grasshopper Sparrow	*Ammodramus savannarum*	T	
Amphipods			
Taconic Cave Amphipod	*Stygobromus borealis*	E	
Freshwater Mussels			
Eastern Pearlshell	*Margaritifera margaritifera*	T	
Dwarf Wedgemussel	*Alasmidonta heterodon*	E	LE
Brook Floater	*Alasmidonta varicosa*	T	
Cylindrical Papershell	*Anodontoides ferussacianus*	E	
Pocketbook	*Lampsilis ovata*	E	
Fluted-shell	*Lasmigona costata*	E	
Fragile Papershell	*Leptodea fragilis*	E	
Black Sandshell	*Ligumia recta*	E	
Pink Heelsplitter	*Potamilus alatus*	E	
Giant Floater	*Pyganodon grandis*	T	
Beetles			
Beach-dune Tiger Beetle	*Cicindela hirticollis*	T	
Cobblestone Tiger Beetle	*Cicindela marginipennis*	T	
Puritan Tiger Beetle	*Cicindela puritana*	T	LT

State Status - Legal protection under Vermont Endangered Species Law (10 V.S.A. Chap. 123)
E = Endangered: in immediate danger of becoming extirpated in the state
T = Threatened: with high possibility of becoming endangered in the near future
PDL = Proposed for Delisting

Federal Status - Designation under the federal Endangered Species Act, U.S. Fish & Wildlife Service
LE = Listed Endangered
LT = Listed Threatened
PDL = Proposed for Delisting
C = Candidate for Listing (not legally protected)

APPENDIX D

TechLaw
Quality & Integrity

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July 12, 2011

Office of Environmental Measurement and Evaluation
US EPA - Region I
11 Technology Drive
North Chelmsford, Massachusetts 01863-2431

To: Mr. Bart Hoskins, EPA TOPO
Via: Mr. Louis Macri, ESAT Program Manager

TDF No. 2343B
Task Order No. 66
Task No. 01

Subject: Assessing metal bioavailability in mine waste soils from the Ely Copper Mine Superfund Site, Vershire, VT.

Dear Mr. Hoskins:

The Environmental Services Assistance Team (ESAT) prepared a technical memorandum on the subject of metals bioavailability in the terrestrial environment at the Ely Mine site. The Technical Direction Form (TDF) requested that ESAT focus the memorandum on three broad issues, as follows:

- Evidence for and against metal bioaccumulation in soil invertebrates, specifically earthworms used in soil toxicity testing at the New England Regional Laboratory, in proportion to metal concentrations in the test soil.

- Evidence for and against biomagnification of metals based on comparing tissue residue data from terrestrial invertebrates and small mammals collected from the Site and reference location in support of the baseline ecological risk assessment.

- Evidence from a 2007 United States Geological Survey (USGS) sequential extraction study that metals may be relatively unavailable to biota based on comparing the extraction strength of digestive tracts of animals relative to the sequential extractions performed by USGS on different types of mine wastes.

The task was requested by Mr. Bart Hoskins, the task order project officer, and was authorized under TDF No. 2343B. The completion date for the task is July 12, 2011.

Do not hesitate to contact Stan Pauwels at (617) 918-8669 or (207) 883-4780 with any questions or comments.

Sincerely,

Stan Pauwels
Senior Staff Scientist
TechLaw, Inc.

Assessing metal bioavailability
in mine waste soils from the
Ely Copper Mine Superfund Site, Vershire, VT.

TDF No. 2343B
Task Order No. 66
Task No. 01

Submitted to the:

Task Order Project Officer
Office of Environmental Measurement and Evaluation
USEPA - New England Regional Laboratory
11 Technology Drive
North Chelmsford, MA 01863-2431

Submitted by:

ESAT - Region I
7 Technology Drive
North Chelmsford, MA 01863

July 12, 2011

EPA Contract EP-W-06-017

1.0 GENERAL INTRODUCTION

1.1 Technical direction form

The Environmental Services Assistance Team (ESAT) prepared a technical memorandum on the subject of metals bioavailability in the terrestrial environment at the Ely Mine site. The Technical Direction Form (TDF) requested that ESAT focus the memorandum on three broad issues, as follows:

- Evidence for and against metal bioaccumulation in soil invertebrates in proportion to metal concentrations measured in mine soil, specifically earthworms used in soil toxicity testing at the New England Regional Laboratory (NERL) in North Chelmsford, MA.

- Evidence for and against metal biomagnification based on comparing tissue residue data from terrestrial invertebrates and small mammals collected from the Site and reference location in support of the terrestrial Baseline Ecological Risk Assessment (BERA).

- Evidence from the 2007 USGS sequential extraction study that metals may be relatively unavailable to biota based on comparing the extraction strength of digestive tracts of animals relative to the sequential extractions performed by USGS on different types of mine wastes.

The original TDF had a completion date of June 23, 2011. The Task Order Project Officer (TOPO) modified the TDF (No. 2343A) on June 27, 2011 to extend the due date to July 5, 2011 in anticipation of receiving selenium data from the U.S. Geological Survey (USGS) for soil and earthworm samples generated by the soil toxicity testing program. The TOPO modified the TDF for a second time (No. 2343B) on July 6, 2011 to extend the completion date to July 12, 2011.

1.2 Site history

The Ely Copper Mine Superfund Site (the Site) is located in Vershire, VT, within the Vermont Copper Belt. It covers about 1,800 acres of wooded hills, 275-350 acres of which were used for copper mining, rock processing, and smelting between 1821 and 1920. The mine has been inactive since 1920, except for the removal of "dump-ore" from the property in 1949 and 1950.

The mine waste at this Site is rich in metals and sulfides. As rain or snowmelt passes over and through these materials, sulfuric acid is generated and metals are dissolved and mobilized. This process creates acid mine drainage which causes low pH and/or high metal loads in the waterways flowing through and down-gradient from the Site. The waste piles are also essentially devoid of vegetation.

An aquatic BERA prepared by ESAT and finalized in June of 2010 identified ecological risk to aquatic receptors, and wildlife species feeding on those aquatic receptors, in most of the waterways at and downstream from the Site. A draft terrestrial BERA prepared by Avatar Environmental and released on February 15, 2011 also identified potential for some ecological risk in the terrestrial settings around the waste piles at the Site.

In addition, ESAT carried out a soil toxicity testing program at the NERL in 2009 and 2010 to assess the toxicity and metals uptake in earthworms exposed for 14 days (pilot study) and 28 days (definitive study) to pH-adjusted mine wastes from Ely Mine. Samples of the test soils and depurated dried worms were sent to the USGS for metals analysis.

This technical memorandum is organized as follows: Section 2.0 offers evidence for and against metals bioaccumulation in soil invertebrates, Section 3.0 qualitatively discusses evidence for and against biomagnification of metals in the soil invertebrates to small mammal food chain at the Site, Section 4.0 discusses evidence from the 2007 USGS sequential extraction study that metals may be relatively unavailable to terrestrial biota at the Site, Section 5 provides a summary and conclusions, and Section 6 provides references

2.0 EVIDENCE REGARDING METAL BIOACCUMULATION IN SOIL INVERTEBRATES

2.1 Introduction

ESAT collected several samples of mine wastes from Ely Mine in the summer and fall of 2009 for use in earthworm toxicity testing at the NERL. The test consisted of a 14-day pilot study using three pH-adjusted soils, followed by a 28-day definitive test performed using three more pH-adjusted soils (TechLaw, 2010).

Composite samples of depurated worms and test soils were sent to Robert Seal at the USGS for metals analysis. **Attachment 1** summarizes the earthworm survival data generated at the NERL, together with the concentrations of select metals [Copper (Cu), Cadmium (Cd), Cobalt (Co), Molybdenum (Mo), Nickel (Ni), Lead (Pb), Selenium (Se), and Zinc (Zn)] measured in the test soils and worm tissue by the USGS.

These data were used to perform a linear regression analysis (see **Figure 1**). The goal of this effort was to determine if a relationship existed between the worm tissue concentrations and the corresponding soil concentrations.

2.2 Results and interpretation

The information in **Figure 1** can be interpreted as follows:

- A significant correlation was found between metals in earthworms and soil for Cu, Co, Ni, Pb, Se, and Zn, resulting in the regression equations shown in **Figure 1**. No significant correlations were found for Cd and Mo.

- For all metals, except Cd, the earthworm residue concentrations were substantially lower than those measured in the corresponding test soils, indicating that the metals accumulated in the worms but at a low rate. The data for Cd were suspect. Several samples with relatively high soil Cd levels resulted in low worm Cd levels (right-hand side of **Figure 1.2**), whereas several samples with relatively low soil Cd levels had in higher worm levels (left-hand side of **Figure 1.2**).

- Cu had by far the biggest range of soil concentrations (from 526 mg/kg to 8550 mg/kg, representing a 16-fold increase), but showed a much more limited range of worm tissue concentrations (from 49 mg/kg to 334 mg/kg, representing only a seven-fold increase). This same general pattern was also observed for the other metals with significant regressions.

In conclusion, the regression analysis showed that worms exposed to Ely Mine waste soils accumulated metals in their tissues in rough proportion to the levels present in the exposure soils, except for Cd and Mo. However, the metal uptake into the worms did not follow the soil concentrations in a 1:1 ratio. Instead, the range of soil metal to worm metal ratios estimated from the graphs in **Figure 1** were as follows: Cu = 1:0.075 to 1:0.04; Co = 1:0.34 to 1:0.20; Ni = 1:0.43 to 1:0.36; Pb = 1:0.09 to 1: 0.06; Se = 1:0.34 to 1:0.14; and Zn = 1:0.91 to 1:0.24. These ratios fell well below 1, suggesting that the worms were able to limit metals uptake in their tissues when exposed to mine waste soil.

3.0 EVIDENCE REGARDING METAL BIOMAGNIFICATION IN TERRESTRIAL FOOD CHAINS

3.1 Introduction

Avatar Environmental collected terrestrial invertebrates and small mammals for whole body tissue analysis from the halo zone (i.e., the areas between the barren mine waste piles and the surrounding unimpacted forests) at Ely Mine and from an off-site reference location. The purpose of this sampling effort was to provide site-specific metals residue data for use in wildlife food chain modeling. These data were summarized in Tables 2-4, and 2-7 through 2-11 in the February 2011 draft terrestrial BERA prepared by Nobis.

The TDF requested a qualitative assessment to determine if the high metals measured in the mine waste-impacted soils from the halo zone would result in substantially higher metal levels in the terrestrial receptors that foraged in and around the halo zone, as compared to the off-site reference location.

The available data were spotty for the purpose of this review. Only three metals (Cu, Mn, and Zn) were consistently detected in the soils, soil invertebrates, and small mammals collected from both the halo zone at Ely Mine and the off-site reference location. Of the three, Mn was dropped because its average soil concentration was about four times higher at the reference location compared to the halo zone. Many other metals were also analyzed, but were not consistently detected in all three on-site and off-site matrices of interest. Therefore, only Cu and Zn were evaluated graphically. Even though this data set was limited, it did include Cu, which is the main contaminant of concern at Ely Mine.

3.2 Results and interpretation

Figures 2.1 and 2.2 show the mean concentration + 1 standard deviation for Cu and Zn, respectively, measured in soil, terrestrial invertebrates, and small mammals collected from the halo zone at Ely Mine and form the off-site reference location. The pattern observed at the halo zone is similar for both metals, i.e., high concentrations in soils, with lower concentrations in the terrestrial invertebrates, and the lowest concentrations in the small mammals.

More importantly, the Cu and Zn levels did not differ between the small mammals collected from the halo zone and the reference location. This pattern was all the more striking for Cu, which had an average soil halo zone concentration of around 700 mg/kg versus 15 mg/kg in the reference soil. Hence, the roughly 50-fold higher (average) Cu concentration in halo zone soil did not affect the residue levels in the small mammals collected from the same general area.

Attachment 2 provides the available average concentration data for several other metals in soil, terrestrial invertebrates, and small mammals. Even though these data are spotty, the overall pattern is similar to Cu and Zn, i.e., substantially higher metal levels in soils from the halo zone do not result in higher tissue residue levels in small mammals captured in the same area. Also, the small mammals collected from the halo zone and off-site reference location have comparable metal residue levels.

The available evidence showed that mine-related metals did not biomagnify through the terrestrial food chain consisting of soil, terrestrial invertebrates, and small mammals. This general observation has several uncertainties, as outlined below:

- The small mammal residue data set was comprised of invertivores (e.g., shrews), omnivores (e.g., mice), and herbivores (e.g., voles). It seems reasonable to expect that the metal residues in invertivores would be higher than in herbivores. However, the observed patterns (i.e., highest metal levels in soil and lowest metal levels in small mammals, plus minor differences in tissue residues between small mammals collected from Ely Mine and the off-site reference location) suggested that the interpretation would not be much different from the one presented in this memorandum if the three trophic groups had been analyzed separately for metals.

- The small mammals captured in the halo zone were presumed to be feeding in that general area. However, it is not known how much time small mammals spend feeding in the halo zone versus the surrounding forest, or what fraction of their daily food intake comes from the halo zone. Hence, the similarities in Cu and Zn tissue residue levels between small mammals caught in the halo zone and the off-Site reference location may not reflect a lack of food chain uptake but may simply indicate that most of the small mammals collected from the halo zone fed in the surrounding forest instead.

- Avatar Environmental had a hard time collecting enough terrestrial invertebrates from the halo zone to meet the minimum mass required for analytical chemistry. This pattern suggested that the halo zone was not a high-quality habitat for terrestrial invertebrates. Hence, small mammals feeding on terrestrial invertebrates might have less success feeding in the halo zone versus the surrounding forest. Also, some of the terrestrial invertebrates were winged (e.g., crickets, grasshoppers) and may have spent much/most of their time in the surrounding forest without becoming exposed to the metals in the halo zone.

- Cu and Zn are key inorganic nutrients, which are under tight homeostatic control. As such, it is perhaps not surprising that the tissue residue levels of these two metals measured in the site and reference small mammals did not differ substantially. On the other hand, the fact that the small mammals from the halo zone showed low levels of Cu and Zn also suggested that any exposure to those metal-enriched areas did not overwhelm the ability of the small mammals to internally regulate both metals.

4.0 EVIDENCE REGARDING BIOAVAILABILITY OF METALS IN MINE WASTE SOILS

4.1 Introduction

The TDF requested that ESAT review a 2007 USGS report (Piatak et al., 2007) on sequential mine waste extraction. The purpose of this review was to qualitatively estimate how much of a metal in mine waste might be bioavailable to terrestrial receptors exposed to those wastes. Unfortunately, the soils used in the 2009 and 2010 earthworm toxicity testing program were not sequentially extracted but only analyzed for bulk metal concentrations.

The USGS used different types of mine waste samples (e.g., stream sediment, roast bed material, waste pile material) collected from several mining sites in the North East, including Ely Mine and Pike Hill Mine, to perform sequential extractions (Piatek et al., 2007). A 1.0 g soil sample was subjected to progressively more aggressive extractions, starting with step 1 which released soluble, absorbed and exchangeable metals, and ending with step 7 which uses concentrated acids to complete the digestion (see Figure 5 in Piatak et al., 2007 for details). The concentration of a metal released by each sequential extraction was then summed to obtain a total concentration for that metal. In theory, the sum of the concentrations from each sequential extraction should equal the original total element concentration of the solid sample (bulk total).

It is not known which combination of the seven extraction steps most closely mimics a stomach environment. Robert Seal (USGS, pers. comm.) was of the opinion that the sum of the concentrations obtained from serial extraction steps 1 through 4 might provide a reasonable approximation. The first three steps used relatively mild acid extractions at room temperature to obtain the soluble, adsorbed and exchangeable fraction (step 1), the carbonate fraction (step 2), and the organic fraction (step 3). The fourth sequential extraction used hydrochloric acid (typical of stomach environments) at 50°C for 30 minutes to release the fraction represented by amorphous iron and aluminum hydroxides plus amorphous and crystalline manganese oxides. The remaining three steps used increasingly more aggressive acids at higher temperatures (90°C) to continue the extractions, until the original sample was completely digested down to silicate residuals.

The current review assumed that the sum of the metals released from soil particles by sequential extraction steps 1 through 4 was equivalent to the amount of metal that would be released if the soil particles were present in a stomach environment.

4.2 Results and observations

Appendix 1 at the end of this technical memorandum summarizes the analytical data for the serial extractions of six waste samples, representing sediment, roast bed material, and waste pile material from Ely Mine and Pike Hill Mine (Piatak et al., 2007). Many more samples were analyzed from Elizabeth Mine (see Table 1 in Piatak et al., 2007) but were not included in this review due to time constraints.

Appendix 1 is organized by sample and provides the concentrations for Cd, Co, Cu, Fe, Mo, Ni, Pb, Se, and Zn. Two ratios were calculated to help interpret the data, as follows:

- RATIO 1 is the metal-specific sum of the concentrations from the first four extraction steps divided by the sum of the concentrations of the seven extraction steps.

- RATIO 2 is the metal-specific sum of the concentrations from the first four extraction steps divided by the bulk concentration, which was obtained independently of the serial extractions.

Several observations follow:

- With only a few exceptions, the sums of the concentrations of the seven extraction steps exceeded their corresponding bulk concentrations. This trend suggested that the sequential extractions released more metals from the mine soils compared to the “one time” aggressive acid extraction used in routine soil analyses.

- The data for extraction steps 1 through 4 (shaded in **Appendix 1**) showed that the vast majority of a metal was released only under the highly aggressive methods used in steps 5 through 7. This trend is captured by the two ratios which showed that, with a few exceptions, the “bioavailable fraction” represented by the sum of the metals released by serial extraction steps 1 through 4 made up less than 10% of the total concentrations. As an example, RATIO 1 and RATIO 2 averaged over the six samples equaled 2.9% and 3.5% for Cu, and 1.7% and 3.0% for zinc, respectively. These values showed that only a small fraction of the total metals in Ely Mine wastes may actually be released in a stomach environment.

The data from Piatak et al. (2007) suggested that only around 30 to 35 mg/kg Cu would be released in a stomach environment for every 1,000 mg/kg of Cu present in mine waste soil. This conclusion assumes that serial extraction steps 1 through 4 create chemical conditions resembling those found in a stomach. On the other hand, the data also showed that most of the metals were released from the mine waste samples only under chemical conditions which do not exist in stomach environments. It would appear, therefore, that the working assumptions used in this technical memorandum are broadly supported. In conclusion, it is reasonable to postulate that the vast majority of metals in mine waste are unlikely to be bioavailable when ingested.

5.0 SUMMARY AND CONCLUSIONS

ESAT qualitatively evaluated three independent lines of evidence to determine if metals present in waste materials from Ely Mine have the potential to be bioavailable or to bioaccumulate/biomagnify through the terrestrial food chain. The available evidence can be summarized as follows:

- The earthworm toxicity tests showed that metals entered into the test organisms in proportion to soil concentrations, as shown by the statistically significant regressions for six of eight metals. However, the uptake and depuration dynamics in the earthworms appeared to be such that the tissue residue levels remained well below the soil concentrations.

- Comparing average metal concentrations in co-located soil, terrestrial invertebrate, and small mammal samples from the halo zone and the off-site reference location showed that metals did not move up the food chain. In fact, the residue levels in mammals from the halo zone were no different from those at the reference location. This pattern was particularly striking for Cu in halo zone soil, which was highly enriched compared to the reference soil, but did not accumulate in small mammals captured at the halo zone.

- The sequential soil extractions performed by the USGS on mine waste samples showed that chemical conditions similar to those found in a stomach environment were unlikely to release more than a few percent of the metals.

It is therefore concluded that metals in Ely Mine waste soils have low bioavailability and little or no potential to biomagnify through terrestrial food chains.

6.0 REFERENCES

Piatak, N.M., R.R. Seal, R.K. Sanzolone, P.J. Lamothe, Z.A. Brown, and M. Adams. 2007. Sequential extraction results and mineralogy of mine waste and stream sediments associated with metal mines in Vermont, Maine, and New Zealand: U.S. Geological Survey Open-File Report 2007-1063, 34 p.

TechLaw. 2009. Test results for the chronic 14-day and 28-day Ely Mine soil toxicity tests using *E. foetida* (Vershire, VT). Technical report submitted on June 30, 2010 and prepared under Technical Direction Form 1795B.

Attachment 1: Summary of the fall 2009 and spring 2010 soil and worm residue analysis for key metals																			
soil ID	dilution (w/ref soil)	earthworm survival (%)	soil pH at end of test	$[Cu]_{soil}$ (mg/kg)	$[Cu]_{worms}$ (mg/kg)	$[Cd]_{soil}$ (mg/kg)	$[Cd]_{worms}$ (mg/kg)	$[Co]_{soil}$ (mg/kg)	$[Co]_{worms}$ (mg/kg)	$[Mo]_{soil}$ (mg/kg)	$[Mo]_{worms}$ (mg/kg)	$[Ni]_{soil}$ (mg/kg)	$[Ni]_{worms}$ (mg/kg)	$[Pb]_{soil}$ (mg/kg)	$[Pb]_{worms}$ (mg/kg)	$[Se]_{soil}$ (mg/kg)	$[Se]_{worms}$ (mg/kg)	$[Zn]_{soil}$ (mg/kg)	$[Zn]_{worms}$ (mg/kg)
14-day pilot study (8/20/09-9/3/09)																			
	0%	97.5	3.91	2620	334	3.6	1.2	81	15.3	27.4	6.6	18.7	5.8	144	16.3	48.2	9.83	513	128
	34%	100	4.19	1850	147	3.1	1	64.8	10.6	21.9	7.1	19.9	7.7	121	7.95	33.8	5.76	386	111
SA-05A	56%	100	4.18	1140	114	1.9	1.2	45.7	9.9	14.6	7	20	7.9	84	5.56	21.9	5.03	268	113
	0%	97.5	3.34	4730	191	0.3	1	10.2	6.9	41.7	3.7	7.8	2	73.8	4.41	44.8	6.54	96	93.9
	34%	100	3.75	3090	189	0.3	1.2	10.5	7.5	23.8	7.2	13	7	56.2	4.2	28.6	5.75	84	99
TZ-26A	56%	97.5	3.91	1900	93.5	0.2	1.2	11.1	7.4	14.5	6.1	16.1	6.3	43.1	3.07	18	4.08	70	94.6
	0%	95	3.85	808	69	0.3	1	37.5	8.8	29	6.5	7.7	4.4	68.8	4.47	63	7.69	239	101
	34%	100	4.01	548	49	0.2	1.1	30.1	8.9	18.1	5.1	13.8	4.6	55.5	3.69	39.3	5.81	183	101
TR-06-A2	56%	100	4.12	526	52	0.2	1	25.8	8.4	15.9	8.3	17.5	9.3	43.4	3.53	27	4.63	145	101
28-day definitive test (4/21/10-5/19/10)																			
ref soil	--	100	3.97	19.2	11.2	0.2	1.6	11.2	8.4	0.37	4.6	21.8	5.8	21.6	2.03	0.4	2.23	57	98.8
	0%	28.8	4.32	2920	280	3.6	1.3	108	26.6	18.4	6.1	21.6	10	82.2	4.15	26.3	4.15	572	123
SA-05	50%	53.8	4.20	1810	139	2.3	1.9	75.8	19.5	11.5	1.8	20.8	4.2	60.1	2.2	16.8	4.06	319	118
T6-7	0%	3.8	7.46	8550	333	3.4	1.2	61.6	7.4	9.27	6.9	27.6	9.1	56.7	1.18	8.4	3.55	359	109
T6-7 (dup)	0%	2.5	7.34	8330	--	3.5	--	65.1	--	9.81	--	28	--	70	--	7.9	--	358	--
	0%	not tested for toxicity		NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
	25%	0	2.88	12000	NS	10.4	NS	252	NS	21.8	NS	60.3	NS	55.1	NS	58.2	NS	926	NS
	50%	0	3.18	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--
	75%	0	3.50	4420	NS	4.5	NS	110	NS	9.84	NS	35.2	NS	38.8	NS	23.6	NS	433	NS
TW-B	88%	0	3.67	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--	NA	--

Robert Seal from the USGS provided all the analytical data for the worm and soil samples

NA = not analyzed

NS = no survival

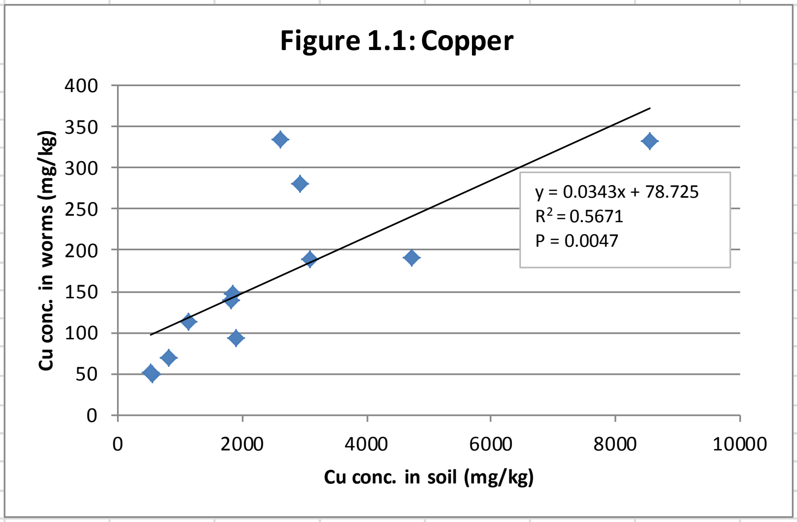
Attachment 2: Additional data for metals in soil, soil invertebrates, and small mammals												
Matrix	**FOD**	**Aluminum**	**FOD**	**Arsenic**	**FOD**	**Cadmium**	**FOD**	**Chromium**	**FOD**	**Iron**	**FOD**	**Lead**
Off-Site Reference Location												
soil	15/15	7,670	15/15	2.11	8/15	0.61	15/15	20.4	15/15	13,900	15/15	27.7
soil invertebrates	--	no data	--	no data	--	no data	--	no data	2/2	25.5	--	no data
small mammals	5/10	25	--	no data	--	no data	2/10	1.09	10/10	101	--	no data
Ely Mine Halo Zone												
soil	170/170	11,600	135/170	2.79	135/169	1.38	170/170	38.1	170/170	43,200	170/170	49.6
soil invertebrates	5/5	125	--	no data	2/5	0.67	2/5	1.52	5/5	375	--	no data
small mammals	7/30	23.2	8/30	1.05	1/30	0.52	3/3	1.1	30/30	116	1/30	1.02

FOD = frequency of detection

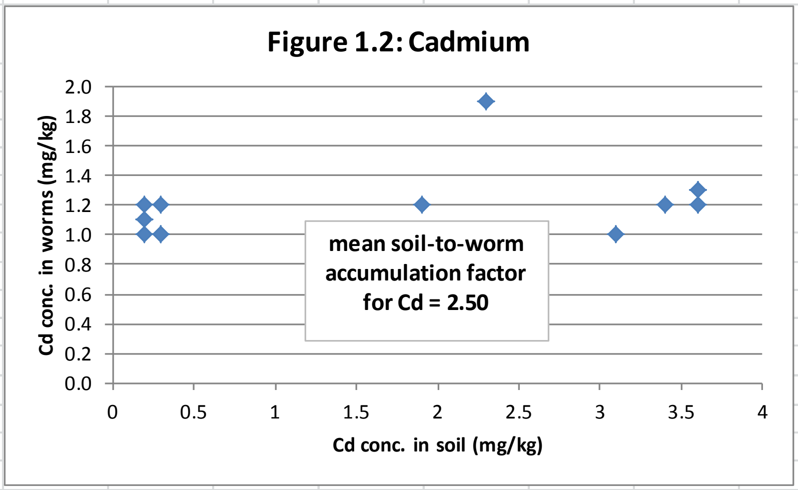
source: Tables 2-4, and 2.7 through 2.11 in the Feb. 2011 draft terrestrial BERA prepared by Nobis

Figure 1: Concentrations of select metals in soils and earthworms

Sample ID	$[Cu]_{soil}$ (mg/kg)	$[Cu]_{worms}$ (mg/kg)
SA-05A	2620	334
	1850	147
	1140	114
TZ-26A	4730	191
	3090	189
	1900	94
TR-06-A2	808	69
	548	49
	526	52
SA-05	2920	280
	1810	139
T6-7	8550	333



Sample ID	$[Cd]_{soil}$ (mg/kg)	$[Cd]_{worms}$ (mg/kg)
SA-05A	3.6	1.2
	3.1	1.0
	1.9	1.2
TZ-26A	0.3	1.0
	0.3	1.2
	0.2	1.2
TR-06-A2	0.3	1.0
	0.2	1.1
	0.2	1.0
SA-05	3.6	1.3
	2.3	1.9
T6-7	3.4	1.2



Sample ID	$[Co]_{soil}$ (mg/kg)	$[Co]_{worms}$ (mg/kg)
SA-05A	81	15.3
	64.8	10.6
	45.7	9.9
TZ-26A	10.2	6.9
	10.5	7.5
	11.1	7.4
TR-06-A2	37.5	8.8
	30.1	8.9
	25.8	8.4
SA-05	108	26.6
	75.8	19.5
T6-7	61.6	7.4

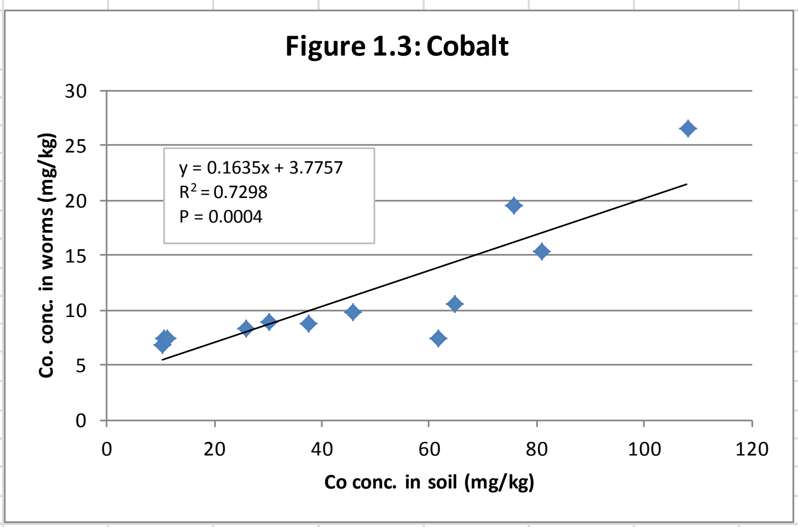
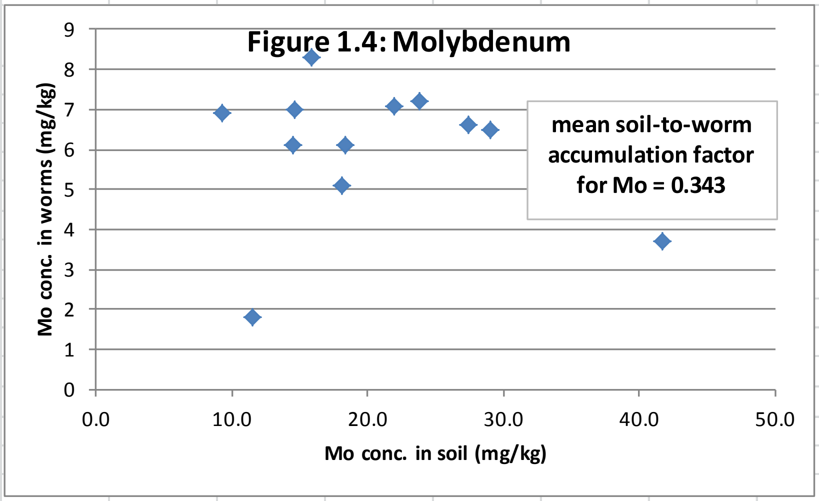
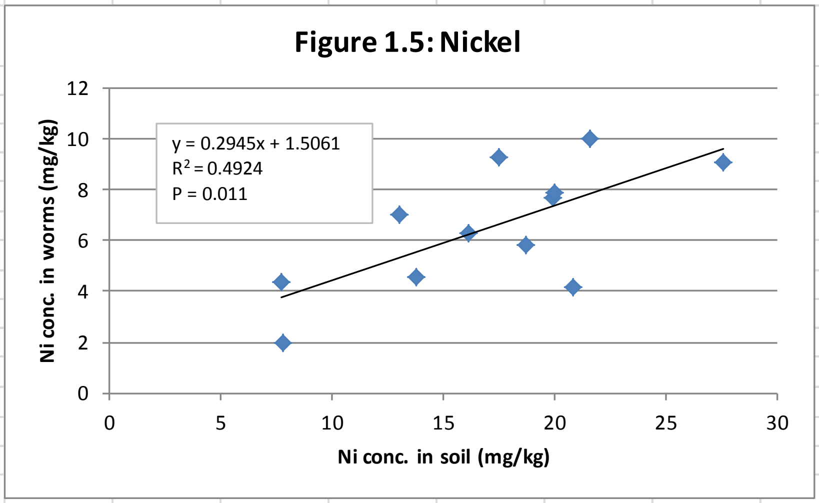


Figure 1: Concentrations of select metals in soils and earthworms

Sample ID	$[Mo]_{soil}$ (mg/kg)	$[Mo]_{worms}$ (mg/kg)
SA-05A	27.4	6.6
	21.9	7.1
	14.6	7.0
TZ-26A	41.7	3.7
	23.8	7.2
	14.5	6.1
TR-06-A2	29.0	6.5
	18.1	5.1
	15.9	8.3
SA-05	18.4	6.1
	11.5	1.8
T6-7	9.3	6.9



soil ID	$[Ni]_{soil}$ (mg/kg)	$[Ni]_{worms}$ (mg/kg)
SA-05A	18.7	5.8
	19.9	7.7
	20	7.9
TZ-26A	7.8	2
	13	7
	16.1	6.3
TR-06-A2	7.7	4.4
	13.8	4.6
	17.5	9.3
SA-05	21.6	10
	20.8	4.2
T6-7	27.6	9.1



soil ID	$[Pb]_{soil}$ (mg/kg)	$[Pb]_{worms}$ (mg/kg)
SA-05A	144	16.3
	121	7.95
	84	5.56
TZ-26A	73.8	4.41
	56.2	4.2
	43.1	3.07
TR-06-A2	68.8	4.47
	55.5	3.69
	43.4	3.53
SA-05	82.2	4.15
	60.1	2.2
T6-7	56.7	1.18

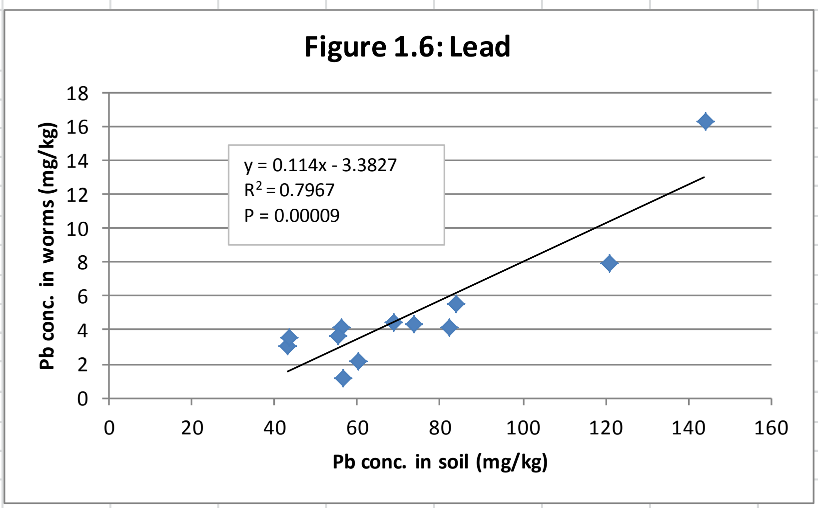
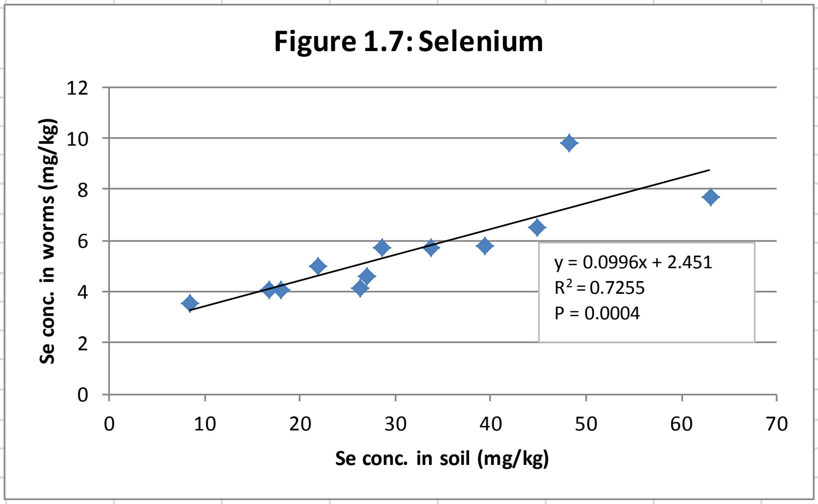


Figure 1: Concentrations of select metals in soils and earthworms

Soil ID	$[Se]_{soil}$ (mg/kg)	$[Se]_{worm}$ (mg/kg)
SA-05	48.2	9.83
	33.8	5.76
	21.9	5.03
TZ-26A	44.8	6.54
	28.6	5.75
	18	4.08
TR-06-A2	63	7.69
	39.3	5.81
	27	4.63
SA-05	26.3	4.15
	16.8	4.06
T6-7	8.4	3.55



Sample	$[Zn]_{soil}$ (mg/kg)	$[Zn]_{worms}$ (mg/kg)
SA-05A	513	128
	386	111
	268	113
TZ-26A	96	93.9
	84	99
	70	94.6
TR-06-A2	239	101
	183	101
	145	101
SA-05	572	123
	319	118
T6-7	359	109

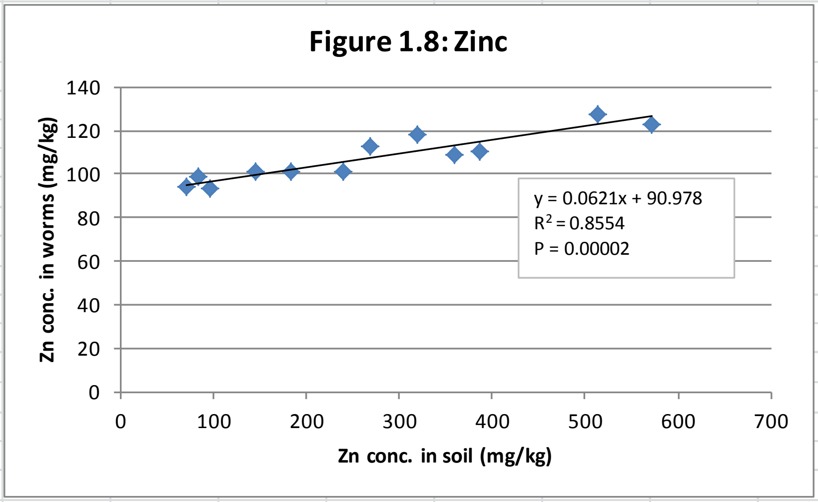


Figure 2.1: Cu (mean + 1 SD) in soil, terrestrial invertebrates, and small mammals from Ely Mine and a reference location

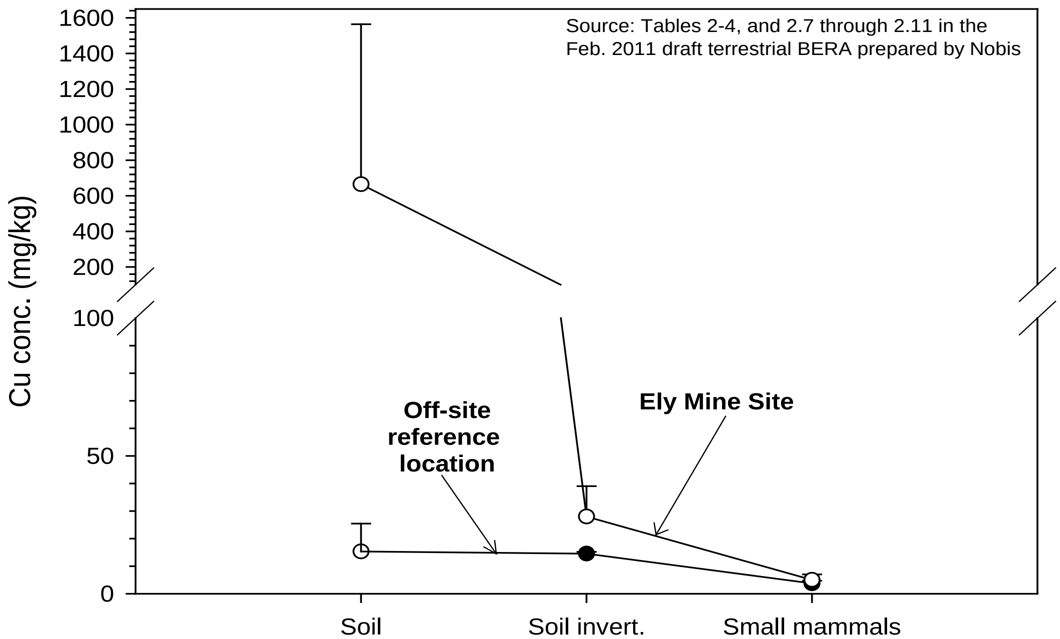
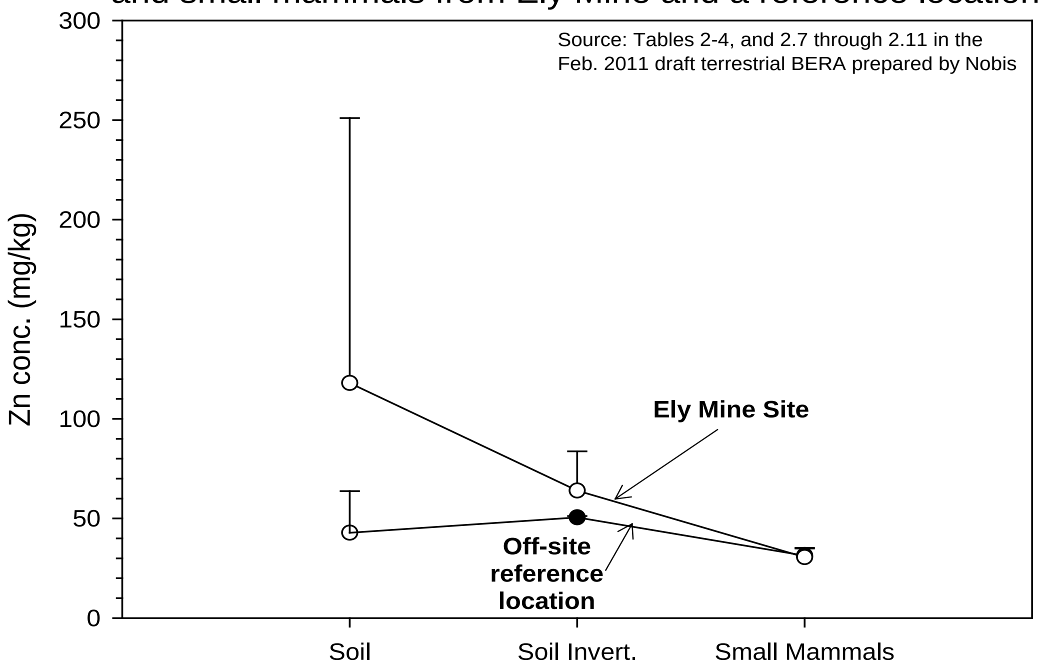


Figure 2.2: Zn (mean + 1 SD) in soil, terrestrial invertebrates, and small mammals from Ely Mine and a reference location



Appendix 1: Analytical data for sequential extractions of six mine waste samples									
Sample Ely-SD-09 (Ely Brook Sediment)									
extraction step	**Cd (mg/kg)**	**Co (mg/kg)**	**Cu (mg/kg)**	**Fe (mg/kg)**	**Mo (mg/kg)**	**Ni (mg/kg)**	**Pb (mg/kg)**	**Se (mg/kg)**	**Zn (mg/kg)**
1	< 0.004	0.35	6.3	< 10	< 0.4	0.2	< 0.01	< 0.2	0.2
2	0.02	0.12	35	48	< 0.4	0.1	< 0.5	< 0.2	< 2.3
3	< 0.004	0.12	22.4	2150	< 0.4	< 0.08	< 0.2	< 0.2	0.2
4	0.02	0.24	45.4	1690	< 0.4	0.2	1.1	0.2	1
5	< 0.004	1.32	371	43170	6.43	1.8	18	4.9	11.7
6	0.27	13.2	2640	99900	25.2	11.3	40.8	29	139
7	0.09	5.7	86.3	24100	24.3	10.2	33.2	2.5	70
sum of extractions[a]	**0.412**	**21.05**	**3206**	**171068**	**57.5**	**23.9**	**93.8**	**37.2**	**224**
RATIO 1[b]	***0.117***	***0.039***	***0.034***	***0.023***	***0.028***	***0.024***	***0.019***	***0.022***	***0.016***
bulk conc.[c]	**0.38**	**15.2**	**2840**	**162000**	**20.3**	**10.5**	**51.4**	**43.0**	**153**
RATIO 2[d]	***0.126***	***0.055***	***0.038***	***0.024***	***0.079***	***0.055***	***0.035***	***0.019***	***0.024***
Sample 02Ely2A (Ely Mine upper mine waste pile)									
extraction step	**Cd (mg/kg)**	**Co (mg/kg)**	**Cu (mg/kg)**	**Fe (mg/kg)**	**Mo (mg/kg)**	**Ni (mg/kg)**	**Pb (mg/kg)**	**Se (mg/kg)**	**Zn (mg/kg)**
1	0.04	1.96	47.5	11	< 0.4	0.5	< 0.01	0.3	8.8
2	0.04	0.16	47.1	22	< 0.4	< 0.08	< 0.5	0.2	1.7
3	< 0.004	0.08	22	1120	0.54	< 0.08	< 0.2	0.5	1
4	0.01	0.12	20.5	1180	0.49	< 0.08	0.07	0.4	1
5	< 0.004	1.42	264	53670	10.4	0.7	19.2	10.7	12.8
6	0.92	17.9	2250	153000	23	9.7	35.1	32	283
7	0.1	6.5	65.9	29300	8.6	9.6	40.1	2.8	91.1
sum of extractions[a]	**1.1**	**28.1**	**2717**	**238303**	**43.8**	**20.7**	**95.2**	**47**	**399**
RATIO 1[b]	***0.084***	***0.082***	***0.050***	***0.010***	***0.042***	***0.036***	***0.008***	***0.030***	***0.031***
bulk conc.[c]	**0.48**	**18.9**	**2500**	**174000**	**15.8**	**7.7**	**50.6**	**41.0**	**186**
RATIO 2[d]	***0.196***	***0.123***	***0.055***	***0.013***	***0.116***	***0.096***	***0.015***	***0.034***	***0.067***

Appendix 1 (cont'd): Analytical data for sequential extractions of six mine waste samples

Sample 02Ely10A (Ely Mine roast bed)

extraction step	Cd (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Mo (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
1	< 0.004	0.04	7.2	< 10	< 0.4	< 0.08	< 0.01	1.1	< 0.1
2	0.01	0.009	27.3	13	< 0.4	< 0.08	< 0.5	< 0.2	< 2.3
3	< 0.004	0.01	18.2	1240	1.38	< 0.08	0.1	3.4	< 0.7
4	0.01	0.06	21.1	1350	1.23	0.1	1.3	1.3	0.8
5	0.07	4.14	428	50670	22.3	1.8	37.2	21.2	34.1
6	1.1	36.2	1630	155000	23.3	15.6	22.2	47	493
7	1.3	41.9	704	117000	11.8	16.3	37.2	27	557
sum of extractions[a]	**2.5**	**82.4**	**2836**	**325283**	**60.8**	**34.0**	**98.5**	**101**	**1088**
RATIO 1[b]	***0.011***	***0.001***	***0.026***	***0.008***	***0.056***	***0.010***	***0.019***	***0.059***	***0.004***
bulk conc.[c]	**1.1**	**35.6**	**1970**	**205000**	**24.8**	**14.3**	**60.5**	**75.0**	**466**
RATIO 2[d]	***0.025***	***0.003***	***0.037***	***0.013***	***0.138***	***0.024***	***0.032***	***0.080***	***0.008***

Sample 1139830-SD (Pike Hill Brook sediment)

extraction step	Cd (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Mo (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
1	0.09	2.35	27.5	< 10	< 0.4	0.3	< 0.01	< 0.2	15.1
2	0.07	0.39	60.2	44	< 0.4	< 0.08	< 0.5	< 0.2	7.6
3	0.02	0.31	40.6	1730	< 0.4	< 0.08	< 0.2	< 0.2	4.5
4	0.05	0.47	78.4	1510	< 0.4	0.1	2	< 0.2	8
5	< 0.004	3.73	513	55570	3.42	1.2	36.9	6.5	62.8
6	11.7	77.2	13900	272000	35.9	16.7	31.8	37	2230
7	0.05	9.7	110	37600	8.8	13.6	16	9.3	86.2
sum of extractions[a]	**12.0**	**94.2**	**14730**	**368464**	**49.7**	**32.1**	**87.4**	**53.6**	**2414**
RATIO 1[b]	***0.019***	***0.037***	***0.014***	***0.009***	***0.032***	***0.017***	***0.031***	***0.015***	***0.015***
bulk conc.[c]	**5.5**	**50.3**	**6940**	**208000**	**16.5**	**8.4**	**55.8**	**44.0**	**1110**
RATIO 2[d]	***0.042***	***0.070***	***0.030***	***0.016***	***0.097***	***0.067***	***0.049***	***0.018***	***0.032***

Appendix 1 (cont'd): Analytical data for sequential extractions of six mine waste samples

04PKHL9 (Pike Hill Mine partially burned mine waste)

extraction step	Cd (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Mo (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
1	0.12	19.3	156	14	< 0.4	1	< 0.01	1.8	13.4
2	0.07	1.89	170	35	< 0.4	0.1	< 0.5	0.3	4.5
3	< 0.004	0.26	61	2240	1.3	< 0.08	< 0.2	10.4	1
4	0.01	0.31	29.6	1290	0.82	0.08	1.9	2.7	1
5	< 0.004	5.74	232	44170	14.8	0.9	94.8	15.3	35.7
6	1.1	68.2	9070	225000	29.5	10.7	23.5	100	528
7	0.36	31.8	2480	161000	18.3	9.4	15.8	55	337
sum of extractions[a]	**1.7**	**128**	**12199**	**433749**	**65.5**	**22.3**	**137**	**186**	**921**
RATIO 1[b]	***0.122***	***0.171***	***0.034***	***0.008***	***0.045***	***0.057***	***0.019***	***0.082***	***0.022***
bulk conc.[c]	**2.2**	**91.7**	**10300**	**237000**	**33.2**	**9.5**	**153**	**140**	**637**
RATIO 2[d]	***0.093***	***0.237***	***0.040***	***0.015***	***0.088***	***0.133***	***0.017***	***0.109***	***0.031***

04PKHL11 (Pike Hill Mine waste pile)

extraction step	Cd (mg/kg)	Co (mg/kg)	Cu (mg/kg)	Fe (mg/kg)	Mo (mg/kg)	Ni (mg/kg)	Pb (mg/kg)	Se (mg/kg)	Zn (mg/kg)
1	0.04	1.06	20	< 10	< 0.4	0.2	< 0.01	0.4	3.9
2	0.02	0.11	32.3	23	< 0.4	< 0.08	< 0.5	0.3	0.2
3	< 0.004	0.06	16	1160	0.53	< 0.08	< 0.2	0.7	0
4	0.01	0.08	16.9	1290	0.57	< 0.08	0.9	0.8	0.9
5	< 0.004	4.34	282	59470	11.8	0.9	55.5	12.7	27.6
6	0.21	43.6	5780	168000	18	5.1	30.5	33	239
7	0.03	4.2	666	14900	4.3	3.3	16.4	5	53.9
sum of extractions[a]	**0.32**	**53.5**	**6813**	**244853**	**36**	**9.7**	**104**	**52.9**	**326**
RATIO 1[b]	***0.233***	***0.025***	***0.013***	***0.010***	***0.053***	***0.045***	***0.015***	***0.042***	***0.015***
bulk conc.[c]	**0.72**	**42.6**	**8140**	**215000**	**25.8**	**4**	**91.5**	**62**	**276**
RATIO 2[d]	***0.103***	***0.031***	***0.010***	***0.012***	***0.074***	***0.110***	***0.018***	***0.035***	***0.018***

Source: Piatak et al. 2007. Sequential extraction results and mineralogy of mine waste and stream sediments associated with metal mines in Vermont, Maine, and New Zealand: U.S. Geological Survey Open-File report 2007-1063, 34 p.

Shaded areas indicate the first four extraction steps which together are assumed to simulate a generic "stomach environment".

[a] the sum of the extractions is obtained by adding the concentrations from extraction steps 1 through 7.

[b] RATIO 1 represents the metal-specific sum of the concentrations from the seven extraction steps divided by the sum of the concentrations from the first four extraction steps.

[c] The bulk concentrations were obtained from Appendix 2 in Piatak et al., 2007.

[d] RATIO 2 for each metal represents the bulk concentration divided by the sum of the concentrations from the first four extraction steps.

APPENDIX E

TABLE E-1
SUMMARY OF SOIL SAMPLES USED IN THE ERA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Data Group	Source	Sample ID	Date	Depth Range (feet)
Background	URS	ELY-SS-BK-07A (0-3)	10/16/2007	0 - 0.25
Background	URS	ELY-SS-BK-07B (0-3)	10/16/2007	0 - 0.25
Background	URS	ELY-SS-BK-07C (0-4)	10/16/2007	0 - 0.33
Background	URS	ELY-SS-BK-08A (0-10)	10/16/2007	0 - 0.83
Background	URS	ELY-SS-BK-08B (0-7)	10/16/2007	0 - 0.58
Background	URS	ELY-SS-BK-08C (0-12)	10/16/2007	0 - 1
Background	URS	ELY-SS-BK-10A (0-6)	10/16/2007	0 - 0.5
Background	URS	ELY-SS-BK-10B (0-1)	10/16/2007	0 - 0.08
Background	URS	ELY-SS-BK-10C (0-6)	10/16/2007	0 - 0.5
Background	URS	ELY-SS-BK-10C (0-6) DUP	10/16/2007	0 - 0.5
Background	URS	ELY-SS-BK-14A (0-1)	10/16/2007	0 - 0.08
Background	URS	ELY-SS-BK-14B (0-8)	10/16/2007	0 - 0.67
Background	URS	ELY-SS-BK-14C (0-1)	10/16/2007	0 - 0.08
Background	URS	ELY-SS-BK-15A (0-2)	10/16/2007	0 - 0.17
Background	URS	ELY-SS-BK-15B (0-0.5)	10/16/2007	0 - 0.04
Background	URS	ELY-SS-BK-15C (0-2.5)	10/16/2007	0 - 0.21
Barren	Nobis	TD-03X-082809-AX	8/28/2009	0 - 1
Barren	Nobis	TD-05X-082809-DX	8/28/2009	0 - 1
Barren	Nobis	TF-11X-090209AX	9/2/2009	0 - 0.5
Barren	Nobis	TF-11X-090909AX	9/2/2009	0 - 0.5
Barren	Nobis	TH-01X-082509AX	8/25/2009	0 - 1
Barren	Nobis	TP-16X-080309AX	8/3/2009	0 - 1
Barren	URS	ELY-SB-1_2_3	12/7/2006	0 - 0
Barren	URS	ELY-SB-7_8	12/7/2006	0 - 0
Barren	URS	ELY-SS-NF-01 (0-2)	10/16/2007	0 - 0.17
Barren	URS	ELY-SS-SA-02 (0-3)	10/16/2007	0 - 0.25
Barren	URS	ELY-SS-SA-02 (0-3) DUP	10/16/2007	0 - 0.25
Barren	URS	ELY-SS-SA-03 (0-6)	10/15/2007	0 - 0.5
Barren	URS	ELY-SS-SA-05 (0-6)	10/15/2007	0 - 0.5
Barren	URS	ELY-SS-SA-07 (0-6)	10/15/2007	0 - 0.5
Barren	URS	ELY-SS-SA-08 (0-6)	10/15/2007	0 - 0.5
Barren	URS	ELY-SS-SA-10 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-11 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-12 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-12 (0-6) DUP	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-13 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-14 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-15 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-15 (0-6) DUP	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-16 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-17 (0-6)	10/16/2007	0 - 0.5
Barren	URS	ELY-SS-SA-18 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-19 (0-6)	10/16/2007	0 - 0.5
Barren	URS	ELY-SS-SA-20 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-21 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-22 (0-6)	10/17/2007	0 - 0.5
Barren	URS	ELY-SS-SA-24 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-24 (0-6) DUP	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-25 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-26 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-27 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-28 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-29 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-30 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-SA-31 (0-6)	10/18/2007	0 - 0.5
Barren	URS	ELY-SS-TR-01A (0-1)	10/15/2007	0 - 0.08
Barren	URS	ELY-SS-TR-01A (1-8)	10/15/2007	0.08 - 0.67
Barren	URS	ELY-SS-TR-01B (0-1.5)	10/15/2007	0 - 0.13

TABLE E-1
SUMMARY OF SOIL SAMPLES USED IN THE ERA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Data Group	Source	Sample ID	Date	Depth Range (feet)
Barren	URS	ELY-SS-TR-01B (1.5-8)	10/15/2007	0.13 - 0.67
Barren	URS	ELY-SS-TR-01C (0-2)	10/15/2007	0 - 0.17
Barren	URS	ELY-SS-TR-01C (2-11)	10/15/2007	0.17 - 0.92
Barren	URS	ELY-SS-TR-01D (0.5-10)	10/15/2007	0.04 - 0.83
Barren	URS	ELY-SS-TR-01D (0-0.5)	10/15/2007	0 - 0.04
Barren	URS	ELY-SS-TR-03A (0.5-12)	10/17/2007	0.04 - 1
Barren	URS	ELY-SS-TR-03A (0-0.5)	10/17/2007	0 - 0.04
Barren	URS	ELY-SS-TR-04A (0-1)	10/17/2007	0 - 0.08
Barren	URS	ELY-SS-TR-04A (1-12)	10/17/2007	0.08 - 1
Barren	URS	ELY-SS-TR-05A (0-2.5)	10/17/2007	0 - 0.21
Barren	URS	ELY-SS-TR-05A (2.5-9)	10/17/2007	0.21 - 0.75
Barren	URS	ELY-SS-TR-05B (0-1)	10/17/2007	0 - 0.08
Barren	URS	ELY-SS-TR-05B (1-7)	10/17/2007	0.08 - 0.58
Barren	URS	ELY-SS-TR-07A (0-1)	10/18/2007	0 - 0.08
Barren	URS	ELY-SS-TR-07A (1-8)	10/18/2007	0.08 - 0.67
Barren	URS	ELY-SS-TR-08B (0-3)	10/18/2007	0 - 0.25
Barren	URS	ELY-SS-TR-08B (0-3) DUP	10/18/2007	0 - 0.25
Barren	URS	ELY-SS-TR-08B (3-8)	10/18/2007	0.25 - 0.67
Barren	URS	ELY-SS-TR-08B (3-8) DUP	10/18/2007	0.25 - 0.67
Barren	URS	ELY-SS-TR-09A (0-2.5)	10/18/2007	0 - 0.21
Barren	URS	ELY-SS-TR-09A (2.5-12)	10/18/2007	0.21 - 1
Barren	URS	ELY-SS-TZ-01 (0-1.5)	10/16/2007	0 - 0.13
Barren	URS	ELY-SS-TZ-01 (1.5-8)	10/16/2007	0.13 - 0.67
Barren	URS	ELY-SS-TZ-02 (0-1.5)	10/16/2007	0 - 0.13
Barren	URS	ELY-SS-TZ-02 (1.5-6)	10/16/2007	0.13 - 0.5
Barren	URS	ELY-SS-TZ-04 (0-2)	10/16/2007	0 - 0.17
Barren	URS	ELY-SS-TZ-04 (0-2) DUP	10/16/2007	0 - 0.17
Barren	URS	ELY-SS-TZ-04 (2-6)	10/16/2007	0.17 - 0.5
Barren	URS	ELY-SS-TZ-04 (2-6) DUP	10/16/2007	0.17 - 0.5
Barren	URS	ELY-SS-TZ-05 (0-1)	10/16/2007	0 - 0.08
Barren	URS	ELY-SS-TZ-05 (0-1)	10/23/2007	0 - 0.08
Barren	URS	ELY-SS-TZ-05 (1-8)	10/16/2007	0.08 - 0.67
Barren	URS	ELY-SS-TZ-05 (1-8)	10/23/2007	0.08 - 0.67
Barren	URS	ELY-SS-TZ-07 (0-1.5)	10/16/2007	0 - 0.13
Barren	URS	ELY-SS-TZ-07 (1.5-6.5)	10/16/2007	0.13 - 0.54
Barren	URS	ELY-SS-TZ-08 (0.5-10)	10/16/2007	0.04 - 0.83
Barren	URS	ELY-SS-TZ-08 (0-0.5)	10/16/2007	0 - 0.04
Barren	URS	ELY-SS-TZ-09 (0.5-12)	10/18/2007	0.04 - 1
Barren	URS	ELY-SS-TZ-09 (0-0.5)	10/18/2007	0 - 0.04
Barren	URS	ELY-SS-TZ-10 (0-1)	10/15/2007	0 - 0.08
Barren	URS	ELY-SS-TZ-10 (1-10)	10/15/2007	0.08 - 0.83
Barren	URS	ELY-SS-TZ-13 (0-4)	10/17/2007	0 - 0.33
Barren	URS	ELY-SS-TZ-13 (4-12)	10/17/2007	0.33 - 1
Barren	URS	ELY-SS-TZ-17 (0.5-12)	10/17/2007	0.04 - 1
Barren	URS	ELY-SS-TZ-17 (0-0.5)	10/17/2007	0 - 0.04
Barren	URS	ELY-SS-TZ-19 (.5-12)	10/17/2007	0.04 - 1
Barren	URS	ELY-SS-TZ-19 (0-.5)	10/17/2007	0 - 0.04
Barren	URS	ELY-SS-TZ-20 (0-1)	10/17/2007	0 - 0.08
Barren	URS	ELY-SS-TZ-20 (1-12)	10/17/2007	0.08 - 1
Barren	URS	ELY-SS-TZ-22 (0-2)	10/17/2007	0 - 0.17
Barren	URS	ELY-SS-TZ-22 (2-10)	10/17/2007	0.17 - 0.83
Barren	URS	ELY-SS-TZ-24 (0-1)	10/17/2007	0 - 0.08
Barren	URS	ELY-SS-TZ-24 (1-12)	10/17/2007	0.08 - 1
Barren	URS	ELY-SS-TZ-25 (0-3)	10/17/2007	0 - 0.25
Barren	URS	ELY-SS-TZ-25 (3-11)	10/17/2007	0.25 - 0.92
Barren	URS	ELY-SS-TZ-26 (0-1.5)	10/17/2007	0 - 0.13
Barren	URS	ELY-SS-TZ-26 (1.5-12)	10/17/2007	0.13 - 1
Barren	URS	ELY-SS-TZ-28 (0.5-9)	10/19/2007	0.04 - 0.75

TABLE E-1
SUMMARY OF SOIL SAMPLES USED IN THE ERA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Data Group	Source	Sample ID	Date	Depth Range (feet)
Barren	URS	ELY-SS-TZ-28 (0-0.5)	10/19/2007	0 - 0.04
Barren	URS	ELY-SS-TZ-32 (0-2)	10/19/2007	0 - 0.17
Barren	URS	ELY-SS-TZ-32 (2-9)	10/19/2007	0.17 - 0.75
Barren	URS	ELY-SS-TZ-33 (0-2)	10/18/2007	0 - 0.17
Barren	URS	ELY-SS-TZ-33 (2-12)	10/18/2007	0.17 - 1
Barren	URS	ELY-SS-TZ-41 (0-1.5)	10/18/2007	0 - 0.13
Barren	URS	ELY-SS-TZ-41 (1.5-11)	10/18/2007	0.13 - 0.92
Barren	URS	ELY-SS-TZ-44 (0-3)	10/17/2007	0 - 0.25
Barren	URS	ELY-SS-TZ-44 (3-12)	10/17/2007	0.25 - 1
Barren	URS	ELY-SS-TZ-45 (0-2)	10/17/2007	0 - 0.17
Barren	URS	ELY-SS-TZ-45 (2-12)	10/17/2007	0.17 - 1
Vegetated	Nobis	SS-01X-090209AX	9/2/2009	0 - 0.5
Vegetated	Nobis	SS-02X-090209AX	9/2/2009	0 - 0.5
Vegetated	Nobis	SS-03X-090209AX	9/2/2009	0 - 0.5
Vegetated	Nobis	SS-04X-090209AX	9/2/2009	0 - 0.5
Vegetated	Nobis	SS-05X-090209AX	9/2/2009	0 - 0.3
Vegetated	Nobis	SS-06X-090209AX	9/2/2009	0 - 0.5
Vegetated	Nobis	SS-07X-090209AX	9/2/2009	0 - 0.5
Vegetated	Nobis	SS-08X-090209AX	9/2/2009	0 - 1
Vegetated	Nobis	SS-09X-090209AX	9/2/2009	0 - 1
Vegetated	Nobis	SS-10X-090309AX	9/3/2009	0 - 0.5
Vegetated	Nobis	SS-11X-090309AX	9/3/2009	0 - 0.5
Vegetated	Nobis	SS-12X-090309AX	9/3/2009	0 - 0.5
Vegetated	Nobis	SS-13X-082809AX	8/28/2009	0 - 0.3
Vegetated	Nobis	SS-14X-083109AX	8/31/2009	0 - 0.2
Vegetated	Nobis	SS-15X-083109AX	8/31/2009	0 - 0.2
Vegetated	Nobis	SS-16X-090309AX	9/3/2009	0 - 0.5
Vegetated	Nobis	SS-17X-083109AX	8/31/2009	0 - 0.3
Vegetated	Nobis	SS-18X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	SS-19X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	SS-20X-083109AX	8/31/2009	0 - 0.2
Vegetated	Nobis	SS-21X-083109AX	8/31/2009	0 - 0.2
Vegetated	Nobis	SS-22X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	SS-23X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	SS-24X-083109AX	8/31/2009	0 - 0.2
Vegetated	Nobis	SS-25X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	SS-26X-083109AX	8/31/2009	0 - 0.3
Vegetated	Nobis	SS-27X-082609AX	8/26/2009	0 - 1
Vegetated	Nobis	SS-28X-083109AX	8/31/2009	0 - 1
Vegetated	Nobis	SS-29X-083109AX	8/31/2009	0 - 0.3
Vegetated	Nobis	TA-04X-082409AX	8/24/2009	0 - 1
Vegetated	Nobis	TA-14X-082409AX	8/24/2009	0 - 1
Vegetated	Nobis	TC-03X-082609AX	8/26/2009	0 - 1
Vegetated	Nobis	TF-13X-090909BX	9/2/2009	0 - 0.5
Vegetated	Nobis	TG-02X-082409AX	8/24/2009	0 - 1
Vegetated	Nobis	TI-03X-082509AX	8/25/2009	0 - 1
Vegetated	Nobis	TK-01X-082509AX	8/25/2009	0 - 1
Vegetated	Nobis	TL-04X-082509AX	8/25/2009	0 - 1
Vegetated	Nobis	TN-02X-082509AD	8/25/2009	0 - 1
Vegetated	Nobis	TN-02X-082509AX	8/25/2009	0 - 1
Vegetated	Nobis	TN-10X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	TO-05X-082709AX	8/27/2009	0 - 1
Vegetated	Nobis	TP-15X-073009AD	7/30/2009	0 - 1
Vegetated	Nobis	TP-15X-073009AX	7/30/2009	0 - 1
Vegetated	Nobis	TQ-06X-082609AX	8/26/2009	0 - 1
Vegetated	Nobis	TQ-16X-082609AX	8/26/2009	0 - 1
Vegetated	URS	ELY-SS-NF-01 (2-7)	10/16/2007	0.17 - 0.58
Vegetated	URS	ELY-SS-NF-02 (0-8)	10/16/2007	0 - 0.67

TABLE E-1
SUMMARY OF SOIL SAMPLES USED IN THE ERA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Data Group	Source	Sample ID	Date	Depth Range (feet)
Vegetated	URS	ELY-SS-NF-03 (0-4)	10/16/2007	0 - 0.33
Vegetated	URS	ELY-SS-NF-03 (4-12)	10/16/2007	0.33 - 1
Vegetated	URS	ELY-SS-NF-04 (0-4)	10/16/2007	0 - 0.33
Vegetated	URS	ELY-SS-NF-04 (0-4) DUP	10/16/2007	0 - 0.33
Vegetated	URS	ELY-SS-NF-04 (4-10)	10/16/2007	0.33 - 0.83
Vegetated	URS	ELY-SS-NF-04 (4-10) DUP	10/16/2007	0.33 - 0.83
Vegetated	URS	ELY-SS-NF-05 (0-3)	10/16/2007	0 - 0.25
Vegetated	URS	ELY-SS-NF-05 (3-11)	10/16/2007	0.25 - 0.92
Vegetated	URS	ELY-SS-NF-06 (0-3)	10/16/2007	0 - 0.25
Vegetated	URS	ELY-SS-NF-06 (3-12)	10/16/2007	0.25 - 1
Vegetated	URS	ELY-SS-NF-07 (0-2)	10/17/2007	0 - 0.17
Vegetated	URS	ELY-SS-NF-07 (2-8)	10/17/2007	0.17 - 0.67
Vegetated	URS	ELY-SS-NF-08 (0-2)	10/16/2007	0 - 0.17
Vegetated	URS	ELY-SS-NF-08 (2-11)	10/16/2007	0.17 - 0.92
Vegetated	URS	ELY-SS-NF-09 (0-1.5)	10/17/2007	0 - 0.13
Vegetated	URS	ELY-SS-NF-09 (1.5-12)	10/17/2007	0.13 - 1
Vegetated	URS	ELY-SS-NF-10 (0-4)	10/16/2007	0 - 0.33
Vegetated	URS	ELY-SS-NF-10 (4-12)	10/16/2007	0.33 - 1
Vegetated	URS	ELY-SS-NF-11 (0-3)	10/16/2007	0 - 0.25
Vegetated	URS	ELY-SS-NF-11 (3-9)	10/16/2007	0.25 - 0.75
Vegetated	URS	ELY-SS-NF-12 (0-2)	10/19/2007	0 - 0.17
Vegetated	URS	ELY-SS-NF-12 (2-9)	10/19/2007	0.17 - 0.75
Vegetated	URS	ELY-SS-NF-13 (0-2.5)	10/19/2007	0 - 0.21
Vegetated	URS	ELY-SS-NF-13 (2.5-12)	10/19/2007	0.21 - 1
Vegetated	URS	ELY-SS-NF-14 (0-3)	10/18/2007	0 - 0.25
Vegetated	URS	ELY-SS-NF-14 (3-12)	10/18/2007	0.25 - 1
Vegetated	URS	ELY-SS-NF-15 (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-NF-15 (2-5)	10/18/2007	0.17 - 0.42
Vegetated	URS	ELY-SS-NF-16 (0-1)	10/18/2007	0 - 0.08
Vegetated	URS	ELY-SS-NF-16 (1-12)	10/18/2007	0.08 - 1
Vegetated	URS	ELY-SS-NF-17 (0-4)	10/18/2007	0 - 0.33
Vegetated	URS	ELY-SS-NF-17 (4-10)	10/18/2007	0.33 - 0.83
Vegetated	URS	ELY-SS-SA-01 (0-2)	10/16/2007	0 - 0.17
Vegetated	URS	ELY-SS-SA-04 (0-6)	10/15/2007	0 - 0.5
Vegetated	URS	ELY-SS-SA-06 (0-6)	10/15/2007	0 - 0.5
Vegetated	URS	ELY-SS-SA-09 (0-4)	10/15/2007	0 - 0.33
Vegetated	URS	ELY-SS-SA-23 (0-6)	10/19/2007	0 - 0.5
Vegetated	URS	ELY-SS-TR-02A (0-1.5)	10/15/2007	0 - 0.13
Vegetated	URS	ELY-SS-TR-02A (1.5-11)	10/15/2007	0.13 - 0.92
Vegetated	URS	ELY-SS-TR-02B (0-4)	10/15/2007	0 - 0.33
Vegetated	URS	ELY-SS-TR-02B (4-11)	10/15/2007	0.33 - 0.92
Vegetated	URS	ELY-SS-TR-02C (0-3)	10/15/2007	0 - 0.25
Vegetated	URS	ELY-SS-TR-02C (3-12)	10/15/2007	0.25 - 1
Vegetated	URS	ELY-SS-TR-02D (0-2)	10/15/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-02D (2-12)	10/15/2007	0.17 - 1
Vegetated	URS	ELY-SS-TR-02D (2-12) DUP	10/15/2007	0.17 - 1
Vegetated	URS	ELY-SS-TR-02D(0-2) DUP	10/15/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-03B (0-2)	10/17/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-03B (2-12)	10/17/2007	0.17 - 1
Vegetated	URS	ELY-SS-TR-03C (0-3)	10/17/2007	0 - 0.25
Vegetated	URS	ELY-SS-TR-03C (3-12)	10/17/2007	0.25 - 1
Vegetated	URS	ELY-SS-TR-04B (0-1.5)	10/17/2007	0 - 0.13
Vegetated	URS	ELY-SS-TR-04B (1.5-12)	10/17/2007	0.13 - 1
Vegetated	URS	ELY-SS-TR-04C (0-3)	10/17/2007	0 - 0.25
Vegetated	URS	ELY-SS-TR-04C (3-6)	10/17/2007	0.25 - 0.5
Vegetated	URS	ELY-SS-TR-05C (0-1)	10/17/2007	0 - 0.08
Vegetated	URS	ELY-SS-TR-05C (1-12)	10/17/2007	0.08 - 1
Vegetated	URS	ELY-SS-TR-05D (0-3)	10/17/2007	0 - 0.25

TABLE E-1
SUMMARY OF SOIL SAMPLES USED IN THE ERA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Data Group	Source	Sample ID	Date	Depth Range (feet)
Vegetated	URS	ELY-SS-TR-05D (3-12)	10/17/2007	0.25 - 1
Vegetated	URS	ELY-SS-TR-06A (0-1)	10/19/2007	0 - 0.08
Vegetated	URS	ELY-SS-TR-06A (1-12)	10/19/2007	0.08 - 1
Vegetated	URS	ELY-SS-TR-06B (0-3)	10/19/2007	0 - 0.25
Vegetated	URS	ELY-SS-TR-06B (3-7)	10/19/2007	0.25 - 0.58
Vegetated	URS	ELY-SS-TR-06C (0-3)	10/19/2007	0 - 0.25
Vegetated	URS	ELY-SS-TR-06C (3-12)	10/19/2007	0.25 - 1
Vegetated	URS	ELY-SS-TR-07B (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-07B (2-8)	10/18/2007	0.17 - 0.67
Vegetated	URS	ELY-SS-TR-07C (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-07C (2-12)	10/18/2007	0.17 - 1
Vegetated	URS	ELY-SS-TR-07D (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-07D (2-9)	10/18/2007	0.17 - 0.75
Vegetated	URS	ELY-SS-TR-08A (0.5-12)	10/18/2007	0.04 - 1
Vegetated	URS	ELY-SS-TR-08A (0.5-12)DUP	10/18/2007	0.04 - 1
Vegetated	URS	ELY-SS-TR-08A (0-0.5)	10/18/2007	0 - 0.04
Vegetated	URS	ELY-SS-TR-08A (0-0.5) DUP	10/18/2007	0 - 0.04
Vegetated	URS	ELY-SS-TR-08C (0-5)	10/18/2007	0 - 0.42
Vegetated	URS	ELY-SS-TR-08C (0-5) DUP	10/18/2007	0 - 0.42
Vegetated	URS	ELY-SS-TR-08C (5-12)	10/18/2007	0.42 - 1
Vegetated	URS	ELY-SS-TR-08C (5-12) DUP	10/18/2007	0.42 - 1
Vegetated	URS	ELY-SS-TR-08D (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-08D (0-2) DUP	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-08D (2-12)	10/18/2007	0.17 - 1
Vegetated	URS	ELY-SS-TR-08D (2-12) DUP	10/18/2007	0.17 - 1
Vegetated	URS	ELY-SS-TR-09B (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TR-09B (2-5)	10/18/2007	0.17 - 0.42
Vegetated	URS	ELY-SS-TR-09C (0-1.5)	10/18/2007	0 - 0.13
Vegetated	URS	ELY-SS-TR-09C (1.5-8)	10/18/2007	0.13 - 0.67
Vegetated	URS	ELY-SS-TR-09D (0-3)	10/18/2007	0 - 0.25
Vegetated	URS	ELY-SS-TR-09D (3-12)	10/18/2007	0.25 - 1
Vegetated	URS	ELY-SS-TZ-06 (0-1)	10/16/2007	0 - 0.08
Vegetated	URS	ELY-SS-TZ-06 (1-12)	10/16/2007	0.08 - 1
Vegetated	URS	ELY-SS-TZ-11 (0-1)	10/15/2007	0 - 0.08
Vegetated	URS	ELY-SS-TZ-11 (1-5.5)	10/15/2007	0.08 - 0.46
Vegetated	URS	ELY-SS-TZ-12 (0-3)	10/18/2007	0 - 0.25
Vegetated	URS	ELY-SS-TZ-12 (3-8)	10/18/2007	0.25 - 0.67
Vegetated	URS	ELY-SS-TZ-14 (0-4)	10/17/2007	0 - 0.33
Vegetated	URS	ELY-SS-TZ-14 (4-12)	10/17/2007	0.33 - 1
Vegetated	URS	ELY-SS-TZ-15 (0-3.5)	10/17/2007	0 - 0.29
Vegetated	URS	ELY-SS-TZ-15 (3.5-12)	10/17/2007	0.29 - 1
Vegetated	URS	ELY-SS-TZ-16 (0-4)	10/17/2007	0 - 0.33
Vegetated	URS	ELY-SS-TZ-16 (4-12)	10/17/2007	0.33 - 1
Vegetated	URS	ELY-SS-TZ-18 (.5-12)	10/17/2007	0.04 - 1
Vegetated	URS	ELY-SS-TZ-18 (0-.5)	10/17/2007	0 - 0.04
Vegetated	URS	ELY-SS-TZ-21 (0-5)	10/17/2007	0 - 0.42
Vegetated	URS	ELY-SS-TZ-21 (5-12)	10/17/2007	0.42 - 1
Vegetated	URS	ELY-SS-TZ-23 (0-2.5)	10/17/2007	0 - 0.21
Vegetated	URS	ELY-SS-TZ-23 (2.5-12)	10/17/2007	0.21 - 1
Vegetated	URS	ELY-SS-TZ-27 (0-2.5)	10/16/2007	0 - 0.21
Vegetated	URS	ELY-SS-TZ-27 (2.5-8)	10/16/2007	0.21 - 0.67
Vegetated	URS	ELY-SS-TZ-29 (0-1)	10/19/2007	0 - 0.08
Vegetated	URS	ELY-SS-TZ-29 (1-9)	10/19/2007	0.08 - 0.75
Vegetated	URS	ELY-SS-TZ-30 (0.5-12)	10/19/2007	0.04 - 1
Vegetated	URS	ELY-SS-TZ-30 (0-0.5)	10/19/2007	0 - 0.04
Vegetated	URS	ELY-SS-TZ-31 (0-3)	10/19/2007	0 - 0.25
Vegetated	URS	ELY-SS-TZ-31 (3-9)	10/19/2007	0.25 - 0.75
Vegetated	URS	ELY-SS-TZ-34 (0-2.5)	10/18/2007	0 - 0.21

TABLE E-1
SUMMARY OF SOIL SAMPLES USED IN THE ERA
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Data Group	Source	Sample ID	Date	Depth Range (feet)
Vegetated	URS	ELY-SS-TZ-34 (2.5-8)	10/18/2007	0.21 - 0.67
Vegetated	URS	ELY-SS-TZ-35 (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TZ-35 (2-9)	10/18/2007	0.17 - 0.75
Vegetated	URS	ELY-SS-TZ-36 (0-1.5)	10/18/2007	0 - 0.13
Vegetated	URS	ELY-SS-TZ-36 (1.5-9)	10/18/2007	0.13 - 0.75
Vegetated	URS	ELY-SS-TZ-37 (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TZ-37 (2-12)	10/18/2007	0.17 - 1
Vegetated	URS	ELY-SS-TZ-38 (0.5-7)	10/18/2007	0.04 - 0.58
Vegetated	URS	ELY-SS-TZ-38 (0-0.5)	10/18/2007	0 - 0.04
Vegetated	URS	ELY-SS-TZ-39 (0-3)	10/18/2007	0 - 0.25
Vegetated	URS	ELY-SS-TZ-39 (3-8)	10/18/2007	0.25 - 0.67
Vegetated	URS	ELY-SS-TZ-40 (0-2)	10/18/2007	0 - 0.17
Vegetated	URS	ELY-SS-TZ-40 (2-10)	10/18/2007	0.17 - 0.83
Vegetated	URS	ELY-SS-TZ-42 (0-2)	10/17/2007	0 - 0.17
Vegetated	URS	ELY-SS-TZ-42 (2-12)	10/17/2007	0.17 - 1
Vegetated	URS	ELY-SS-TZ-43 (0-2.5)	10/17/2007	0 - 0.21
Vegetated	URS	ELY-SS-TZ-43 (2.5-11)	10/17/2007	0.21 - 0.92
Vegetated	URS	ELY-TP-104 (0-1)	10/5/2007	0 - 1
Vegetated	URS	ELY-TP-104 (0-1) DUP	10/5/2007	0 - 1
Vegetated	URS	ELY-TP-109 (0-1)	10/5/2007	0 - 1

APPENDIX F

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-NF-01	ELY-SS-NF-02	ELY-SS-NF-03	ELY-SS-NF-03	ELY-SS-NF-04	ELY-SS-NF-04 DUP	ELY-SS-NF-04
	Depth (ft):	0.17-0.58	0-0.67	0-0.33	0.33-1	0-0.33	0-0.33	0.33-0.83
	Sample Date:	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007
Analyte	**Units**							
Aluminum	mg/kg	14000 J	16000 J	1300 J	100000 J	38000 J	1700 J	20000 J
Antimony	mg/kg	12 U	3.1 U	6 U	15 U	7.9 U	6.6 U	6.3 U
Arsenic	mg/kg	0.59 J	2.4 J	1.3	2.7 J	2.1 U	2.1	1.6
Barium	mg/kg	23 J	71 J	36	110	130 J	26 J	46 J
Beryllium	mg/kg	0.4 UJ	0.82	0.057 UJ	5.4	2.2	0.11 J	0.94
Cadmium	mg/kg	0.26 J	0.88	2.2	3.6	1.3 J	0.74 J	0.72 J
Calcium	mg/kg	1000 J	4200 J	8200	4000	1200 J	1200 J	530 J
Chromium	mg/kg	36 J	36 J	3.7 J	440 J	88 J	3.2 J	47 J
Cobalt	mg/kg	16 J	15 J	2.9	87	24 J	3.1 J	11 J
Copper	mg/kg	220 J	270 J	34	2000	400 J	51 J	320 J
Cyanide	mg/kg							
Iron	mg/kg	20000 J	19000 J	2400 J	140000 J	53000 J	2400 J	29000 J
Lead	mg/kg	4.7 J	35 J	12	20	14 J	65 J	8.6 J
Magnesium	mg/kg	4800 J	6800 J	910 J	24000 J	16000 J	710 J	6100 J
Manganese	mg/kg	180	720	260	660	270 J	74 J	160 J
Mercury	mg/kg	0.017 J	0.19 J	0.22	0.042 J	0.18	0.26	0.045 J
Molybdenum	mg/kg	12 U	0.41 J	6 U	3.7 J	0.64 J	0.55 J	0.54 J
Nickel	mg/kg	19 J	26 J	4.1	110	61 J	7.9 J	25 J
Potassium	mg/kg	880 J	1800 J	1500	6700	10000 J	860 J	2800 J
Selenium	mg/kg	2.7 J	1.7 J	1.5 J	9.9	3.7	2.6	3.3
Silver	mg/kg	0.33 J	0.33 J	0.17 J	1 J	0.3 J	0.21 J	0.11 J
Sodium	mg/kg	470 UJ	390 J	340	610 U	320 U	150 J	250 U
Strontium	mg/kg							
Thallium	mg/kg	4.7 U	6.1 U	2.4 U	6.1 U	3 J	2.6 U	2.1 J
Vanadium	mg/kg	49 J	34 J	7.2 J	400 J	110 J	6 J	56 J
Zinc	mg/kg	40 J	94 J	150	460	99	71	52
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-NF-04 DUP	ELY-SS-NF-05	ELY-SS-NF-05	ELY-SS-NF-06	ELY-SS-NF-06	ELY-SS-NF-07	ELY-SS-NF-07
	Depth (ft):	0.33-0.83	0-0.25	0.25-0.92	0-0.25	0.25-1	0-0.17	0.17-0.67
	Sample Date:	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/17/2007	10/17/2007
Analyte	**Units**							
Aluminum	mg/kg	17000 J	13000 J	10000 J	14000 J	15000 J	7000 J	7600 J
Antimony	mg/kg	5.9 U	13 U	12 U	16 U	18 U	4.9 U	4.4 U
Arsenic	mg/kg	1.7 U	3.2	2.4	1.9 J	2.1 J	2.5	0.6 UJ
Barium	mg/kg	41 J	48 J	36 J	72 J	64 J	42 J	30 J
Beryllium	mg/kg	0.9	0.68 J	0.55 J	0.68 J	0.69 J	0.26 J	0.23 J
Cadmium	mg/kg	0.54 J	1 J	1 J	2.5 J	1.9 J	0.47 J	0.26 J
Calcium	mg/kg	660 J	1700 J	1400 J	3600 J	2700 J	1300 J	2200 J
Chromium	mg/kg	42 J	29 J	22 J	32 J	33 J	9	7.3
Cobalt	mg/kg	9.3 J	42 J	50 J	16 J	14 J	8	9.4
Copper	mg/kg	250 J	1500 J	1400 J	300 J	290 J	48	56
Cyanide	mg/kg							
Iron	mg/kg	26000 J	39000 J	36000 J	18000 J	18000 J	17000	13000
Lead	mg/kg	9.3 J	75 J	34 J	24 J	22 J	22	1.1 J
Magnesium	mg/kg	5000 J	5300 J	3700 J	5200 J	5400 J	3100 J	3100 J
Manganese	mg/kg	170 J	300 J	410 J	1200 J	1000 J	400 J	77 J
Mercury	mg/kg	0.041 J	0.12	0.079 J	0.11 J	0.12 J	0.051 J	0.022 J
Molybdenum	mg/kg	0.43 J	2.7 J	3 J	16 U	1.2 J	0.78 J	0.76 J
Nickel	mg/kg	20 J	19 J	16 J	24 J	24 J	8.1 J	9 J
Potassium	mg/kg	2500 J	1200 J	1200 J	1000 J	1000 J	620 J	800 J
Selenium	mg/kg	2.5 U	5.6	4.3 J	2.6 UJ	1.3 UJ	2	1.4 UJ
Silver	mg/kg	0.23 J	1.5 J	0.51 UJ	0.64 UJ	0.6 UJ	0.17 J	0.88 U
Sodium	mg/kg	230 U	710	970	660 U	700 U	200 U	180 U
Strontium	mg/kg							
Thallium	mg/kg	5.9 U	5.4 U	4.7 U	6.6 U	2.9 J	1.1 J	1.2 J
Vanadium	mg/kg	53 J	36 J	23 J	32 J	33 J	52 J	39 J
Zinc	mg/kg	44	360	470	110	97	45	24
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-NF-08	ELY-SS-NF-08	ELY-SS-NF-09	ELY-SS-NF-09	ELY-SS-NF-10	ELY-SS-NF-10	ELY-SS-NF-11
	Depth (ft):	0-0.17	0.17-0.92	0-0.13	0.13-1	0-0.33	0.33-1	0-0.25
	Sample Date:	10/16/2007	10/16/2007	10/17/2007	10/17/2007	10/16/2007	10/16/2007	10/16/2007
Analyte	**Units**							
Aluminum	mg/kg	20000 J	15000 J	7500	17000	16000 J	21000 J	18000 J
Antimony	mg/kg	12 U	18 U	23 U	11 U	17 U	13 U	21 U
Arsenic	mg/kg	1.2 J	2.6 J	4.8	0.77 J	2.1 J	1.8 J	4.2
Barium	mg/kg	49 J	100 J	72	62	91 J	61 J	120 J
Beryllium	mg/kg	0.95 J	0.69 J	0.42 UJ	0.84 J	0.83 J	1 J	0.94 J
Cadmium	mg/kg	0.36 J	1.2 J	0.5 J	0.35 J	0.82 J	0.51 J	1.1 J
Calcium	mg/kg	880 J	3900 J	670	1100	4200 J	1900 J	3000 J
Chromium	mg/kg	48 J	35 J	30	57	45 J	61 J	53 J
Cobalt	mg/kg	12 J	11 J	15	14	12 J	14 J	16 J
Copper	mg/kg	56 J	47 J	530	320	85 J	66 J	94 J
Cyanide	mg/kg							
Iron	mg/kg	20000 J	14000 J	93000	27000	20000 J	25000 J	23000 J
Lead	mg/kg	6.7 J	27 J	74	5.7 J	36 J	16 J	94 J
Magnesium	mg/kg	7300 J	5600 J	3100	8400	7000 J	8900 J	8000 J
Manganese	mg/kg	240 J	660 J	110 J	180 J	500 J	410 J	1700 J
Mercury	mg/kg	0.064 J	0.11 J	0.26	0.044 J	0.059 J	0.037 J	0.12 J
Molybdenum	mg/kg	12 U	18 U	15 J	1.8 UJ	17 U	13 U	21 U
Nickel	mg/kg	38 J	29 J	18	36	30 J	35 J	33 J
Potassium	mg/kg	2000 J	1600 J	2800 J	4100 J	1900 J	2300 J	1900 J
Selenium	mg/kg	1.4 UJ	1.6 UJ	35	4.5	1.7 UJ	1.7 UJ	2.5 UJ
Silver	mg/kg	0.14 UJ	0.34 UJ	9.3	1.3 J	0.47 UJ	0.3 UJ	0.82 UJ
Sodium	mg/kg	470 U	700 U	920 U	450 U	690 U	530 U	830 U
Strontium	mg/kg							
Thallium	mg/kg	4.7 U	7 U	5 J	4.5 U	6.9 U	5.3 U	8.3 U
Vanadium	mg/kg	39 J	32 J	71	47	44 J	59 J	59 J
Zinc	mg/kg	56	120	130	61	79	60	120
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-NF-11	ELY-SS-NF-12	ELY-SS-NF-12	ELY-SS-NF-13	ELY-SS-NF-13	ELY-SS-NF-14	ELY-SS-NF-14
	Depth (ft):	0.25-0.75	0-0.17	0.17-0.75	0-0.21	0.21-1	0-0.25	0.25-1
	Sample Date:	10/16/2007	10/19/2007	10/19/2007	10/19/2007	10/19/2007	10/18/2007	10/18/2007
Analyte	**Units**							
Aluminum	mg/kg	20000 J	14000	24000	14000	12000	8400	14000
Antimony	mg/kg	12 U	5.8 U	12 U	14 U	12 U	7 U	11 U
Arsenic	mg/kg	1.9 J	3	2.4 U	2.1 J	2.4 U	2.7	1 J
Barium	mg/kg	79 J	34	63	76	68	60 J	40 J
Beryllium	mg/kg	0.96 J	0.72	1.3	0.6 J	0.59 J	0.44 J	0.76 J
Cadmium	mg/kg	0.45 J	0.39 J	0.25 J	0.45 J	0.38 J	0.4 J	2.2 U
Calcium	mg/kg	1500 J	540	760	800	400	2000	970
Chromium	mg/kg	51 J	28 J	47 J	44 J	48 J	21 J	33 J
Cobalt	mg/kg	13 J	7.1	16	12	12	6.8	9.4
Copper	mg/kg	110 J	23	48	520	570	37	54
Cyanide	mg/kg							
Iron	mg/kg	21000 J	14000	26000	43000	59000	14000	17000
Lead	mg/kg	18 J	44	7.8 J	16	9.6 J	32	6.3 J
Magnesium	mg/kg	8600 J	4900	12000	6600	7000	4200 J	6100 J
Manganese	mg/kg	660 J	140 J	140 J	230 J	150 J	500	210
Mercury	mg/kg	0.032 J	0.068 J	0.029 J	0.092 J	0.02 J	0.1 J	0.045 J
Molybdenum	mg/kg	12 U	0.59 UJ	12 U	1.8 J	4.2 J	0.62 J	11 U
Nickel	mg/kg	31 J	22	53	28	24	20 J	26 J
Potassium	mg/kg	2900 J	1300 J	5000 J	3800 J	5600 J	2400	1800
Selenium	mg/kg	1.6 UJ	1.5 J	1.4 J	8.3	17	1.6 J	1.6 J
Silver	mg/kg	0.29 UJ	1.2 U	2.4 U	2.4 J	1 J	0.33 J	2.2 U
Sodium	mg/kg	480 U	230 U	490 U	550 U	480 U	280 U	450 U
Strontium	mg/kg							
Thallium	mg/kg	4.8 U	2.3 U	4.9 U	5.5 U	4.8 U	2.8 U	4.5 U
Vanadium	mg/kg	50 J	32	48	47	56	32 J	38 J
Zinc	mg/kg	64	60 J	44 J	110 J	87 J	72	44
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-NF-15	ELY-SS-NF-15	ELY-SS-NF-16	ELY-SS-NF-16	ELY-SS-NF-17	ELY-SS-NF-17	ELY-SS-SA-01
	Depth (ft):	0-0.17	0.17-0.42	0-0.08	0.08-1	0-0.33	0.33-0.83	0-0.17
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/16/2007
Analyte	**Units**							
Aluminum	mg/kg	7600 J	23000 J	2900 J	16000 J	1600	16000	3700 J
Antimony	mg/kg	6.2 U	12 U	2.7 U	12 U	3.4 U	1.2 UJ	1.1 J
Arsenic	mg/kg	2.8	2.5 U	1.2	2.5 U	1.4	2.6 U	2.7 J
Barium	mg/kg	170	71	55	51	170	91	38 J
Beryllium	mg/kg	0.43 J	1.2	0.16 J	0.86 J	0.13 J	0.94 J	0.12 UJ
Cadmium	mg/kg	2.2	0.24 J	0.38 J	2.5 U	1.3	0.23 UJ	1 J
Calcium	mg/kg	6900	900	1900	1300	5900	1100	1500 J
Chromium	mg/kg	20 J	50 J	9.1 J	41 J	5.2	58	12 J
Cobalt	mg/kg	6.8	12	2.8	10	3.9	10	51 J
Copper	mg/kg	24	35	21	130	16	53	1700 J
Cyanide	mg/kg							
Iron	mg/kg	11000 J	27000 J	4800 J	20000 J	2700	22000	54000 J
Lead	mg/kg	35 J	13 J	19 J	7.5 J	28 J	6.6 J	21 J
Magnesium	mg/kg	3700 J	8800 J	1500 J	7100 J	1100	6600	1600 J
Manganese	mg/kg	900 J	94 J	320 J	240 J	1000 J	460 J	160
Mercury	mg/kg	0.2 J	0.078 J	0.1	0.04 J	0.19	0.059 J	0.42 J
Molybdenum	mg/kg	6.2 U	12 U	0.2 J	12 U	0.24 UJ	13 U	5.6 J
Nickel	mg/kg	18 J	39 J	7.4 J	30 J	6.6	28	11 J
Potassium	mg/kg	2300	3700	910	2300	830 J	2300 J	1100 J
Selenium	mg/kg	2.4 J	2.3 UJ	1.2	2 UJ	1.4	2.6 J	13 J
Silver	mg/kg	0.62 J	0.21 J	0.27 J	0.16 J	0.35 J	0.2 UJ	1.9 J
Sodium	mg/kg	280	500 U	39 J	490 U	160	530 U	420 J
Strontium	mg/kg							
Thallium	mg/kg	2.5 UJ	5 UJ	1.1 UJ	4.9 UJ	0.45 J	5.3 UJ	4.6 U
Vanadium	mg/kg	26 J	55 J	12 J	38 J	8	52	21 J
Zinc	mg/kg	140	52	71	42	120	46	310 J
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-SA-04	ELY-SS-SA-06	ELY-SS-SA-09	ELY-SS-SA-23	ELY-SS-TR-02A	ELY-SS-TR-02A	ELY-SS-TR-02B
	Depth (ft):	0-0.5	0-0.5	0-0.33	0-0.5	0-0.13	0.13-0.92	0-0.33
	Sample Date:	10/15/2007	10/15/2007	10/15/2007	10/19/2007	10/15/2007	10/15/2007	10/15/2007
Analyte	**Units**							
Aluminum	mg/kg	6200	2200	6400	8700	2200 J	6200 J	1700 J
Antimony	mg/kg	1.2 UJ	5.9 J	2.3 UJ	23 U	0.39 J	0.28 J	6.8 U
Arsenic	mg/kg	3.3	2.5	1.3 J	4.6 U	2.3 J	3.1 J	2.4 J
Barium	mg/kg	77	59	41	57	21	43	58
Beryllium	mg/kg	0.27 UJ	0.34 UJ	0.18 UJ	0.39 UJ	0.099 J	0.35	0.053 J
Cadmium	mg/kg	2.4 U	5 U	2.2 U	0.39 J	0.54 J	3.2 J	1 J
Calcium	mg/kg	950	70	660	150	5600 J	42000 J	10000 J
Chromium	mg/kg	20	18	34	92 J	6 J	13 J	4.2 J
Cobalt	mg/kg	73	35	120	27	7 J	47 J	12 J
Copper	mg/kg	3800	1700	1600	670	280 J	1500 J	670 J
Cyanide	mg/kg							
Iron	mg/kg	63000	170000	150000	130000	12000 J	12000 J	8500 J
Lead	mg/kg	41	180	16	27	33 J	11 J	39 J
Magnesium	mg/kg	2400	820	2300	4600	930 J	4300 J	920 J
Manganese	mg/kg	180 J	100 J	200 J	150 J	150 J	500 J	180 J
Mercury	mg/kg	0.22	0.44	0.21	0.05 J	0.044 J	0.02 J	0.15 J
Molybdenum	mg/kg	6 J	27	17	6 UJ	0.37 J	0.95 J	0.68 J
Nickel	mg/kg	17	8.9	7.9	15	6	16	6.4
Potassium	mg/kg	1800	6800	3200	12000 J	490 J	1200 J	1100 J
Selenium	mg/kg	15	72	22	26	3	11	6.6
Silver	mg/kg	3.9	12	5.9	2.9 J	0.24 UJ	0.71	1 J
Sodium	mg/kg	750 J	500 UJ	1700 J	920 U	300 J	830 J	600 J
Strontium	mg/kg							
Thallium	mg/kg	4.4 J	5.9 J	5.3 J	5.2 UJ	1 J	9.5 U	2.7 U
Vanadium	mg/kg	27	85	67	110	9.6	19 J	7.3 J
Zinc	mg/kg	300	190	730	140 J	100	210	180
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-02B	ELY-SS-TR-02C	ELY-SS-TR-02C	ELY-SS-TR-02D	ELY-SS-TR-02D	ELY-SS-TR-02D DUP
	Depth (ft):	0.33-0.92	0-0.25	0.25-1	0-0.17	0.17-1	0.17-1
	Sample Date:	10/15/2007	10/15/2007	10/15/2007	10/15/2007	10/15/2007	10/15/2007
Analyte	**Units**						
Aluminum	mg/kg	5700 J	9300 J	6200 J	11000 J	10000 J	11000 J
Antimony	mg/kg	1.2 J	0.92 J	0.7 J	0.64 UJ	1.2 J	2.6 J
Arsenic	mg/kg	14 J	6.8 J	9.1 J	8.3 J	3.6 J	3 J
Barium	mg/kg	74	44	55	91	56	52
Beryllium	mg/kg	0.24 J	0.43	0.31	0.44 J	0.36 J	0.36 J
Cadmium	mg/kg	1 UJ	1.1 J	2.8 J	1.7 UJ	2.6 UJ	2.6 UJ
Calcium	mg/kg	1000 J	2600 J	42000 J	5100 J	1800 J	2000 J
Chromium	mg/kg	16 J	14 J	9 J	33 J	27 J	27 J
Cobalt	mg/kg	33 J	14 J	8.5 J	22 J	82 J	110 J
Copper	mg/kg	1900 J	420 J	360 J	690 J	2100 J	2800 J
Cyanide	mg/kg						
Iron	mg/kg	40000 J	14000 J	11000 J	39000 J	75000 J	98000 J
Lead	mg/kg	68 J	200 J	200 J	54 J	51 J	26 J
Magnesium	mg/kg	1800 J	2200 J	2400 J	4700 J	4100 J	4000 J
Manganese	mg/kg	150 J	240 J	240 J	440 J	350 J	390 J
Mercury	mg/kg	0.09 J	0.074 J	0.028 J	0.13 J	0.044 J	0.055 J
Molybdenum	mg/kg	3.6 J	1.5 J	1.2 J	3.2 J	6.6 J	9.8 J
Nickel	mg/kg	14	13	10	25	18	17
Potassium	mg/kg	2000 J	1200 J	1200 J	2700 J	2100 J	2400 J
Selenium	mg/kg	38	2.6	2.6	9.3	9.4	11
Silver	mg/kg	1.6	0.24 UJ	0.38 J	2.9	1.4 J	1.7 J
Sodium	mg/kg	560 J	480 J	620 J	230 J	2600 J	3800 J
Strontium	mg/kg						
Thallium	mg/kg	10 U	5.3 U	10 U	2.7 J	4.9 J	4.1 J
Vanadium	mg/kg	20 J	30 J	21 J	43 J	33 J	33 J
Zinc	mg/kg	120	120	150	170	1000	1500
Acid Base Potential	t CaCO3/1000t						
Acid Generation Potential	t CaCO3/1000t						
Acid Neutralization Potential	t CaCO3/1000t						
Acid-Base Accounting	t CaCO3/1000t						
Cation Exchange Capacity	meq/100 g						
pH	SU						
Saturated Paste Conductivity	mmhos/cm						
Sulfate	%						
Sulfur	%						
Sulfur, Dissociable	%						
Sulfur, Pyritic	%						
Sulfur, Residual	%						
Total Organic Carbon	%						

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-02D(0-2)	ELY-SS-TR-03B	ELY-SS-TR-03B	ELY-SS-TR-03C	ELY-SS-TR-03C	ELY-SS-TR-04B
	Depth (ft):	0-0.17	0-0.17	0.17-1	0-0.25	0.25-1	0-0.13
	Sample Date:	10/15/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**						
Aluminum	mg/kg	24000 J	6800	15000	1700	12000	1600 J
Antimony	mg/kg	1 J	43 U	1.9 J	5.5 U	14 U	4.1 U
Arsenic	mg/kg	15 J	8.6 U	1.7 J	1.3	1.4 J	0.9
Barium	mg/kg	150	120 J	190 J	60 J	32 J	22
Beryllium	mg/kg	1	4.3 U	1.1 J	0.035 UJ	0.57 J	0.084 UJ
Cadmium	mg/kg	2 UJ	2 J	2 J	2.3	2.9 U	0.25 J
Calcium	mg/kg	4800 J	14000	1000	2400	1700	1300
Chromium	mg/kg	72 J	7.4 J	77 J	2.6 J	35 J	5.1 J
Cobalt	mg/kg	32 J	6.4 J	35	7.8	5.4 J	1.8
Copper	mg/kg	1200 J	1600 J	2900 J	190 J	270 J	42
Cyanide	mg/kg						
Iron	mg/kg	72000 J	62000	160000	9500	25000	3900 J
Lead	mg/kg	44 J	180	62	22	23	17 J
Magnesium	mg/kg	11000 J	760	7400	430	5000	760 J
Manganese	mg/kg	880 J	40	160	33	92	81 J
Mercury	mg/kg	0.14 J	0.14 J	0.074 J	0.19 J	0.044 J	0.27
Molybdenum	mg/kg	6.8 J	43 U	16 J	0.66 J	14 U	0.5 UJ
Nickel	mg/kg	50	7.4 J	32	4.9	15	3.9 J
Potassium	mg/kg	6800 J	790 J	5900 J	900 J	850 J	700
Selenium	mg/kg	18	19	62	4.6	3.6 J	1.7
Silver	mg/kg	4.3	10	11	5.5	0.55 J	0.31 J
Sodium	mg/kg	410 UJ	1800	690 U	200 J	580 U	52 J
Strontium	mg/kg						
Thallium	mg/kg	4.4 J	6.4 J	13 J	2.2 U	5.8 U	1.6 UJ
Vanadium	mg/kg	82 J	9.3	120	5.2	39	7.2 J
Zinc	mg/kg	200	320	280	35	74	35
Acid Base Potential	t CaCO3/1000t						
Acid Generation Potential	t CaCO3/1000t						
Acid Neutralization Potential	t CaCO3/1000t						
Acid-Base Accounting	t CaCO3/1000t						
Cation Exchange Capacity	meq/100 g						
pH	SU						
Saturated Paste Conductivity	mmhos/cm						
Sulfate	%						
Sulfur	%						
Sulfur, Dissociable	%						
Sulfur, Pyritic	%						
Sulfur, Residual	%						
Total Organic Carbon	%						

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-04B	ELY-SS-TR-04C	ELY-SS-TR-04C	ELY-SS-TR-05C	ELY-SS-TR-05C	ELY-SS-TR-05D	ELY-SS-TR-05D
	Depth (ft):	0.13-1	0-0.25	0.25-0.5	0-0.08	0.08-1	0-0.25	0.25-1
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**							
Aluminum	mg/kg	17000 J	7300 J	22000 J	8900 J	16000 J	8300 J	8400 J
Antimony	mg/kg	6.5 U	12 U	18 U	6.2 U	0.33 J	0.7 J	1.2 J
Arsenic	mg/kg	1 J	3.7	2.4 J	2.2 U	0.59 UJ	4.7	0.96 UJ
Barium	mg/kg	37	110	160	24 J	44 J	40 J	46
Beryllium	mg/kg	0.84	0.36 J	0.99 J	0.34 J	0.66	0.34 J	0.34 J
Cadmium	mg/kg	0.31 J	1.4 J	0.72 J	0.69 J	0.96 J	1.4 J	1.4
Calcium	mg/kg	1300	5200	1400	480 J	400 J	770 J	460 J
Chromium	mg/kg	50 J	21 J	64 J	72	150	60	82
Cobalt	mg/kg	11	7.4	14	15	27	14	11
Copper	mg/kg	240	240	1300	550	430	940	1300
Cyanide	mg/kg							
Iron	mg/kg	22000 J	22000 J	94000 J	33000	35000	72000	77000
Lead	mg/kg	15 J	15 J	40 J	21	0.72 J	40	7.8
Magnesium	mg/kg	7400 J	3300 J	8200 J	3000 J	5100 J	3200 J	2400 J
Manganese	mg/kg	180 J	540 J	260 J	66 J	120 J	83 J	82 J
Mercury	mg/kg	0.33	0.13 J	0.14 J	0.042 J	0.031 J	0.13 J	0.085 J
Molybdenum	mg/kg	0.48 UJ	1.7 J	6.3 J	0.95 J	4.9 U	3.8 J	3.1 J
Nickel	mg/kg	31 J	16 J	34 J	19 J	41 J	17 J	15 J
Potassium	mg/kg	2000	2400	8100	1700 J	3100 J	2300 J	1600 J
Selenium	mg/kg	1.6 J	7.8	25	5.3	2.6	16	18
Silver	mg/kg	0.12 J	0.83 J	2.8 J	0.91 J	0.11 J	11	2.4
Sodium	mg/kg	260 U	200 J	730 U	250 U	200 U	340 U	260 U
Strontium	mg/kg							
Thallium	mg/kg	2.6 UJ	4.6 UJ	7.3 UJ	2.2 J	1.4 J	2.8 J	6.6 U
Vanadium	mg/kg	47 J	25 J	80 J	49 J	71 J	66 J	100 J
Zinc	mg/kg	77	160	130	72	120	100	51
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Sample ID: / Depth (ft): / Sample Date: / Units	ELY-SS-TR-06A 0-0.08 10/19/2007	ELY-SS-TR-06A 0.08-1 10/19/2007	ELY-SS-TR-06B 0-0.25 10/19/2007	ELY-SS-TR-06B 0.25-0.58 10/19/2007	ELY-SS-TR-06C 0-0.25 10/19/2007	ELY-SS-TR-06C 0.25-1 10/19/2007	ELY-SS-TR-07B 0-0.17 10/18/2007
Aluminum	mg/kg	10000	3600	6800	10000	17000	12000	8700
Antimony	mg/kg	15 U	25 U	18 U	22 U	18 U	14 U	16 U
Arsenic	mg/kg	3 U	4.9 U	1.3 J	2.7 J	7.9	2.4 J	1.6 J
Barium	mg/kg	76	47	66	84	100	70	84 J
Beryllium	mg/kg	0.4 J	0.15 UJ	0.34 UJ	0.37 UJ	0.61 J	0.52 J	0.54 J
Cadmium	mg/kg	0.44 J	0.45 J	0.36 J	4.3 U	0.43 J	0.27 J	0.31 J
Calcium	mg/kg	200	56	1100	490	750	550	1200
Chromium	mg/kg	48 J	37 J	31 J	42 J	48 J	42 J	40 J
Cobalt	mg/kg	9.8	20	6.3 J	10	14	9.6	17
Copper	mg/kg	650	580	410	1200	1100	730	630 J
Cyanide	mg/kg							
Iron	mg/kg	86000	140000	42000	66000	50000	50000	56000
Lead	mg/kg	24	83	38	38	21	21	43
Magnesium	mg/kg	5700	2100	3200	4200	7200	5900	4500
Manganese	mg/kg	100 J	130 J	66 J	95 J	170 J	140 J	300 J
Mercury	mg/kg	0.058 J	0.045 J	0.27	0.23	0.087 J	0.061 J	0.094 J
Molybdenum	mg/kg	5 J	18 J	3.6 J	4.2 J	2.4 J	3.4 J	2.6 J
Nickel	mg/kg	19	5.2 J	14	19	30	23	12
Potassium	mg/kg	5700 J	6700 J	3900 J	4500 J	3800 J	3700 J	5000 J
Selenium	mg/kg	25	83	12	17	11	15	14
Silver	mg/kg	6.4	5.8	9.9	5.7	13	1.7 J	4
Sodium	mg/kg	600 U	990 U	700 U	860 U	700 U	560 U	650 UJ
Strontium	mg/kg							
Thallium	mg/kg	3.2 UJ	5.2 UJ	3.2 UJ	2.7 UJ	2.2 UJ	3.1 UJ	2.4 J
Vanadium	mg/kg	58	55	44	48	51	50	63
Zinc	mg/kg	76 J	170 J	77 J	68 J	93 J	81 J	120
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-07B	ELY-SS-TR-07C	ELY-SS-TR-07C	ELY-SS-TR-07D	ELY-SS-TR-07D	ELY-SS-TR-08A	ELY-SS-TR-08A
	Depth (ft):	0.17-0.67	0-0.17	0.17-1	0-0.17	0.17-0.75	0.04-1	0.04-1
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**							
Aluminum	mg/kg	17000	2500	17000	8600	16000	5100 J	4800 J
Antimony	mg/kg	12 U	4.4 U	13 U	5.5 U	11 U	23 U	8.1 J
Arsenic	mg/kg	2.6	2.5	1.5 J	2.4	2.3 U	1.4 J	4.8 U
Barium	mg/kg	49 J	40 J	46 J	19 J	40 J	40 J	55 J
Beryllium	mg/kg	0.86 J	0.13 J	0.86 J	0.44 J	0.84 J	0.36 UJ	0.29 J
Cadmium	mg/kg	0.29 J	0.52 J	0.22 J	0.24 J	0.19 J	4.7 U	4.8 U
Calcium	mg/kg	850	590	640	310	790	55 J	61 J
Chromium	mg/kg	47 J	5.5 J	39 J	22 J	39 J	39 J	34 J
Cobalt	mg/kg	14	7.4	12	5.8	9.6	9.5	12
Copper	mg/kg	560 J	340 J	480 J	61 J	44	4000 J	1400 J
Cyanide	mg/kg							
Iron	mg/kg	32000	6800	21000	14000	18000	120000 J	120000 J
Lead	mg/kg	16	74	11 J	43	8.6 J	46 J	37 J
Magnesium	mg/kg	7800	400	5900	3400	6000 J	2800 J	2700 J
Manganese	mg/kg	290 J	56 J	360 J	110 J	260	69 J	68 J
Mercury	mg/kg	0.051 J	0.26	0.053 J	0.1	0.057 J	0.49 J	0.55 J
Molybdenum	mg/kg	1.2 J	0.86 J	13 U	0.61 J	1.1 J	10 J	17 J
Nickel	mg/kg	37	10	30	15	27 J	11 J	10 J
Potassium	mg/kg	2300 J	1000 J	1000 J	830 J	1400	7100 J	7200 J
Selenium	mg/kg	4.1 J	3.9	1.6 J	2.1 J	1.6 J	42 J	38 J
Silver	mg/kg	0.53 J	6.4	0.29 J	0.49 J	0.16 J	9	7
Sodium	mg/kg	490 UJ	100 J	510 UJ	220 UJ	460 U	940 U	950 U
Strontium	mg/kg							
Thallium	mg/kg	4.9 U	1.8 U	5.1 U	2.2 U	4.6 U	6.9 J	7.2 J
Vanadium	mg/kg	49	15	42	31	38 J	68 J	67 J
Zinc	mg/kg	78	50	56	58	58	93 J	99 J
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-08A	ELY-SS-TR-08A DUP	ELY-SS-TR-08C	ELY-SS-TR-08C DUP	ELY-SS-TR-08C	ELY-SS-TR-08C DUP
	Depth (ft):	0-0.04	0-0.04	0-0.42	0-0.42	0.42-1	0.42-1
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**						
Aluminum	mg/kg	5300 J	5500 J	6100 J	12000 J	9800 J	9300 J
Antimony	mg/kg	1.8 UJ	24 U	14 U	2.4 J	0.96 J	1.2 J
Arsenic	mg/kg	2.3 U	4.9 U	1.3 J	2.8 U	2.6 U	2.6 U
Barium	mg/kg	68	70 J	67 J	110 J	48 J	55 J
Beryllium	mg/kg	0.41 UJ	0.38 UJ	0.27 UJ	0.64 J	0.54 J	0.58 J
Cadmium	mg/kg	0.5 UJ	4.9 U	0.27 J	0.43 J	0.62 J	0.47 J
Calcium	mg/kg	100	110 J	620 J	360 J	100 J	78 J
Chromium	mg/kg	34 J	36 J	46 J	90 J	72 J	74 J
Cobalt	mg/kg	8.6	9.5 J	8	13	14 J	13
Copper	mg/kg	950	880 J	1600 J	930 J	500 J	450 J
Cyanide	mg/kg						
Iron	mg/kg	94000 J	100000 J	48000 J	78000 J	98000 J	100000 J
Lead	mg/kg	62 J	58 J	12 J	24 J	18 J	18 J
Magnesium	mg/kg	2900 J	3100 J	3000 J	6900 J	5800 J	5400 J
Manganese	mg/kg	83 J	81 J	84 J	180 J	140 J	130 J
Mercury	mg/kg	0.16	0.14 J	0.065 J	0.045 J	0.046 J	0.021 J
Molybdenum	mg/kg	9.4 J	10 J	1.6 UJ	4 UJ	5.6 J	7.5 J
Nickel	mg/kg	9.1 J	10 J	3.6 J	9.6	5.1 J	5.7 J
Potassium	mg/kg	5500	5900 J	5800 J	11000 J	13000 J	12000 J
Selenium	mg/kg	28	33 J	22 J	24 J	33 J	40 J
Silver	mg/kg	4.7	5.9	9.6	2.2 J	2.6	2.1 J
Sodium	mg/kg	460 U	980 U	580 U	550 U	530 U	520 U
Strontium	mg/kg						
Thallium	mg/kg	4.6 UJ	5.2 J	5.8 U	5.5 U	1.9 J	3.5 J
Vanadium	mg/kg	62 J	67 J	78 J	110 J	120 J	120 J
Zinc	mg/kg	120	110 J	100 J	140 J	130 J	120 J
Acid Base Potential	t CaCO3/1000t						
Acid Generation Potential	t CaCO3/1000t						
Acid Neutralization Potential	t CaCO3/1000t						
Acid-Base Accounting	t CaCO3/1000t						
Cation Exchange Capacity	meq/100 g						
pH	SU						
Saturated Paste Conductivity	mmhos/cm						
Sulfate	%						
Sulfur	%						
Sulfur, Dissociable	%						
Sulfur, Pyritic	%						
Sulfur, Residual	%						
Total Organic Carbon	%						

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-08D	ELY-SS-TR-08D DUP	ELY-SS-TR-08D	ELY-SS-TR-08D DUP	ELY-SS-TR-09B	ELY-SS-TR-09B
	Depth (ft):	0-0.17	0-0.17	0.17-1	0.17-1	0-0.17	0.17-0.42
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**						
Aluminum	mg/kg	6400 J	8300 J	14000 J	14000 J	3800	11000
Antimony	mg/kg	4.1 U	3.9 U	4.4 U	12 U	3.8 U	7.5 U
Arsenic	mg/kg	1.6	2.3	0.98	0.96 J	1.7	1.8
Barium	mg/kg	180 J	140 J	59 J	60 J	8.3	32
Beryllium	mg/kg	0.26 J	0.39	0.66	0.66 J	0.12 J	0.55 J
Cadmium	mg/kg	1.5	1	0.25 J	0.22 J	0.39 J	0.21 UJ
Calcium	mg/kg	9900 J	6400 J	1200 J	1400 J	500	810
Chromium	mg/kg	17	24 J	37 J	39 J	11	47
Cobalt	mg/kg	7.4	9.2	11	12	5.9	9.6
Copper	mg/kg	36 J	49 J	110 J	650 J	1000	520
Cyanide	mg/kg						
Iron	mg/kg	8800 J	11000 J	16000 J	18000 J	4800	22000
Lead	mg/kg	23 J	46 J	5.5 J	6.4 J	11 J	16 J
Magnesium	mg/kg	3000 J	3900 J	6300 J	6600 J	1000	6200
Manganese	mg/kg	950 J	790 J	330 J	350 J	29 J	130 J
Mercury	mg/kg	0.1 J	0.24 J	0.055 J	0.032 J	0.12 J	0.042 UJ
Molybdenum	mg/kg	0.37 UJ	0.61 UJ	4.4 U	2.1 UJ	0.38 UJ	7.5 U
Nickel	mg/kg	17	22	27	29	6.2	24
Potassium	mg/kg	1900 J	1900 J	3000 J	2900 J	580 J	1400 J
Selenium	mg/kg	1.5 J	2.1 J	1.5 J	1.6 J	1.7	3.7
Silver	mg/kg	0.52 J	0.65 J	0.11 UJ	0.41 UJ	10	2.9
Sodium	mg/kg	410	63 J	180 U	460 U	200	300 U
Strontium	mg/kg						
Thallium	mg/kg	1.6 U	1.6 U	1.8 U	4.6 U	1.5 UJ	3 UJ
Vanadium	mg/kg	18 J	26 J	34 J	35 J	9.4	42
Zinc	mg/kg	190 J	100 J	47 J	59 J	30	46
Acid Base Potential	t CaCO3/1000t						
Acid Generation Potential	t CaCO3/1000t						
Acid Neutralization Potential	t CaCO3/1000t						
Acid-Base Accounting	t CaCO3/1000t						
Cation Exchange Capacity	meq/100 g						
pH	SU						
Saturated Paste Conductivity	mmhos/cm						
Sulfate	%						
Sulfur	%						
Sulfur, Dissociable	%						
Sulfur, Pyritic	%						
Sulfur, Residual	%						
Total Organic Carbon	%						

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-09C	ELY-SS-TR-09C	ELY-SS-TR-09D	ELY-SS-TR-09D	ELY-SS-TZ-06	ELY-SS-TZ-06	ELY-SS-TZ-11
	Depth (ft):	0-0.13	0.13-0.67	0-0.25	0.25-1	0-0.08	0.08-1	0-0.08
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/16/2007	10/16/2007	10/15/2007
Analyte	**Units**							
Aluminum	mg/kg	3500	4600	940	5600	7800 J	14000 J	8100
Antimony	mg/kg	1.7 UJ	0.94 UJ	7.1 U	2.5 UJ	13 U	12 U	4.2 J
Arsenic	mg/kg	2.7 U	2.4 U	1.7	2.7 U	3.3	2.3 J	3.2
Barium	mg/kg	54	56	31	68	76	98	42
Beryllium	mg/kg	0.22 UJ	0.33 UJ	0.052 UJ	0.41 UJ	0.33 J	0.64 J	0.42 J
Cadmium	mg/kg	2.7 U	2.4 U	0.84 J	0.45 UJ	0.87 J	1.3 J	0.29 J
Calcium	mg/kg	1400	150	590	85	690	790	9300
Chromium	mg/kg	21	28	2.5	28	33 J	43 J	23
Cobalt	mg/kg	6	9.2	7.1	20	71	44	28
Copper	mg/kg	820	920	170	810	2000	1500	420
Cyanide	mg/kg							
Iron	mg/kg	75000	98000	6400	140000	79000 J	54000 J	27000
Lead	mg/kg	10 J	13 J	38 J	16 J	23	19	43
Magnesium	mg/kg	2000	2600	760	2800	4100 J	7000 J	4700
Manganese	mg/kg	87 J	71 J	36 J	95 J	120	230	410 J
Mercury	mg/kg	0.094 J	0.04 UJ	0.22 J	0.033 UJ	0.076 J	0.042 J	0.03 J
Molybdenum	mg/kg	5.9 J	8.4 J	0.87 J	18	11 J	4.1 J	1.5 J
Nickel	mg/kg	7.2	9.1	6	9.6	24	31	20
Potassium	mg/kg	4500 J	5500 J	1400 J	6800 J	4300	6400	1900
Selenium	mg/kg	27	36	5.2	63	19	12	2.7
Silver	mg/kg	3.6	2.4	22	4.4	7.8	1.9 J	0.51 UJ
Sodium	mg/kg	530 U	490 U	150 J	550 U	540 U	470 U	590 J
Strontium	mg/kg							
Thallium	mg/kg	5.3 UJ	4.9 UJ	2.8 UJ	5.5 UJ	5.4 U	4.7 U	1.4 J
Vanadium	mg/kg	41	55	7.4	55	43 J	47 J	25
Zinc	mg/kg	39	43	80	55	140	180	200
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-11	ELY-SS-TZ-12	ELY-SS-TZ-12	ELY-SS-TZ-14	ELY-SS-TZ-14	ELY-SS-TZ-15	ELY-SS-TZ-15
	Depth (ft):	0.08-0.46	0-0.25	0.25-0.67	0-0.33	0.33-1	0-0.29	0.29-1
	Sample Date:	10/15/2007	10/18/2007	10/18/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**							
Aluminum	mg/kg	9700	1400	8700	6400	8200	3100	9400
Antimony	mg/kg	2.4 UJ	6.1	1.9 UJ	32 U	4.3 J	7.4 U	1.3 J
Arsenic	mg/kg	3.8	3.2	22	2.7 J	7 U	2.8	2.3 J
Barium	mg/kg	60	25	83	110 J	75 J	36 J	28 J
Beryllium	mg/kg	0.48 UJ	0.064 UJ	0.42 UJ	0.34 UJ	3.5 U	0.22 J	0.45 J
Cadmium	mg/kg	0.39 J	1	0.93 J	3 J	0.8 J	0.93 J	3.2 U
Calcium	mg/kg	3800	2700	790	16000	180	2600	360
Chromium	mg/kg	30	3.9	28	32 J	59 J	15 J	43 J
Cobalt	mg/kg	70	4.2	23	21	10 J	5.1	8.7
Copper	mg/kg	1400	120	640	980 J	1200 J	230 J	460 J
Cyanide	mg/kg							
Iron	mg/kg	57000	9200	53000	100000	300000	18000	37000
Lead	mg/kg	54	1700 J	36 J	48	46	56	19
Magnesium	mg/kg	4700	700	4700	3200	4100	1200	3700
Manganese	mg/kg	480 J	150 J	320 J	310	110	83	240
Mercury	mg/kg	0.061 J	0.34	0.065 J	0.26 J	0.1 J	0.26 J	0.073 J
Molybdenum	mg/kg	4.2 J	1.5 J	1.8 UJ	4.7 J	11 J	2 J	2.8 J
Nickel	mg/kg	20	6.9	20	13 J	12 J	8.8	16
Potassium	mg/kg	2100	1400 J	2800 J	2500 J	19000 J	1000 J	1300 J
Selenium	mg/kg	8.3	6	9.1	34	55	7.1	8.1
Silver	mg/kg	1.5 UJ	4	1.2 J	12	8.2	3.8	0.87 J
Sodium	mg/kg	1500 J	160 J	450 U	1300 U	1400 U	300 U	630 U
Strontium	mg/kg							
Thallium	mg/kg	4 J	1.9 UJ	4.5 UJ	7.6 J	13 J	1.7 J	2.2 J
Vanadium	mg/kg	36	14	32	55	99	26	46
Zinc	mg/kg	550	79	100	160	97	67	50
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-16	ELY-SS-TZ-16	ELY-SS-TZ-18	ELY-SS-TZ-18	ELY-SS-TZ-21	ELY-SS-TZ-21	ELY-SS-TZ-23
	Depth (ft):	0-0.33	0.33-1	0.04-1	0-0.04	0-0.42	0.42-1	0-0.21
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**							
Aluminum	mg/kg	2000	18000	10000	4100	10000	29000 J	2500
Antimony	mg/kg	9.4 U	2.6 J	12 U	16 U	13 U	9.4 U	4 U
Arsenic	mg/kg	2.2	2.7 J	0.7 J	1.4 J	6.4	2.3	1.9
Barium	mg/kg	75 J	68 J	92	48	120 J	120	18
Beryllium	mg/kg	0.079 UJ	0.66 J	0.55 UJ	0.19 UJ	0.47 J	1.4	0.13 J
Cadmium	mg/kg	2.5	0.5 J	2.3 U	3.3 U	3.2	0.83 J	0.29 J
Calcium	mg/kg	21000	1900	280	1900	19000	4300	750
Chromium	mg/kg	3.1 J	74 J	55	22	24 J	82 J	8.1
Cobalt	mg/kg	25	17	7.8	5.4 J	60	21	2.4
Copper	mg/kg	1200 J	1800 J	530	280	960 J	590	56
Cyanide	mg/kg							
Iron	mg/kg	16000	100000	43000	25000	35000	35000 J	5000
Lead	mg/kg	34	27	5 J	7.1 J	58	31 J	16
Magnesium	mg/kg	770	6400	5400	2000	1700	9600 J	1200
Manganese	mg/kg	140	260	89 J	160 J	1600	280 J	51 J
Mercury	mg/kg	0.14 J	0.073 J	0.009 J	0.074 J	0.21 J	0.38	0.18
Molybdenum	mg/kg	0.76 J	5.3 J	12 U	1.1 UJ	2.4 J	1 UJ	0.4 UJ
Nickel	mg/kg	11	11	26	11	25	43 J	7.4
Potassium	mg/kg	450 J	4700 J	4500 J	1700 J	680 J	3100	870 J
Selenium	mg/kg	7.8	31	3.1 J	7.1	12	3.5 J	2.5
Silver	mg/kg	7.2	4	0.35 UJ	3 J	1.3 J	0.73 J	0.55 J
Sodium	mg/kg	800	780 U	470 U	650 U	840	380 U	160 U
Strontium	mg/kg							
Thallium	mg/kg	3.8 U	11 J	2.4 J	6.5 U	5.2 U	3.8 J	1.6 U
Vanadium	mg/kg	9.7	110	44	20	43	76 J	11
Zinc	mg/kg	75	190	45	62	82	130	40
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-23	ELY-SS-TZ-27	ELY-SS-TZ-27	ELY-SS-TZ-29	ELY-SS-TZ-29	ELY-SS-TZ-30	ELY-SS-TZ-30
	Depth (ft):	0.21-1	0-0.21	0.21-0.67	0-0.08	0.08-0.75	0.04-1	0-0.04
	Sample Date:	10/17/2007	10/16/2007	10/16/2007	10/19/2007	10/19/2007	10/19/2007	10/19/2007
Analyte	**Units**							
Aluminum	mg/kg	18000	8600 J	21000 J	7400	13000	12000	8700
Antimony	mg/kg	12 U	32 U	17 U	18 U	14 U	14 U	1.9 J
Arsenic	mg/kg	0.73 J	13	2.2 J	3.7 U	2.8 U	1.4 J	1.8 J
Barium	mg/kg	56	130 J	60 J	110	73	69	58
Beryllium	mg/kg	0.83 J	0.51 J	1 J	0.49 J	0.84 J	0.43 J	0.3 UJ
Cadmium	mg/kg	0.25 J	1.6 J	0.44 J	0.53 J	0.8 J	0.34 J	0.26 J
Calcium	mg/kg	1100	5000 J	870 J	1600	160	380	760
Chromium	mg/kg	54	38 J	52 J	50 J	82 J	52 J	33 J
Cobalt	mg/kg	11	16 J	14 J	12	17	10	8.5
Copper	mg/kg	260	680 J	610 J	620	740	1300	1100
Cyanide	mg/kg							
Iron	mg/kg	20000	52000 J	34000 J	100000	120000	60000	46000
Lead	mg/kg	5.6 J	200 J	63 J	28	19	33	29
Magnesium	mg/kg	7500	3500 J	8100 J	4000	7300	6000	4200
Manganese	mg/kg	140 J	310 J	260 J	130 J	160 J	120 J	110 J
Mercury	mg/kg	0.045 J	0.58	0.32	0.22	0.091 J	0.07 J	0.069 J
Molybdenum	mg/kg	12 U	5.6 J	1.3 J	11 J	12 J	3.4 J	5.8 J
Nickel	mg/kg	34	20 J	33 J	12	19	24	18
Potassium	mg/kg	3100 J	2200 J	3000 J	9800 J	10000 J	4100 J	3800 J
Selenium	mg/kg	1.8 J	13	3.6 UJ	32	44	13	11
Silver	mg/kg	0.28 UJ	2.8 J	0.39 UJ	6	3.5	1.2 J	1.4 J
Sodium	mg/kg	470 U	1300 U	680 U	740 U	550 U	580 U	650 U
Strontium	mg/kg							
Thallium	mg/kg	2.2 J	13 U	6.8 U	3.9 UJ	4.4 UJ	5.8 U	6.5 U
Vanadium	mg/kg	44	84 J	60 J	86	120	51	39
Zinc	mg/kg	49	170	88	140 J	160 J	64 J	86 J
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-31	ELY-SS-TZ-31	ELY-SS-TZ-34	ELY-SS-TZ-34	ELY-SS-TZ-35	ELY-SS-TZ-35	ELY-SS-TZ-36
	Depth (ft):	0-0.25	0.25-0.75	0-0.21	0.21-0.67	0-0.17	0.17-0.75	0-0.13
	Sample Date:	10/19/2007	10/19/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**							
Aluminum	mg/kg	8900	12000	2400	17000	2200	12000	4300
Antimony	mg/kg	6.6 U	13 U	5.5 U	12 U	2.5 UJ	1.1 J	12 U
Arsenic	mg/kg	4.3	2.2 J	1.5	1.1 J	2.5 J	0.92 J	0.84 J
Barium	mg/kg	15 J	22	25 J	35 J	82	88	55 J
Beryllium	mg/kg	0.43 J	0.54 J	0.12 J	0.6 J	3 U	0.58 J	0.27 UJ
Cadmium	mg/kg	0.13 J	2.6 U	0.36 J	0.3 J	6 U	2.6 U	0.5 UJ
Calcium	mg/kg	320	470	1400	940	1800	860	900
Chromium	mg/kg	28 J	37 J	10 J	68 J	12	57	23 J
Cobalt	mg/kg	6.8	8.6	4	17	3.9 J	12	5.9
Copper	mg/kg	300 J	240	64 J	470 J	840	940	690 J
Cyanide	mg/kg							
Iron	mg/kg	18000	21000	6100	31000	47000	50000	59000
Lead	mg/kg	60	20	32	15	68 J	19 J	10 J
Magnesium	mg/kg	3500	5100	720	6000	700	6700	2300
Manganese	mg/kg	81 J	100 J	110 J	260 J	38 J	170 J	97 J
Mercury	mg/kg	0.007 J	0.032 J	0.2 J	0.046 J	0.35	0.055 J	0.065 J
Molybdenum	mg/kg	1.3 J	1.6 J	0.45 J	12 U	3.9 J	2.5 J	6.3 J
Nickel	mg/kg	17	22	7.5	34	6.3 J	22	8.5
Potassium	mg/kg	840 J	1200 J	1100 J	1500 J	3300 J	5000 J	3800 J
Selenium	mg/kg	3	2.5 J	3	3.2 J	15	9.6	21
Silver	mg/kg	2.5	1.4 J	0.9 J	0.51 J	11	3.2	2.7
Sodium	mg/kg	260 UJ	520 U	350 J	500 UJ	1200 U	520 U	470 UJ
Strontium	mg/kg							
Thallium	mg/kg	1.3 J	5.2 U	2.2 U	5 U	4 UJ	5.2 UJ	4.7 U
Vanadium	mg/kg	41	38	13	59	37	57	40
Zinc	mg/kg	44	56 J	180	110	44	66	42
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-36	ELY-SS-TZ-37	ELY-SS-TZ-37	ELY-SS-TZ-38	ELY-SS-TZ-38	ELY-SS-TZ-39	ELY-SS-TZ-39
	Depth (ft):	0.13-0.75	0-0.17	0.17-1	0.04-0.58	0-0.04	0-0.25	0.25-0.67
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**							
Aluminum	mg/kg	18000	2200 J	5600	6200 J	3800 J	2500 J	7400 J
Antimony	mg/kg	12 U	30 U	2.6 UJ	1.9 UJ	23 U	24 U	2.8 J
Arsenic	mg/kg	0.76 J	2.2 J	5.6 U	2.4 U	4.5 U	3.7 J	5.4 U
Barium	mg/kg	58 J	84 J	61	50	38	53 J	45 J
Beryllium	mg/kg	0.93 J	0.2 UJ	0.63 UJ	0.24 UJ	2.3 U	0.14 UJ	0.42 UJ
Cadmium	mg/kg	0.33 UJ	6 U	5.6 U	2.4 U	0.84 J	4.8 U	5.4 U
Calcium	mg/kg	770	2300 J	87	200	2800	3300 J	95 J
Chromium	mg/kg	54 J	12 J	32	32 J	14 J	12 J	34 J
Cobalt	mg/kg	14	6.2 J	17	11	7.5 J	9.1 J	17
Copper	mg/kg	270 J	460 J	490	1400	3700	530 J	1500 J
Cyanide	mg/kg							
Iron	mg/kg	36000	60000 J	160000	87000 J	39000 J	53000 J	170000 J
Lead	mg/kg	11 J	16 J	34 J	19 J	20 J	90 J	93 J
Magnesium	mg/kg	6900	1200 J	3300	3900 J	2000 J	1100 J	4700 J
Manganese	mg/kg	250 J	78 J	99 J	110 J	220 J	54 J	110 J
Mercury	mg/kg	0.077 J	0.12 J	0.036 UJ	0.022 J	0.16 J	0.57 J	2.8 J
Molybdenum	mg/kg	2 J	6.7 J	20 J	4.3 J	4.2 J	6.5 J	26 J
Nickel	mg/kg	32	6 J	11 J	12 J	8.7 J	10 J	8 J
Potassium	mg/kg	2500 J	4300 J	11000 J	2800	1600	1900 J	12000 J
Selenium	mg/kg	7.7	25 J	66	28	15	20 J	76 J
Silver	mg/kg	0.83 J	6.2	5.4 J	4	4.3 J	14	14
Sodium	mg/kg	470 UJ	1200 U	1100 U	480 U	380 J	960 U	1100 U
Strontium	mg/kg							
Thallium	mg/kg	4.7 U	12 U	11 UJ	3 J	9 UJ	9.6 U	6.8 J
Vanadium	mg/kg	52	32 J	85	37 J	19 J	44 J	130 J
Zinc	mg/kg	69	97 J	45	89	190	97 J	95 J
Acid Base Potential	t CaCO3/1000t							
Acid Generation Potential	t CaCO3/1000t							
Acid Neutralization Potential	t CaCO3/1000t							
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							
Sulfur	%							
Sulfur, Dissociable	%							
Sulfur, Pyritic	%							
Sulfur, Residual	%							
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-40	ELY-SS-TZ-40	ELY-SS-TZ-42	ELY-SS-TZ-42	ELY-SS-TZ-43	ELY-SS-TZ-43	ELY-TP-104
	Depth (ft):	0-0.17	0.17-0.83	0-0.17	0.17-1	0-0.21	0.21-0.92	0-1
	Sample Date:	10/18/2007	10/18/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/5/2007
Analyte	**Units**							
Aluminum	mg/kg	4100 J	11000 J	6200 J	11000 J	9200 J	18000 J	13000
Antimony	mg/kg	5.5 U	11 U	5 U	4.6 U	7.4 U	4.7 U	1.5 J
Arsenic	mg/kg	2.2	1.7 J	3.5	1.4 U	2.9	1.6 U	1.2 UJ
Barium	mg/kg	180	58	110 J	36 J	38 J	39 J	46
Beryllium	mg/kg	0.26 J	0.58 J	0.34 J	0.39 J	0.39 J	0.79	0.36 UJ
Cadmium	mg/kg	2.3	2.2 U	2.2	0.46 J	0.44 J	0.39 J	2.4 U
Calcium	mg/kg	12000	1300	3000 J	1400 J	720 J	740 J	590
Chromium	mg/kg	12 J	28 J	21	30	23	38	23
Cobalt	mg/kg	9.9	10	11	12	6	9.8	51 J
Copper	mg/kg	110	260	66	150	22	41	1600
Cyanide	mg/kg							
Iron	mg/kg	9600 J	20000 J	12000	16000	12000	18000	73000
Lead	mg/kg	38 J	28 J	44	6.6	26	6	12
Magnesium	mg/kg	2600 J	5200 J	3000 J	4000 J	3400 J	6700 J	4300
Manganese	mg/kg	1600 J	420 J	810 J	320 J	120 J	110 J	280 J
Mercury	mg/kg	0.16 J	0.028 J	0.18 J	0.026 J	0.12 J	0.034 J	0.014 UJ
Molybdenum	mg/kg	0.53 J	11 U	0.87 J	0.37 J	7.4 U	4.7 U	4.4 J
Nickel	mg/kg	16 J	25 J	16 J	17 J	16 J	27 J	17
Potassium	mg/kg	2400	2600	1400 J	1000 J	1100 J	2000 J	2200
Selenium	mg/kg	3.1	3.2 UJ	4.8	1.9 U	2.6 J	1.7 UJ	9
Silver	mg/kg	1.3	0.33 J	0.55 J	0.13 J	1.5 U	0.94 U	1.1 UJ
Sodium	mg/kg	660	440 U	200 U	180 U	300 U	190 U	1200 J
Strontium	mg/kg							
Thallium	mg/kg	2.2 UJ	4.4 UJ	2 U	1 J	1.5 J	1.4 J	4.8 U
Vanadium	mg/kg	16 J	28 J	35 J	45 J	30 J	41 J	26
Zinc	mg/kg	330	46	130	45	58	38	560
Acid Base Potential	t CaCO3/1000t							120
Acid Generation Potential	t CaCO3/1000t							52
Acid Neutralization Potential	t CaCO3/1000t							180
Acid-Base Accounting	t CaCO3/1000t							
Cation Exchange Capacity	meq/100 g							
pH	SU							
Saturated Paste Conductivity	mmhos/cm							
Sulfate	%							0.08
Sulfur	%							1.72
Sulfur, Dissociable	%							0.01 U
Sulfur, Pyritic	%							0.01 U
Sulfur, Residual	%							1.65
Total Organic Carbon	%							

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Analyte	Units	ELY-TP-104 DUP	ELY-TP-109	SS-01X-090209AX	SS-02X-090209AX	SS-03X-090209AX	SS-04X-090209AX
Depth (ft):		0-1	0-1	0-0.5	0-0.5	0-0.5	0-0.5
Sample Date:		10/5/2007	10/5/2007	9/2/2009	9/2/2009	9/2/2009	9/2/2009
Aluminum	mg/kg		5500	15500	14200	20200	12500
Antimony	mg/kg		4 J	1.1	0.12	0.49 U	0.46 U
Arsenic	mg/kg		1.2 UJ	3.1	3.7	1.9 JEB	0.64
Barium	mg/kg		43	74.8	81.9	91.5	47.5
Beryllium	mg/kg		0.11 UJ	0.29 J	0.27 J	0.41 J	0.23
Cadmium	mg/kg		10 U	0.92	0.35	0.2	0.15
Calcium	mg/kg		450	2110	675	1420	255
Chromium	mg/kg		29	46.2	44.8	46.2	34
Cobalt	mg/kg		17 J	14.9	16	11.4	6.6
Copper	mg/kg		1500	362	494	188	122
Cyanide	mg/kg			1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg		140000	31000	34000	25300	21000
Lead	mg/kg		32	295 J	29.7 J	17.9 J	15.3
Magnesium	mg/kg		2300	7860	7110	9380	4690
Manganese	mg/kg		110 J	200 J	116 J	222 J	118
Mercury	mg/kg		0.072 J	0.088	0.074	0.039	0.045
Molybdenum	mg/kg		9.8 J	1.9	2.4	0.63	0.44
Nickel	mg/kg		9.1	34.2	31.1	40.8	23.7
Potassium	mg/kg		2800	3430	3980	5110	2380
Selenium	mg/kg		41	3.3	4.2	0.57	0.62
Silver	mg/kg		4.6	4	1.5	0.54 J	0.45
Sodium	mg/kg		2000 U	137 JEB	197 J	101 JEB	52.1
Strontium	mg/kg			10.6	5.9	4.5	1.8
Thallium	mg/kg		16 J	0.18	0.24	0.18	0.11
Vanadium	mg/kg		51	47.6	43.2	51.1	39.2
Zinc	mg/kg		130	108	73.5	55.8	47.1
Acid Base Potential	t CaCO3/1000t	120	-6				
Acid Generation Potential	t CaCO3/1000t	51	11				
Acid Neutralization Potential	t CaCO3/1000t	170	4.3				
Acid-Base Accounting	t CaCO3/1000t						
Cation Exchange Capacity	meq/100 g						
pH	SU						
Saturated Paste Conductivity	mmhos/cm						
Sulfate	%	0.1	0.06				
Sulfur	%	1.72	0.41				
Sulfur, Dissociable	%	0.01 U	0.01				
Sulfur, Pyritic	%	0.01 U	0.01				
Sulfur, Residual	%	1.62	0.32				
Total Organic Carbon	%						

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	SS-05X-090209AX	SS-06X-090209AX	SS-07X-090209AX	SS-08X-090209AX	SS-09X-090209AX
	Depth (ft):	0-0.3	0-0.5	0-0.5	0-1	0-1
	Sample Date:	9/2/2009	9/2/2009	9/2/2009	9/2/2009	9/2/2009
Analyte	**Units**					
Aluminum	mg/kg	14800	21200	20200	8560	17900
Antimony	mg/kg	0.06	0.079	0.058	0.5 U	0.14
Arsenic	mg/kg	1.1	2.1	1.5 JEB	1.1 JEB	2.8
Barium	mg/kg	44.9	45.4	37.6	62.3	67.1
Beryllium	mg/kg	0.31	0.5	0.48 J	0.21 J	0.36 J
Cadmium	mg/kg	0.28	0.23	0.21	0.54	0.88
Calcium	mg/kg	278	571	651	1680	463 J
Chromium	mg/kg	34.8	42	39.4	28.4	53.2
Cobalt	mg/kg	4.6	7.9	7.1	31.6	17.1
Copper	mg/kg	31.8	44.7	26.4	848	699
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg	23500	23700	22800	25900	34300
Lead	mg/kg	17.8	37.1	34.9 J	8.8 J	22.9 J
Magnesium	mg/kg	3590	6230	6050	4540	6990
Manganese	mg/kg	116	199	120 J	441 J	256 J
Mercury	mg/kg	0.079	0.1	0.11	0.095 U	0.058
Molybdenum	mg/kg	0.48	0.48	0.45	1.5	1.6
Nickel	mg/kg	17.4	28.7	25.1	27.3	29.2
Potassium	mg/kg	581	1000	851	2060	2960
Selenium	mg/kg	0.97	0.94	0.66	2.4	3
Silver	mg/kg	0.32	0.33	1 U	1.1	1.5
Sodium	mg/kg	26.6	37.8	29.3 JEB	65 JEB	58.9 JEB
Strontium	mg/kg	1.8	3.4	2.8	4.8	2.4
Thallium	mg/kg	0.096	0.14	0.16	0.11	0.19
Vanadium	mg/kg	53.5	47.5	46.3	35.2	61.6
Zinc	mg/kg	41.6	56.8	55.6	54.5	97.1
Acid Base Potential	t CaCO3/1000t					
Acid Generation Potential	t CaCO3/1000t					
Acid Neutralization Potential	t CaCO3/1000t					
Acid-Base Accounting	t CaCO3/1000t					
Cation Exchange Capacity	meq/100 g				13.1	27
pH	SU				5.47	4.77
Saturated Paste Conductivity	mmhos/cm				0.17	0.12
Sulfate	%					
Sulfur	%					
Sulfur, Dissociable	%					
Sulfur, Pyritic	%					
Sulfur, Residual	%					
Total Organic Carbon	%				0.76	3.81

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	SS-10X-090309AX	SS-11X-090309AX	SS-12X-090309AX	SS-13X-082809AX	SS-14X-083109AX	SS-15X-083109AX
	Depth (ft):	0-0.5	0-0.5	0-0.5	0-0.3	0-0.2	0-0.2
	Sample Date:	9/3/2009	9/3/2009	9/3/2009	8/28/2009	8/31/2009	8/31/2009
Analyte	**Units**						
Aluminum	mg/kg	12400	41900 J	5910	17700 J	6050	1580 J
Antimony	mg/kg	0.2	0.2	0.5 U	0.6	0.51	0.42
Arsenic	mg/kg	2.6	6.5 J	0.76 JEB	9.4 J	3.5 J	2.6 J
Barium	mg/kg	63.4	122 J	28.8	220 J	108	102 J
Beryllium	mg/kg	0.41 J	0.82 J	0.15 J	1.6 J	0.13 J	0.062 J
Cadmium	mg/kg	2.4	1.4	0.37	7.2	0.79	1.5
Calcium	mg/kg	4780	2770 J	2510	9990 J	3360	4710 J
Chromium	mg/kg	21.9	111 J	20.6	20 J	21.2	5.3 J
Cobalt	mg/kg	10.6	18.1 J	5.8	28.9 J	6.8	4.3 J
Copper	mg/kg	605	897 J	149	995 J	142 J	31.4 J
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg	20800	78700 J	9760	11800 J	18800	3400 J
Lead	mg/kg	93.9 J	74.9 J	19.5 J	118 J	93.9 J	63.9 J
Magnesium	mg/kg	3700	16200 J	2230	2280 J	2960	1040 J
Manganese	mg/kg	360 J	306 J	139 J	8380 J	217 J	50.3 J
Mercury	mg/kg	0.12	0.26	0.078	0.3	0.19	0.24
Molybdenum	mg/kg	1.1	2.4	0.32	2.7	1.7	0.6
Nickel	mg/kg	16.7	66.3 J	10.6	57.7 J	15.9	7.4 J
Potassium	mg/kg	529	4520 J	402 J	1060 J	1430	951 J
Selenium	mg/kg	2	3.3	0.8	10.4	2.9	1.5
Silver	mg/kg	0.86 J	3 J	1 U	1 UJ	1.5	0.4 J
Sodium	mg/kg	43 JEB	145 J	27.4 JEB	82.8 J	70.4 J	29.7 J
Strontium	mg/kg	31.5	18.1 J	11.5	63.6 J	20.8	40.4 J
Thallium	mg/kg	0.16	0.35	0.043	3.2	0.07	0.25 U
Vanadium	mg/kg	31.4	128 J	18.3	20.6 J	38.2	12.9 J
Zinc	mg/kg	129	164 J	37.2	49.2 J	122	69.2 J
Acid Base Potential	t CaCO3/1000t						
Acid Generation Potential	t CaCO3/1000t						
Acid Neutralization Potential	t CaCO3/1000t						
Acid-Base Accounting	t CaCO3/1000t	5	2	10			
Cation Exchange Capacity	meq/100 g				69.7	54	78.1
pH	SU	5.66	4.51	5.47	5.73	4.35	3.84
Saturated Paste Conductivity	mmhos/cm	0.31	0.22	0.75	0.61	0.38	0.43
Sulfate	%						
Sulfur	%						
Sulfur, Dissociable	%						
Sulfur, Pyritic	%						
Sulfur, Residual	%						
Total Organic Carbon	%				32.6	17.5	

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	SS-16X-090309AX	SS-17X-083109AX	SS-18X-082709AX	SS-19X-082709AX	SS-20X-083109AX	SS-21X-083109AX
	Depth (ft):	0-0.5	0-0.3	0-1	0-1	0-0.2	0-0.2
	Sample Date:	9/3/2009	8/31/2009	8/27/2009	8/27/2009	8/31/2009	8/31/2009
Analyte	**Units**						
Aluminum	mg/kg	19500	13000	3560 J	2500	7340	4320
Antimony	mg/kg	0.14	0.31	0.32	0.32	0.31	1.8
Arsenic	mg/kg	2.3	4.2	1.6 J	1.9 J	2.3	1.4
Barium	mg/kg	55.2	56.7	203 J	117	34.3	14.6 J
Beryllium	mg/kg	0.54	0.27 J	0.16 J	0.08 J	0.11 J	0.068 J
Cadmium	mg/kg	0.39	0.92	2.9	1.4	0.26	0.4
Calcium	mg/kg	1850	2930	3470 J	5850	558	1270
Chromium	mg/kg	40.4	35.2	10.7 J	7.8	23.1	13.5
Cobalt	mg/kg	13.7	9.2	11.3 J	3.9 J	4.4 J	4.5 J
Copper	mg/kg	80.1	265	1280 J	74 J	85.9	50.8
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.8 U	1.2 U
Iron	mg/kg	26300	28700	14400 J	6120	15400	8560
Lead	mg/kg	18.7 J	59.8 J	39.2 J	34.7 J	47 J	26 J
Magnesium	mg/kg	6330	4880	1420 J	1300	2990	1620
Manganese	mg/kg	1070 J	214 J	83.2 J	452 J	62.7 J	70 J
Mercury	mg/kg	0.061	0.17	0.14	0.15	0.081	0.057
Molybdenum	mg/kg	0.49	2.9	0.84	0.85	1.3	0.6
Nickel	mg/kg	32	25.1	10.5 J	7.2	16.1	8.6
Potassium	mg/kg	1310	1750 J	1130 J	754	1000 J	401 J
Selenium	mg/kg	0.47	4.4	3.3	1.4	1.6	0.59
Silver	mg/kg	1 U	2.4	3.7 J	0.51 J	0.42 J	0.16 J
Sodium	mg/kg	46.2 JEB	53.3 J	60.3 J	28 J	32.3 J	23 J
Strontium	mg/kg	6.4	9.7 J	26.8 J	40.5	5.5 J	4.8 J
Thallium	mg/kg	0.16	0.098	0.3	0.069	0.024	0.02
Vanadium	mg/kg	54.8	46.3	13.5 J	16.1	31.1	20.3
Zinc	mg/kg	67.5	113	52.8 J	160	59.5	28.8
Acid Base Potential	t CaCO3/1000t						
Acid Generation Potential	t CaCO3/1000t						
Acid Neutralization Potential	t CaCO3/1000t						
Acid-Base Accounting	t CaCO3/1000t	3					
Cation Exchange Capacity	meq/100 g	31.8	44	81	101.7	69.8	54.9
pH	SU	5.08	4.26	4.26	4.7	3.42	4.12
Saturated Paste Conductivity	mmhos/cm	0.21	0.43	0.55	0.7	0.31	0.38
Sulfate	%						
Sulfur	%						
Sulfur, Dissociable	%						
Sulfur, Pyritic	%						
Sulfur, Residual	%						
Total Organic Carbon	%		15.7		34		10.7

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	SS-22X-082709AX	SS-23X-082709AX	SS-24X-083109AX	SS-25X-082709AX	SS-26X-083109AX
	Depth (ft):	0-1	0-1	0-0.2	0-1	0-0.3
	Sample Date:	8/27/2009	8/27/2009	8/31/2009	8/27/2009	8/31/2009
Analyte	**Units**					
Aluminum	mg/kg	7150	11300	5150	4210 J	13100
Antimony	mg/kg	0.64	0.26	0.36	0.36	0.28
Arsenic	mg/kg	3.2 J	3.2 J	2.4	3.5 J	3.5
Barium	mg/kg	44.2	75.1	148	177 J	214
Beryllium	mg/kg	0.12 J	0.3 J	0.11 J	0.3 J	0.32
Cadmium	mg/kg	0.62	0.87	2.2	2.5	2.9
Calcium	mg/kg	1750	4520	8020	20500 J	7270
Chromium	mg/kg	26.1	30.1	14.8	14 J	32.4
Cobalt	mg/kg	6.1	18	7.3	4.9 J	13.9
Copper	mg/kg	149 J	103 J	45.8	231 J	64
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg	18400	17000	8870	5820 J	19600
Lead	mg/kg	78.3 J	71.2 J	107 J	116 J	109
Magnesium	mg/kg	3110	4600	2470	1830 J	6560
Manganese	mg/kg	62.3 J	450 J	1160 J	991 J	2170
Mercury	mg/kg	0.13	0.081	0.13	0.17	0.21
Molybdenum	mg/kg	2	0.79	0.52	1.4	0.81
Nickel	mg/kg	15.8	23.1	13.7	15.6 J	33.2
Potassium	mg/kg	851	962	951 J	1070 J	1870
Selenium	mg/kg	4.8	1.2	0.6	5.9	0.9
Silver	mg/kg	4	0.41 J	0.51 J	0.77 J	0.36
Sodium	mg/kg	37.4 J	50.2 J	28.9 J	63.3 J	48.1
Strontium	mg/kg	11.3	24.8	35 J	107 J	33.1
Thallium	mg/kg	0.18	0.081	0.091	0.21	0.21
Vanadium	mg/kg	39.2	36	20.5	25.4 J	43.2
Zinc	mg/kg	103	71.7	122	43.2 J	225
Acid Base Potential	t CaCO3/1000t					
Acid Generation Potential	t CaCO3/1000t					
Acid Neutralization Potential	t CaCO3/1000t					
Acid-Base Accounting	t CaCO3/1000t					
Cation Exchange Capacity	meq/100 g	63.2	35.6	60.6	111.6	83.9
pH	SU	4.11	5.11	4.89	5.07	5.28
Saturated Paste Conductivity	mmhos/cm	0.43	0.46	0.79	0.54	0.58
Sulfate	%					
Sulfur	%					
Sulfur, Dissociable	%					
Sulfur, Pyritic	%					
Sulfur, Residual	%					
Total Organic Carbon	%		10.5			

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	SS-27X-082609AX	SS-28X-083109AX	SS-29X-083109AX	TA-04X-082409AX	TA-14X-082409AX
	Depth (ft):	0-1	0-1	0-0.3	0-1	0-1
	Sample Date:	8/26/2009	8/31/2009	8/31/2009	8/24/2009	8/24/2009
Analyte	**Units**					
Aluminum	mg/kg	4140 J	13000	13300	16500	18300
Antimony	mg/kg	0.38	0.17	0.3	0.13	0.23
Arsenic	mg/kg	2.2 J	2.4	1.6	1.3	1.1
Barium	mg/kg	111 J	64.3	134	50.1	90.3
Beryllium	mg/kg	0.18 J	0.23	0.23	0.52	0.61
Cadmium	mg/kg	4.8	0.26	3.5	1.1	1
Calcium	mg/kg	22400 J	1200	8030	1460	1980
Chromium	mg/kg	12.1 J	38.9	48.9	26.8	30.9
Cobalt	mg/kg	7.5 J	12.1	12.2	9.8	15.2
Copper	mg/kg	1370 J	95.4	65.6	365	632
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg	8320 J	22400	17700	20900	23300
Lead	mg/kg	82 J	55.6	92.8	27.6	116
Magnesium	mg/kg	1670 J	5880	7420	4640	5790
Manganese	mg/kg	893 J	450	813	527	717
Mercury	mg/kg	0.25	0.078	0.23	0.12	0.36
Molybdenum	mg/kg	1.2	0.72	0.9	0.95	1
Nickel	mg/kg	27.4 J	32.9	36.2	19.2	23.6
Potassium	mg/kg	795 J	1650	4750	888	1560
Selenium	mg/kg	4	0.7	1.1	1	1.4
Silver	mg/kg	1.6 J	0.5	0.73	0.29	0.35
Sodium	mg/kg	65.1 J	48.4	70	62.2	65.8
Strontium	mg/kg	107 J	5.4	26	12.7	18
Thallium	mg/kg	0.44	0.1	0.15	0.1	0.17
Vanadium	mg/kg	14.4 J	58.2	42.9	31.3	34.9
Zinc	mg/kg	99 J	60.1	195	113	136
Acid Base Potential	t CaCO3/1000t					
Acid Generation Potential	t CaCO3/1000t					
Acid Neutralization Potential	t CaCO3/1000t					
Acid-Base Accounting	t CaCO3/1000t					
Cation Exchange Capacity	meq/100 g	79	44.9	87.1		
pH	SU	6.42	4.33	5.18		
Saturated Paste Conductivity	mmhos/cm	0.65	0.33	0.95		
Sulfate	%					
Sulfur	%					
Sulfur, Dissociable	%					
Sulfur, Pyritic	%					
Sulfur, Residual	%					
Total Organic Carbon	%	30.7		19.2		

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	TC-03X-082609AX	TF-13X-090909BX	TG-02X-082409AX	TI-03X-082509AX	TK-01X-082509AX
	Depth (ft):	0-1	0-0.5	0-1	0-1	0-1
	Sample Date:	8/26/2009	9/2/2009	8/24/2009	8/25/2009	8/25/2009
Analyte	**Units**					
Aluminum	mg/kg	15400	11300	10800	22500	14000
Antimony	mg/kg	0.068		0.11	0.098	0.062
Arsenic	mg/kg	0.48	1 U	0.62	1	0.97
Barium	mg/kg	24.9	77.7	32.7	46	72.5
Beryllium	mg/kg	0.43	0.15 J	0.15	0.54	0.41
Cadmium	mg/kg	0.13		0.13	0.12	0.33
Calcium	mg/kg	368	909	1420	942	23900
Chromium	mg/kg	32.2	39	34.6	47.3	35.2
Cobalt	mg/kg	4.7	66.5	10.1	12.6	8.3
Copper	mg/kg	19.3	7850	182	61.8	110
Cyanide	mg/kg	1.2 U		1.2 U	1.2 U	1.2 U
Iron	mg/kg	21300	30700	19800	23600	17400
Lead	mg/kg	16.7	4.8 J	7.7	22.7	26.8
Magnesium	mg/kg	3610	6670	4160	8030	6640
Manganese	mg/kg	166	109 J	187	322	467
Mercury	mg/kg	0.049		0.034	0.071	0.07
Molybdenum	mg/kg	0.33		0.55	0.43	0.5
Nickel	mg/kg	15.6	36.9	29.6	42.6	30.3
Potassium	mg/kg	398	3980	1840	2430	2940
Selenium	mg/kg	0.63		0.85	0.58	0.42
Silver	mg/kg	1 U	2.4	0.18	0.27	1 U
Sodium	mg/kg	24.8	84.3 JEB	81	46.7	77.4
Strontium	mg/kg	1.8	2.8	3.2	4.6	13.8
Thallium	mg/kg	0.1		0.078	0.18	0.18
Vanadium	mg/kg	48.6	33.6	37.6	39.6	33.8
Zinc	mg/kg	43.8	107	30.3	77.5	75.1
Acid Base Potential	t CaCO3/1000t					
Acid Generation Potential	t CaCO3/1000t					
Acid Neutralization Potential	t CaCO3/1000t					
Acid-Base Accounting	t CaCO3/1000t					
Cation Exchange Capacity	meq/100 g					
pH	SU					
Saturated Paste Conductivity	mmhos/cm					
Sulfate	%					
Sulfur	%					
Sulfur, Dissociable	%					
Sulfur, Pyritic	%					
Sulfur, Residual	%					
Total Organic Carbon	%					

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	TL-04X-082509AX	TN-02X-082509AD	TN-02X-082509AX	TO-05X-082709AX	TP-10X-082709AX
	Depth (ft):	0-1	0-1	0-1	0-1	0-1
	Sample Date:	8/25/2009	8/25/2009	8/25/2009	8/27/2009	8/27/2009
Analyte	**Units**					
Aluminum	mg/kg	18100	24600	18800	14100	19100
Antimony	mg/kg	0.19	0.13	0.11	0.058	0.079
Arsenic	mg/kg	1.9	2	1.4	1 UJ	1 UJ
Barium	mg/kg	49.4	41.1	33.1	75	43.8
Beryllium	mg/kg	0.4	0.7	0.54	0.25 J	0.45 J
Cadmium	mg/kg	0.2	0.15	0.12	0.13	0.18
Calcium	mg/kg	950	836	669	1180	741
Chromium	mg/kg	51.3	49.4	39.1	43.6	48.6
Cobalt	mg/kg	10.2	9.2	8.3	18	9.7
Copper	mg/kg	68.6	78.3	61	1100 J	135 J
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg	20800	25300	20300	74000	24900
Lead	mg/kg	15	14.6	12.1	17.9 J	15.9 J
Magnesium	mg/kg	6390	5750	4660	5400	5400
Manganese	mg/kg	338	289	315	383 J	263 J
Mercury	mg/kg	0.048	0.075	0.059	0.099 U	0.057
Molybdenum	mg/kg	0.69	0.58	0.73	3.7	0.62
Nickel	mg/kg	29.7	34.7	27.8	22.7	32.8
Potassium	mg/kg	2020	637	512	3290	1320
Selenium	mg/kg	0.69	0.68	0.62	7.7	0.76
Silver	mg/kg	0.28	0.17	0.16	1.4	0.38 J
Sodium	mg/kg	54.8	50.2	40	125 J	43.6 J
Strontium	mg/kg	4.6	6.9	5.2	7.2	4.4
Thallium	mg/kg	0.17	0.13	0.1	0.17	0.11
Vanadium	mg/kg	46	48.3	37.9	55.2	47.5
Zinc	mg/kg	55.2	72	58.6	85.7	76.1
Acid Base Potential	t CaCO3/1000t					
Acid Generation Potential	t CaCO3/1000t					
Acid Neutralization Potential	t CaCO3/1000t					
Acid-Base Accounting	t CaCO3/1000t					
Cation Exchange Capacity	meq/100 g					
pH	SU					
Saturated Paste Conductivity	mmhos/cm					
Sulfate	%					
Sulfur	%					
Sulfur, Dissociable	%					
Sulfur, Pyritic	%					
Sulfur, Residual	%					
Total Organic Carbon	%					

TABLE F-1
ANALYTICAL RESULTS - TRANSITION ZONE SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	TP-15X-073009AD	TP-15X-073009AX	TQ-06X-082609AX	TQ-16X-082609AX
	Depth (ft):	0-1	0-1	0-1	0-1
	Sample Date:	7/30/2009	7/30/2009	8/26/2009	8/26/2009
Analyte	**Units**				
Aluminum	mg/kg	8060	7370	8850	23200
Antimony	mg/kg	0.5 UJ	0.5 UJ	0.048	0.056
Arsenic	mg/kg	1 U	1 U	1 U	0.62
Barium	mg/kg	96	115	40.1	77.7
Beryllium	mg/kg	0.5 U	0.5 U	0.08	0.53
Cadmium	mg/kg	0.25 UJ	0.25 UJ	0.017	0.14
Calcium	mg/kg	639	171 J	95.5	845
Chromium	mg/kg	42.5	42.3	52.1	55.9
Cobalt	mg/kg	8.4 J	9.2 J	4.1	10.2
Copper	mg/kg	462	584	288	109
Cyanide	mg/kg	1.2 U	1.2 U	1.2 U	1.2 U
Iron	mg/kg	91600	111000	73700	26100
Lead	mg/kg	14.5 J	29.3 J	6.1	8.5
Magnesium	mg/kg	3930	3780	4920	8930
Manganese	mg/kg	167 J	90 J	78.1	228
Mercury	mg/kg	0.099 U	0.1 U	0.037	0.033
Molybdenum	mg/kg	6.8	10.2	0.84	0.33
Nickel	mg/kg	17	15.5	23.3	40.1
Potassium	mg/kg	5120	6130	2840	2640
Selenium	mg/kg	18.4	23.7	2.7	0.46
Silver	mg/kg	1.8	2.5	1.4	0.38
Sodium	mg/kg			53.3	58.7
Strontium	mg/kg	6.6	7.3	1.2	4.4
Thallium	mg/kg	0.27 J	0.34 J	0.12	0.16
Vanadium	mg/kg	55.3	63.9	52.8	50.5
Zinc	mg/kg	50.7	51.2	38	76
Acid Base Potential	t CaCO3/1000t				
Acid Generation Potential	t CaCO3/1000t				
Acid Neutralization Potential	t CaCO3/1000t				
Acid-Base Accounting	t CaCO3/1000t	-37	-34		
Cation Exchange Capacity	meq/100 g				
pH	SU	3.6	3.6		
Saturated Paste Conductivity	mmhos/cm	0.22	0.26		
Sulfate	%				
Sulfur	%				
Sulfur, Dissociable	%				
Sulfur, Pyritic	%				
Sulfur, Residual	%				
Total Organic Carbon	%				

TABLE F-2
ANALYTICAL RESULTS - BACKGROUND SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-BK-07A	ELY-SS-BK-07B	ELY-SS-BK-07C	ELY-SS-BK-08A	ELY-SS-BK-08B	ELY-SS-BK-08C	ELY-SS-BK-10A	ELY-SS-BK-10B
	Depth (ft):	0-0.25	0-0.25	0-0.33	0-0.83	0-0.58	0-1	0-0.5	0-0.08
	Sample Date:	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007
Analyte	**Units**								
Aluminum	mg/kg	12000	6700	5800	9900	5200	12000	12000	12000
Antimony	mg/kg	5 U	8.8 U	7.4 U	6.3 U	2.6 U	6 U	5.4 U	5.7 U
Arsenic	mg/kg	1.5	4.3	3.4	2.3	1.5	2.6	1.9	2.1
Barium	mg/kg	78	54	130	190	98	350	59	64
Beryllium	mg/kg	1	0.6 J	0.51 J	0.65	0.37	0.94	0.7	0.67
Cadmium	mg/kg	1 U	1.8 U	0.52 J	0.34 UJ	0.21 J	0.4 J	1.1 U	1.1 U
Calcium	mg/kg	950	1100	2200	4000	1300	4600	1500	1600
Chromium	mg/kg	32	22	18	24	12	32	30	30
Cobalt	mg/kg	16	8.7	7.4	7.7	4.6	14	7.8	7.6
Copper	mg/kg	45	26	20	14	10	23	14	13
Iron	mg/kg	31000	25000	20000	16000	8700	22000	16000	15000
Lead	mg/kg	12	77	59	19	12	18	17	25
Magnesium	mg/kg	4700	2400	1900	3400	1600	4600	4400	4400
Manganese	mg/kg	1700 J	620 J	940 J	1700 J	7800 J	5200 J	600 J	930 J
Mercury	mg/kg	0.082 J	0.19	0.21	0.088 J	0.06 J	0.13	0.084 J	0.14
Molybdenum	mg/kg	5 U	8.8 U	7.4 U	6.3 U	2.6 U	6 U	5.4 U	5.7 U
Nickel	mg/kg	28	18	15	18	9.5	30	20	21
Potassium	mg/kg	2200	1000	620	950	280	3000	740	890
Selenium	mg/kg	2.1	2.9 J	2.5 J	1.5 J	0.98 J	2.2 J	1.2 J	1.5 J
Silver	mg/kg	0.61 UJ	0.65 UJ	0.58 UJ	0.49 UJ	0.44 UJ	1.4	0.22 UJ	0.34 UJ
Sodium	mg/kg	200 UJ	350 UJ	290 UJ	250 UJ	100 UJ	240 UJ	210 UJ	230 UJ
Thallium	mg/kg	1.4 J	1.3 J	1.2 J	1.3 J	0.91 J	4.3 J	2.1 U	1.2 J
Vanadium	mg/kg	59	58	40	28	15	39	32	32
Zinc	mg/kg	56	37	86	74	40	74	37	41

TABLE F-2
ANALYTICAL RESULTS - BACKGROUND SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-BK-10C	ELY-SS-BK-10C DUP	ELY-SS-BK-14A	ELY-SS-BK-14B	ELY-SS-BK-14C	ELY-SS-BK-15A	ELY-SS-BK-15B	ELY-SS-BK-15C
	Depth (ft):	0-0.5	0-0.5	0-0.08	0-0.67	0-0.08	0-0.17	0-0.04	0-0.21
	Sample Date:	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007
Analyte	**Units**								
Aluminum	mg/kg	10000	12000	8200	6600 J	9700 J	840 J	1800 J	1300 J
Antimony	mg/kg	2.7 U	0.24 UJ	4.1 U	3.3 U	3.1 U	4 U	4.8 U	5.4 U
Arsenic	mg/kg	0.91	1.4	1.3	1 J	1.8 J	1.9 J	2.2 J	2.7 J
Barium	mg/kg	70	79	25	29 J	21 J	26 J	29 J	19 J
Beryllium	mg/kg	0.65	0.75	0.5	0.5	0.62	0.028 J	0.14 J	0.095 J
Cadmium	mg/kg	0.21 UJ	0.24 UJ	0.82 U	0.2 J	0.25 J	0.28 J	0.52 J	0.32 J
Calcium	mg/kg	2400	2600	1000	2000 J	660 J	3000 J	920 J	1500 J
Chromium	mg/kg	28	30	18	29 J	23 J	1.4 J	3.4 J	2.4 J
Cobalt	mg/kg	6.7	8	5.6	3.8 J	5.9 J	0.35 J	1.3 J	0.92 J
Copper	mg/kg	13	14	12	7.9 J	11 J	5.5 J	8 J	6.4 J
Iron	mg/kg	13000	14000	9500	10000 J	15000 J	780 J	3500 J	1800 J
Lead	mg/kg	7.8	9.6	8.6	11 J	13 J	28 J	36 J	71 J
Magnesium	mg/kg	4100	4600	2200	2500 J	2100 J	300 J	560 J	400 J
Manganese	mg/kg	590 J	710 J	98 J	150	290	45	44	26
Mercury	mg/kg	0.052 J	0.064 J	0.12 J	0.02 J	0.052 J	0.27 J	0.16 J	0.29 J
Molybdenum	mg/kg	0.19 UJ	0.64 UJ	0.43 UJ	0.29 J	0.64 J	4 U	0.64 J	0.37 J
Nickel	mg/kg	19	21	13	12 J	11 J	3.5 J	6.8 J	4.4 J
Potassium	mg/kg	920	1100	550	640 J	330 J	460 J	610 J	510 J
Selenium	mg/kg	0.94 J	1 J	1.4 J	1.2 J	1.8 J	1.8 J	2.2 J	2.3 J
Silver	mg/kg	0.2 UJ	0.24 UJ	0.16 UJ	0.078 UJ	0.18 J	0.079 J	0.19 UJ	0.28 J
Sodium	mg/kg	110 UJ	110 UJ	160 UJ	130 UJ	120 UJ	110 J	190 UJ	220 UJ
Thallium	mg/kg	1.1 U	1.1 U	1.6 U	6.5 U	6.2 U	1.6 U	1.9 U	2.2 U
Vanadium	mg/kg	26	30	18	27 J	32 J	3.9 J	11 J	9.2 J
Zinc	mg/kg	44	49	25	21 J	26 J	30 J	31 J	17 J

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SB-1_2_3	ELY-SB-7_8	ELY-SS-NF-01	ELY-SS-SA-02	ELY-SS-SA-02 DUP	ELY-SS-SA-03	ELY-SS-SA-05
	Depth (ft):	0-0	0-0	0-0.17	0-0.25	0-0.25	0-0.5	0-0.5
	Sample Date:	12/7/2006	12/7/2006	10/16/2007	10/16/2007	10/16/2007	10/15/2007	10/15/2007
Analyte	**Units**							
1:2 Conductivity	mmhos	0.68	3.14					
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg			8000 J	3300 J	3000 J	12000	5300
Antimony	mg/kg			4 U	1.9 J	3 J	2.4 U	2.9 UJ
Arsenic	mg/kg			2.3 J	6.3 J	8.8 J	0.64	6.7
Barium	mg/kg			37 J	38 J	29 J	44	54
Beryllium	mg/kg			0.33 J	2.3 U	2.3 U	0.67	0.13 UJ
Cadmium	mg/kg			0.35 J	4.8	3.8 J	0.48 U	2.3 U
Calcium	mg/kg			2000 J	130 J	90 J	1500	250
Chromium	mg/kg			21 J	29 J	29 J	25	26
Cobalt	mg/kg			13 J	160 J	180 J	15	82
Copper	mg/kg			180 J	3100 J	3300 J	850	2500
CYANIDE	mg/kg							
Iron	mg/kg			14000 J	180000 J	190000 J	19000	140000
Lead	mg/kg			17 J	50 J	53 J	9.2	76
Magnesium	mg/kg			3600 J	1400 J	1400 J	5500	2300
Manganese	mg/kg			130	140	160	130 J	170 J
Mercury	mg/kg			0.03 J	0.14 J	0.14 J	0.057 J	0.29
Molybdenum	mg/kg			0.55 J	21 J	21 J	1 J	16
Nickel	mg/kg			14 J	30 J	34 J	16	16
pH	SU	4.3	5.9					
Potassium	mg/kg			1500 J	2000 J	1500 J	1500	3400
Saturated Paste Conductivity	mmhos/cm	0.68	3.14					
Selenium	mg/kg			2.8 J	52 J	48 J	1.9	44
Silver	mg/kg			0.39 J	8.9	7.9	0.32 UJ	9
Sodium	mg/kg			160 UJ	750 J	340 J	210 J	970 J
Strontium	mg/kg							
Thallium	mg/kg			1.5 J	3.3 J	9.2 U	0.65 J	6.9 J
Vanadium	mg/kg			31 J	48 J	47 J	26	44
Zinc	mg/kg			63 J	560 J	450 J	140	480

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-SA-07	ELY-SS-SA-08	ELY-SS-SA-10	ELY-SS-SA-11	ELY-SS-SA-12	ELY-SS-SA-12 DUP	ELY-SS-SA-13
	Depth (ft):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	10/15/2007	10/15/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	3300 J	9500 J	3600	6200	6200	5600	4900
Antimony	mg/kg	1.2 J	2.1 J	1.6 J	2.1 J	11 U	0.79 J	11 U
Arsenic	mg/kg	2.4 J	4 J	2.6 U	0.81 J	2.2 U	2.3 U	2.3 U
Barium	mg/kg	43	69	31 J	58 J	71 J	82 J	56 J
Beryllium	mg/kg	1.1 U	0.31 J	0.1 UJ	0.35 UJ	0.46 J	0.43 J	0.44 J
Cadmium	mg/kg	4.4 UJ	2.4 UJ	0.41 J	0.25 J	2.2 U	2.3 U	2.3 U
Calcium	mg/kg	67 J	1500 J	120	660	140	71	120
Chromium	mg/kg	32 J	34 J	21 J	32 J	33 J	36 J	24 J
Cobalt	mg/kg	24 J	71 J	7.2	7.5	5.6	5.4	4.7
Copper	mg/kg	1100 J	3000 J	4900 J	1700 J	280 J	1000 J	180 J
CYANIDE	mg/kg							
Iron	mg/kg	94000 J	85000 J	100000	97000	45000	65000	52000
Lead	mg/kg	21 J	60 J	15	16	6.8 J	10 J	5.8 J
Magnesium	mg/kg	2000 J	3900 J	1900	3300	3900	3300	2900
Manganese	mg/kg	75 J	300 J	63	90	58	60	64
Mercury	mg/kg	0.13	0.13	0.019 J	0.031 J	0.012 J	0.013 J	0.012 J
Molybdenum	mg/kg	11	9.1 J	6.6 J	10 J	2.2 J	3.6 J	0.99 J
Nickel	mg/kg	9.1	19	6.5	10	15	12	13
pH	SU							
Potassium	mg/kg	2800 J	2900 J	2800 J	4200 J	3900 J	4700 J	3600 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	25	28	31	35	10	19	11
Silver	mg/kg	3.6	4.8	2.4 UJ	3.2	0.83 UJ	2.2 J	0.86 J
Sodium	mg/kg	440 UJ	1100 J	510 U	550 U	450 U	470 U	450 U
Strontium	mg/kg							
Thallium	mg/kg	6.4 J	4 J	8.6 J	9.6 J	3.3 J	4.5 J	2.9 J
Vanadium	mg/kg	32 J	46 J	42	53	42	40	40
Zinc	mg/kg	84	470	75	120	25	37	23

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-SA-14	ELY-SS-SA-15	ELY-SS-SA-15 DUP	ELY-SS-SA-16	ELY-SS-SA-17	ELY-SS-SA-18	ELY-SS-SA-19
	Depth (ft):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/16/2007	10/17/2007	10/16/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	1900	5400	7600	2400	1100 J	2700 J	5900 J
Antimony	mg/kg	1.2 J	12 U	12 U	25 U	26 U	24 U	25 U
Arsenic	mg/kg	1.1 J	0.63 J	2.3 U	5 U	5.2 U	4.8 U	5 U
Barium	mg/kg	54	66	48	48	36 J	43	74 J
Beryllium	mg/kg	0.2 UJ	0.54 J	0.7 J	0.25 UJ	2.6 U	0.2 UJ	0.43 UJ
Cadmium	mg/kg	0.33 J	2.3 U	0.24 J	0.65 J	5.2 U	4.8 U	0.61 J
Calcium	mg/kg	77	140	110	46 J	34 J	40 J	100 J
Chromium	mg/kg	15	42	45	22	8.8 J	18 J	38 J
Cobalt	mg/kg	7.8	6.2	6	21	4.4 J	10	19 J
Copper	mg/kg	2200	400	450	3300	1600 J	1300	1400 J
CYANIDE	mg/kg							
Iron	mg/kg	85000	74000	73000	190000	160000 J	150000 J	160000 J
Lead	mg/kg	9.1 J	3.6 J	2.6 J	30	14 J	48 J	45 J
Magnesium	mg/kg	85	3300	4700	55	170 J	1200 J	3400 J
Manganese	mg/kg	42 J	69 J	50 J	26 J	18 J	54 J	120 J
Mercury	mg/kg	0.1	0.016 J	0.014 J	0.34	0.034 J	0.04 J	0.031 J
Molybdenum	mg/kg	12 J	0.86 J	12 U	38	16 J	18 J	12 J
Nickel	mg/kg	1.4 J	17	22	3.9 J	13 UJ	4.2 J	5.6 J
pH	SU							
Potassium	mg/kg	6000 J	3200 J	7200 J	6700 J	4600 J	6600	9500 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	44	8.5	5.5	84	31	44	37
Silver	mg/kg	7	1.7 J	0.55 UJ	23	4.9 J	5.3	6.2
Sodium	mg/kg	640	470 U	470 U	440 J	1000 U	960 U	1000 U
Strontium	mg/kg							
Thallium	mg/kg	6.9 J	5.8 J	5.4 J	8.7 J	7.5 J	3 J	7.8 J
Vanadium	mg/kg	39	60	57	120	57 J	65 J	81 J
Zinc	mg/kg	56	25	23	310	50	78	180

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-SA-20	ELY-SS-SA-21	ELY-SS-SA-22	ELY-SS-SA-24	ELY-SS-SA-24 DUP	ELY-SS-SA-25
	Depth (ft):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	860 J	5700 J	2700 J	3700	4100	5600 J
Antimony	mg/kg	2 J	24 U	0.58 J	1.1 J	1.8 J	23 U
Arsenic	mg/kg	3.8 J	4.7 U	0.41 UJ	2.3 U	2.3 U	4.6 U
Barium	mg/kg	34 J	34 J	46 J	47 J	50 J	51 J
Beryllium	mg/kg	2.4 U	0.21 UJ	0.55 J	0.26 J	0.35 J	0.28 UJ
Cadmium	mg/kg	0.73 J	0.78 J	0.66 J	1.5 J	1.4 J	4.6 U
Calcium	mg/kg	44 J	130 J	150 J	46	45	71 J
Chromium	mg/kg	7.3	29	18	28 J	34 J	25 J
Cobalt	mg/kg	5.5 J	10	3.1	12	14	9.7
Copper	mg/kg	3200	2800	89	4700 J	1900 J	2600 J
CYANIDE	mg/kg						
Iron	mg/kg	170000	130000	41000 J	150000	140000	110000 J
Lead	mg/kg	30	21 J	26	21	23	15 J
Magnesium	mg/kg	190 J	3200 J	1600 J	2000	2200	3200 J
Manganese	mg/kg	26 J	110 J	86 J	68 J	77 J	110 J
Mercury	mg/kg	0.032 J	0.02 J	0.026 J	0.03 J	0.018 J	0.019 J
Molybdenum	mg/kg	41	16 J	12	11	10 J	19 J
Nickel	mg/kg	1.1 J	8.6 J	2 J	4.9 J	4.9 J	3.3 J
pH	SU						
Potassium	mg/kg	4600 J	6700 J	6900 J	7800 J	8200 J	10000 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	86	52	40	44	38	54 J
Silver	mg/kg	8.6	4.4 J	5.7	11	6	6
Sodium	mg/kg	960 U	950 U	220 U	450 UJ	460 UJ	920 U
Strontium	mg/kg						
Thallium	mg/kg	5 J	9.5 U	2.9 J	4.5 U	4.6 U	3.7 J
Vanadium	mg/kg	76 J	60 J	31 J	70	78	100 J
Zinc	mg/kg	49	130	24	110	110	110 J

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-SA-26	ELY-SS-SA-27	ELY-SS-SA-28	ELY-SS-SA-29	ELY-SS-SA-30	ELY-SS-SA-31	ELY-SS-TR-01A
	Depth (ft):	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.08
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/15/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	970	4500	4700	3200 J	7000	1200 J	12000 J
Antimony	mg/kg	4.6 J	11 U	1.4 J	2 J	1.5 J	23 U	1.5 J
Arsenic	mg/kg	1.1 J	2.3 U	2.4 U	4.8 U	2.4 U	4.6 U	0.83 UJ
Barium	mg/kg	41 J	49 J	42 J	40 J	72	39	41
Beryllium	mg/kg	1.2 U	0.4 UJ	0.58 J	0.26 UJ	0.6 J	2.3 U	0.53
Cadmium	mg/kg	2.2 J	0.8 UJ	1.4 J	4.8 U	0.28 J	0.59 J	0.96 UJ
Calcium	mg/kg	43	62	72	58 J	200	44 UJ	1600 J
Chromium	mg/kg	14 J	31 J	52 J	31 J	44	8.2 J	25 J
Cobalt	mg/kg	13	16	14	12	11	5.7 J	22 J
Copper	mg/kg	2200 J	1400 J	1100	1900 J	510	2100	930 J
CYANIDE	mg/kg							
Iron	mg/kg	210000	120000	180000	130000 J	92000	190000 J	18000 J
Lead	mg/kg	57	14	19	20 J	6.8 J	15 J	9.6 J
Magnesium	mg/kg	290	2500	2400 J	1500 J	4100	320 J	5600 J
Manganese	mg/kg	26 J	68 J	80	58 J	91 J	33 J	220 J
Mercury	mg/kg	0.26	0.15	0.028 J	0.09 J	0.019 UJ	0.055 J	0.015 J
Molybdenum	mg/kg	17	16	18	21 J	9.3 J	69	1.4 J
Nickel	mg/kg	3.7 J	5.4 J	6.8 J	3 UJ	14	1.5 J	17
pH	SU							
Potassium	mg/kg	4900 J	7100 J	11000	6800 J	5200 J	5200	1500 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	67	49	48	55 J	30	170	1.7 J
Silver	mg/kg	16	4.8	5.3	8.2	2.1 J	17	0.27 UJ
Sodium	mg/kg	480 UJ	460 UJ	480 U	950 U	490 U	920 U	210 J
Strontium	mg/kg							
Thallium	mg/kg	4.8 U	3.2 J	9.7 U	9.5 U	4.9 UJ	9.2 UJ	1.6 J
Vanadium	mg/kg	54	81	100 J	180 J	74	64 J	25 J
Zinc	mg/kg	70	85	88	91 J	46	65	120

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-01A	ELY-SS-TR-01B	ELY-SS-TR-01B	ELY-SS-TR-01C	ELY-SS-TR-01C	ELY-SS-TR-01D
	Depth (ft):	0.08-0.67	0-0.13	0.13-0.67	0-0.17	0.17-0.92	0.04-0.83
	Sample Date:	10/15/2007	10/15/2007	10/15/2007	10/15/2007	10/15/2007	10/15/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	11000 J	11000 J	11000 J	8500 J	7000 J	6600 J
Antimony	mg/kg	0.62 J	5.2 U	5.3 U	4.6 U	4.5 U	4.3 U
Arsenic	mg/kg	1.5 J	0.98 UJ	1.1 UJ	0.86 UJ	0.87 UJ	0.94 UJ
Barium	mg/kg	66	50	62	46	36	36
Beryllium	mg/kg	0.56 J	0.52	0.53	0.4 J	0.33 J	0.29 J
Cadmium	mg/kg	0.24 J	1 UJ	0.19 J	0.92 UJ	0.91 UJ	0.85 UJ
Calcium	mg/kg	4000 J	3200 J	3200 J	4200 J	8800 J	13000 J
Chromium	mg/kg	26 J	25 J	25 J	19 J	15 J	16 J
Cobalt	mg/kg	27 J	8.4 J	10 J	8.9 J	8.1 J	8.3 J
Copper	mg/kg	1700 J	260 J	620 J	360 J	270 J	610 J
CYANIDE	mg/kg						
Iron	mg/kg	23000 J	18000 J	19000 J	17000 J	12000 J	16000 J
Lead	mg/kg	60 J	8.2 J	8.8 J	6 J	4.5 J	4 J
Magnesium	mg/kg	5600 J	5600 J	5500 J	4200 J	3700 J	4000 J
Manganese	mg/kg	460 J	320 J	270 J	400 J	320 J	330 J
Mercury	mg/kg	0.04 J	0.01 J	0.01 J	0.006 J	0.08 U	0.09 U
Molybdenum	mg/kg	1.5 J	0.66 J	0.66 J	0.64 J	4.5 U	0.58 J
Nickel	mg/kg	21	19	19	16	14	14
pH	SU						
Potassium	mg/kg	1800 J	1800 J	2200 J	2000 J	1700 J	1800 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	3.2	2.7	2.9	2.5	0.97 J	1.9
Silver	mg/kg	0.5 UJ	0.35 UJ	0.44 UJ	0.37 UJ	0.27 UJ	0.32 UJ
Sodium	mg/kg	520 J	120 J	250 J	150 J	230 J	210 J
Strontium	mg/kg						
Thallium	mg/kg	2.1 J	1.4 J	1.1 J	1.6 J	1.4 J	4.3 U
Vanadium	mg/kg	28 J	26 J	26 J	21 J	16 J	18 J
Zinc	mg/kg	240	61	98	52	59	48

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-01D	ELY-SS-TR-03A	ELY-SS-TR-03A	ELY-SS-TR-04A	ELY-SS-TR-04A	ELY-SS-TR-05A
	Depth (ft):	0-0.04	0.04-1	0-0.04	0-0.08	0.08-1	0-0.21
	Sample Date:	10/15/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	9800 J	7700	8000	10000 J	3900 J	4500 J
Antimony	mg/kg	5.2 U	1.9 J	1.3 J	35 U	14 U	0.68 J
Arsenic	mg/kg	1.3 J	3 U	3.4 U	7 U	2.8 U	4.2
Barium	mg/kg	54	62 J	93 J	130	28	26 J
Beryllium	mg/kg	0.48 J	0.43 J	0.52 J	0.68 UJ	0.26 UJ	0.15 UJ
Cadmium	mg/kg	1 UJ	0.67 J	0.32 J	0.57 J	8.5	1.4 J
Calcium	mg/kg	4300 J	520	890	500	140	1900 J
Chromium	mg/kg	22 J	42 J	47 J	58 J	23 J	22
Cobalt	mg/kg	9.3 J	9.9	8.6	12 J	200	11
Copper	mg/kg	310 J	3400 J	750 J	1700	23000	750
CYANIDE	mg/kg						
Iron	mg/kg	18000 J	130000	140000	150000 J	44000 J	48000
Lead	mg/kg	6.6 J	28	23	86 J	13 J	59
Magnesium	mg/kg	4800 J	3600	4400	5300 J	2200 J	2200 J
Manganese	mg/kg	440 J	92	98	150 J	90 J	130 J
Mercury	mg/kg	0.1 U	0.039 J	0.042 J	0.079 J	0.022 J	0.31
Molybdenum	mg/kg	0.48 J	9.1 J	9.8 J	17 J	3.2 UJ	4.7 J
Nickel	mg/kg	19	9.4	12	15 J	46 J	12 J
pH	SU						
Potassium	mg/kg	2200 J	4500 J	7500 J	8900	1900	1500 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	2.1	45	37	58	48	15
Silver	mg/kg	0.38 UJ	4.9	3.6	6.4 J	2.5 J	19
Sodium	mg/kg	270 J	600 U	690 U	1400 U	1500	410 U
Strontium	mg/kg						
Thallium	mg/kg	2 J	9.9 J	10 J	14 UJ	5.6 UJ	2.8 J
Vanadium	mg/kg	23 J	72	72	94 J	29 J	44 J
Zinc	mg/kg	64	160	120	120	860	99

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-05A	ELY-SS-TR-05B	ELY-SS-TR-05B	ELY-SS-TR-07A	ELY-SS-TR-07A	ELY-SS-TR-08B
	Depth (ft):	0.21-0.75	0-0.08	0.08-0.58	0-0.08	0.08-0.67	0-0.25
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/18/2007	10/18/2007	10/18/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	4400 J	6500 J	7900 J	2200	8000	5600 J
Antimony	mg/kg	1.8 J	0.65 J	0.83 J	18 U	11 U	2.2 J
Arsenic	mg/kg	5.5 U	1.8 U	2 U	1.6 J	1.1 J	3.2 J
Barium	mg/kg	58 J	28 J	26 J	34 J	66 J	120 J
Beryllium	mg/kg	0.25 UJ	0.18 UJ	0.18 UJ	0.19 J	0.58 J	0.29 UJ
Cadmium	mg/kg	5.5 U	0.95 J	1.1	3.6 U	0.31 J	0.47 J
Calcium	mg/kg	180 J	580 J	270 J	1900	110	880 J
Chromium	mg/kg	28	35	46	12 J	44 J	37 J
Cobalt	mg/kg	13	9.1	8.4	7.9	15	21
Copper	mg/kg	690	770	730	420 J	470 J	1400 J
CYANIDE	mg/kg						
Iron	mg/kg	120000	50000	54000	29000	81000	140000 J
Lead	mg/kg	20 J	22	17	19	17	180 J
Magnesium	mg/kg	2500 J	3500 J	5300 J	1100	4000	2900 J
Manganese	mg/kg	69 J	81 J	100 J	120 J	110 J	110 J
Mercury	mg/kg	0.11	0.048 J	0.038 J	0.23	0.052 J	0.14 J
Molybdenum	mg/kg	16 J	3.7 J	2.2 J	2.2 J	6.3 J	16 J
Nickel	mg/kg	10 J	12 J	14 J	5.9 J	13	11 J
pH	SU						
Potassium	mg/kg	3100 J	1800 J	1500 J	1800 J	5000 J	6800 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	47	12	9.4	11	21	44 J
Silver	mg/kg	11	2.1	0.86 J	1.7 J	2.6	12
Sodium	mg/kg	1100 U	230 U	200 U	720 UJ	460 UJ	1100 U
Strontium	mg/kg						
Thallium	mg/kg	4.3 J	5.7 U	5.1 U	2.6 J	2.9 J	10 J
Vanadium	mg/kg	53 J	39 J	50 J	26	67	75 J
Zinc	mg/kg	78	66	56	130	76	210 J

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TR-08B DUP	ELY-SS-TR-08B	ELY-SS-TR-08B DUP	ELY-SS-TR-09A	ELY-SS-TR-09A	ELY-SS-TZ-01
	Depth (ft):	0-0.25	0.25-0.67	0.25-0.67	0-0.21	0.21-1	0-0.13
	Sample Date:	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/18/2007	10/16/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	1900 J	9400 J	4600 J	16000	18000	7200 J
Antimony	mg/kg	4.5 J	3.5 J	2.4 J	15 U	12 U	15 U
Arsenic	mg/kg	2.5 J	1.3 J	5.1 U	1.3 J	0.9 J	11 J
Barium	mg/kg	83 J	83 J	35 J	98 J	91 J	60 J
Beryllium	mg/kg	2.4 U	0.35 UJ	2.6 U	0.77 J	0.78 J	0.22 UJ
Cadmium	mg/kg	4.8 U	0.41 J	5.1 U	0.38 UJ	0.52 UJ	0.91 J
Calcium	mg/kg	6700 J	370 J	95 J	1000	1000	4100 J
Chromium	mg/kg	11 J	44 J	29 J	67 J	68 J	20 J
Cobalt	mg/kg	6 J	19	20	14	26	50 J
Copper	mg/kg	360 J	1400 J	2600 J	790 J	1100 J	520 J
CYANIDE	mg/kg						
Iron	mg/kg	37000 J	130000 J	170000 J	36000	37000	62000 J
Lead	mg/kg	55 J	180 J	160 J	19	6.2 J	59 J
Magnesium	mg/kg	1500 J	6100 J	2300 J	8800	9400	3500 J
Manganese	mg/kg	470 J	150 J	100 J	290 J	510 J	460
Mercury	mg/kg	0.23 J	0.15 J	0.16 J	0.093 J	0.024 J	0.091 J
Molybdenum	mg/kg	8.5 J	13 J	20 J	1.7 J	1.7 J	2.2 J
Nickel	mg/kg	6.5 J	14	11 J	33	37	27 J
pH	SU						
Potassium	mg/kg	3000 J	8200 J	5900 J	3800 J	5000 J	1100 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	13 J	37 J	67 J	6.4	6.6	6.7 J
Silver	mg/kg	4.9	9.8	15	3.1	0.81 J	0.62 J
Sodium	mg/kg	340 J	1000 U	1000 U	600 UJ	470 UJ	470 J
Strontium	mg/kg						
Thallium	mg/kg	4.1 J	7 J	3.4 J	2 J	4.7 U	6 U
Vanadium	mg/kg	20 J	75 J	51 J	61	58	21 J
Zinc	mg/kg	250 J	190 J	270 J	94	96	340 J

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-01	ELY-SS-TZ-02	ELY-SS-TZ-02	ELY-SS-TZ-04	ELY-SS-TZ-04 DUP	ELY-SS-TZ-04
	Depth (ft):	0.13-0.67	0-0.13	0.13-0.5	0-0.17	0-0.17	0.17-0.5
	Sample Date:	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007	10/16/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	7400 J	5200 J	5200 J	14000 J	3500 J	9900 J
Antimony	mg/kg	11 U	1.8 J	2.5 J	11 U	6.3 U	12 U
Arsenic	mg/kg	1.6 J	5.9 J	8.6 J	3.2 J	2.5 J	5.4 J
Barium	mg/kg	44 J	36 J	29 J	89 J	43 J	56 J
Beryllium	mg/kg	0.3 UJ	1.4 U	1.2 U	0.76 J	0.16 J	0.48 UJ
Cadmium	mg/kg	0.64 J	1.9 J	2.6	0.74 J	0.56 J	0.86 J
Calcium	mg/kg	1800 J	4300 J	570 J	6100 J	5600 J	6400 J
Chromium	mg/kg	20 J	28 J	33 J	40 J	9.1 J	27 J
Cobalt	mg/kg	52 J	120 J	160 J	29 J	12 J	34 J
Copper	mg/kg	920 J	2300 J	2900 J	780 J	230 J	2500 J
CYANIDE	mg/kg						
Iron	mg/kg	30000 J	98000 J	130000 J	28000 J	8200 J	24000 J
Lead	mg/kg	52 J	52 J	67 J	110 J	50 J	60 J
Magnesium	mg/kg	3500 J	2600 J	2200 J	7000 J	2500 J	5500 J
Manganese	mg/kg	510	200	190	610	420	380
Mercury	mg/kg	0.1 J	0.39 J	0.56 J	0.19 J	0.13 J	0.71 J
Molybdenum	mg/kg	1.8 J	9.7 J	14	1.4 UJ	0.68 J	0.99 J
Nickel	mg/kg	16 J	30 J	35 J	30 J	8.7 J	25 J
pH	SU						
Potassium	mg/kg	1400 J	1400 J	1400 J	1600 J	1900 J	1800 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	4.2 J	27 J	35 J	4.7 J	3.6 J	4.9 J
Silver	mg/kg	0.38 J	3.4	5.1	0.52 J	0.61 J	0.73 J
Sodium	mg/kg	550 J	210 J	470 UJ	790 J	420 J	480 J
Strontium	mg/kg						
Thallium	mg/kg	4.5 U	5.6 U	7.5 J	1.5 J	2.5 U	4.8 U
Vanadium	mg/kg	20 J	34 J	40 J	42 J	12 J	26 J
Zinc	mg/kg	310 J	280 J	340 J	270 J	140 J	180 J

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-04 DUP	ELY-SS-TZ-05	ELY-SS-TZ-05	ELY-SS-TZ-05	ELY-SS-TZ-05	ELY-SS-TZ-07	ELY-SS-TZ-07
	Depth (ft):	0.17-0.5	0-0.08	0-0.08	0.08-0.67	0.08-0.67	0-0.13	0.13-0.54
	Sample Date:	10/16/2007	10/16/2007	10/23/2007	10/16/2007	10/23/2007	10/16/2007	10/16/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	8300 J	7800 J	9700	7000 J	6900	9200 J	9800 J
Antimony	mg/kg	2.5 U	13 U	13 U	11 U	11 U	3.1 U	11 U
Arsenic	mg/kg	2.3 J	14	23	4.7	2.4	0.93 J	0.87 J
Barium	mg/kg	42 J	44	58 J	43	35 J	46 J	61 J
Beryllium	mg/kg	0.4	0.31 J	0.48 J	0.38 J	0.44 J	0.52	0.43 UJ
Cadmium	mg/kg	0.58	2.3 J	3	1.5 J	0.96 J	0.79	0.59 J
Calcium	mg/kg	3100 J	2000	2300	1400	1300	5500 J	4200 J
Chromium	mg/kg	22 J	16 J	21 J	17 J	16 J	20 J	24 J
Cobalt	mg/kg	19 J	19	28	40	32	11 J	19 J
Copper	mg/kg	740 J	710	990	1700	1500	150 J	520 J
CYANIDE	mg/kg							
Iron	mg/kg	14000 J	29000 J	30000	31000 J	23000	12000 J	22000 J
Lead	mg/kg	40 J	64	90	18	11	13 J	55 J
Magnesium	mg/kg	4800 J	3800 J	4500 J	3800 J	3100 J	4600 J	4700 J
Manganese	mg/kg	300	230	280	310	260	350	390
Mercury	mg/kg	0.11 J	0.024 J	0.1 J	0.017 J	0.035 J	0.021 J	0.079 J
Molybdenum	mg/kg	0.69 J	1.2 J	2 J	4.6 J	2.2 J	0.22 UJ	11 U
Nickel	mg/kg	18 J	27	31 J	20	16 J	16 J	19 J
pH	SU							
Potassium	mg/kg	1300 J	730	1100	1200	980	2100 J	1800 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	2.6 J	4.1 J	5.5	4.3 J	4.4	0.88 J	2.3 J
Silver	mg/kg	0.4 J	2.6 U	0.25 J	1.2 J	1 J	0.3 J	0.15 J
Sodium	mg/kg	320 J	510 J	850 J	760	690 J	280 J	370 J
Strontium	mg/kg							
Thallium	mg/kg	5 U	2 J	1.7 J	4.5 U	4.4 U	0.55 UJ	4.5 U
Vanadium	mg/kg	20 J	23 J	30 J	20 J	17 J	21 J	22 J
Zinc	mg/kg	120 J	210	300	290	240	120 J	200 J

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-08	ELY-SS-TZ-08	ELY-SS-TZ-09	ELY-SS-TZ-09	ELY-SS-TZ-10	ELY-SS-TZ-10	ELY-SS-TZ-13
	Depth (ft):	0.04-0.83	0-0.04	0.04-1	0-0.04	0-0.08	0.08-0.83	0-0.33
	Sample Date:	10/16/2007	10/16/2007	10/18/2007	10/18/2007	10/15/2007	10/15/2007	10/17/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	11000 J	9200 J	3600	4100	14000	6800	3000
Antimony	mg/kg	2.3 U	2.6 U	2 U	0.24 J	6.1 U	11 U	7.9 U
Arsenic	mg/kg	1 J	1.6 J	0.43	0.81	1.9	0.84 UJ	2.1
Barium	mg/kg	45 J	73 J	20	25	50	29	59
Beryllium	mg/kg	0.59	0.46	0.23	0.24	0.87	0.33 UJ	0.11 J
Cadmium	mg/kg	0.49	0.62	0.083 J	0.25 J	0.2 UJ	2.3 U	2.3
Calcium	mg/kg	3600 J	6300 J	13000	4900	3000	1300	8700
Chromium	mg/kg	23 J	20 J	8.1	10	38	19	6.4
Cobalt	mg/kg	13 J	11 J	2.9	4.4	22	41	18
Copper	mg/kg	410 J	260 J	7.5	34	460	810	760
CYANIDE	mg/kg							
Iron	mg/kg	16000 J	15000 J	5000	8800	31000	33000	23000
Lead	mg/kg	11 J	17 J	1.8 J	10 J	57	17	20
Magnesium	mg/kg	5600 J	4600 J	2000	2300	7700	3400	820
Manganese	mg/kg	390	550	210 J	210 J	250 J	270 J	310 J
Mercury	mg/kg	0.017 J	0.041 J	0.08 U	0.026 UJ	0.086 J	0.056 J	0.18 J
Molybdenum	mg/kg	0.34 J	0.45 J	2 U	0.83 J	1.6 J	2.4 J	1.5 J
Nickel	mg/kg	20 J	16 J	8.9	9.8	25	12	7.5
pH	SU							
Potassium	mg/kg	1500 J	2000 J	1200 J	1500 J	2600	1100	2000 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	1.4 J	1.8 J	0.82 U	1.7	3.4	4.1 J	7.1
Silver	mg/kg	0.18 UJ	0.26 UJ	0.079 J	0.34 J	0.72 UJ	0.47 UJ	5.1
Sodium	mg/kg	200 J	260 J	110	170	440 J	830 J	470
Strontium	mg/kg							
Thallium	mg/kg	4.6 U	5.2 U	0.82 UJ	0.89 UJ	0.84 J	4.6 U	3.2 U
Vanadium	mg/kg	24 J	21 J	8	11	42	22	10
Zinc	mg/kg	67 J	110 J	10	40	190	360	98

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-13	ELY-SS-TZ-17	ELY-SS-TZ-17	ELY-SS-TZ-19	ELY-SS-TZ-19	ELY-SS-TZ-20	ELY-SS-TZ-20
	Depth (ft):	0.33-1	0.04-1	0-0.04	0.04-1	0-0.04	0-0.08	0.08-1
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	20000	13000	3500	8700	5900	10000	6400
Antimony	mg/kg	3.6 J	12 U	3.6 U	1 J	18 U	1.4 J	1.1 J
Arsenic	mg/kg	2.3 J	2.4 U	1.1	2.4 U	1.6 J	1.5 J	2.6 U
Barium	mg/kg	110 J	64	32	59	84	110 J	65 J
Beryllium	mg/kg	0.95 J	0.59 J	0.15 J	0.5 UJ	0.28 UJ	0.53 J	0.44 J
Cadmium	mg/kg	0.32 J	0.57 J	0.28 J	0.66 J	0.58 J	3.8 U	0.21 J
Calcium	mg/kg	1300	280	900	260	2400	1300	260
Chromium	mg/kg	59 J	61	15	52	32	46 J	34 J
Cobalt	mg/kg	13	24	6.4	6.4	8.5	9.2	6.1
Copper	mg/kg	640 J	460	130	420	550	1100 J	410 J
CYANIDE	mg/kg							
Iron	mg/kg	40000	52000	13000	78000	60000	110000	89000
Lead	mg/kg	21	2.5 J	5.3	3.3 J	71	28	15
Magnesium	mg/kg	7800	5600	1300	2000	1800	4600	3600
Manganese	mg/kg	180	88 J	59 J	40 J	88 J	160	78
Mercury	mg/kg	0.09 J	0.1 U	0.034 J	0.065 J	0.15	0.11 J	0.042 J
Molybdenum	mg/kg	3.4 J	0.88 UJ	0.31 UJ	2.6 UJ	4 UJ	10 J	4.4 J
Nickel	mg/kg	33	35	9.1	11	11	15	13
pH	SU							
Potassium	mg/kg	2600 J	4000 J	1100 J	3200 J	2600 J	6200 J	4400 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	7.2	6.4	3.2	28	19	39	24
Silver	mg/kg	0.84 UJ	0.98 J	0.32 J	2.1 J	2.8 J	4.7	2.5 J
Sodium	mg/kg	640 U	480 U	58 J	480 U	730 U	760 U	520 U
Strontium	mg/kg							
Thallium	mg/kg	6.4 U	1.9 J	1.4 U	3 J	3 J	14 J	8.1 J
Vanadium	mg/kg	59	60	16	72	42	71	59
Zinc	mg/kg	85	140	64	33	89	110	63

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-22	ELY-SS-TZ-22	ELY-SS-TZ-24	ELY-SS-TZ-24	ELY-SS-TZ-25	ELY-SS-TZ-25	ELY-SS-TZ-26
	Depth (ft):	0-0.17	0.17-0.83	0-0.08	0.08-1	0-0.25	0.25-0.92	0-0.13
	Sample Date:	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	4800 J	8900 J	3100	1500	5600	7000	3100 J
Antimony	mg/kg	23 U	14 U	2.5 J	1.1 J	2 J	15 U	10 U
Arsenic	mg/kg	2.1 J	2.9 U	2.8 U	1.6 J	1.9 J	2.4 J	2.6
Barium	mg/kg	110	61	71	63	62	75	46 J
Beryllium	mg/kg	0.21 UJ	0.47 UJ	1.4 U	0.19 UJ	0.29 UJ	0.4 UJ	0.11 UJ
Cadmium	mg/kg	2.4 J	0.46 J	1.4 J	0.8 J	0.69 J	0.66 J	1 J
Calcium	mg/kg	18000	1800	180	46	3400	810	4100 J
Chromium	mg/kg	18 J	42 J	18	35	30	40	12
Cobalt	mg/kg	41	12	20	4.5 J	13	14	6.9
Copper	mg/kg	1600	2200	1600	480	1000	1800	3500
CYANIDE	mg/kg							
Iron	mg/kg	55000 J	99000 J	160000	160000	72000	92000	24000 J
Lead	mg/kg	21 J	21 J	22	2.6 J	24	21	54
Magnesium	mg/kg	2200 J	4800 J	980	9.7 J	3500	4200	1300 J
Manganese	mg/kg	1200 J	140 J	61 J	17 J	87 J	68 J	61 J
Mercury	mg/kg	0.12 J	0.035 J	0.14	0.044 J	0.078 J	0.098 J	0.23
Molybdenum	mg/kg	4.8 J	9.6 J	35	1.9 J	7.8 J	9.7 J	2.3 J
Nickel	mg/kg	22 J	16 J	7.2	2.5 J	15	17	6.9 J
pH	SU							
Potassium	mg/kg	1700	3400	5100 J	4900 J	3300 J	5400 J	1800 J
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	26	29	74	18	27	35	13
Silver	mg/kg	3.1 J	3.1	19	2.6	4.6	6.5	4.7
Sodium	mg/kg	940 U	580 U	430 J	1800	630 U	610 U	400 U
Strontium	mg/kg							
Thallium	mg/kg	3 J	5.8 UJ	8.5 J	8.5 J	5.6 J	7.7 J	4 U
Vanadium	mg/kg	27 J	63 J	79	60	43	55	22 J
Zinc	mg/kg	110	100	240	28	120	110	130

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-26	ELY-SS-TZ-28	ELY-SS-TZ-28	ELY-SS-TZ-32	ELY-SS-TZ-32	ELY-SS-TZ-33	ELY-SS-TZ-33
	Depth (ft):	0.13-1	0.04-0.75	0-0.04	0-0.17	0.17-0.75	0-0.17	0.17-1
	Sample Date:	10/17/2007	10/19/2007	10/19/2007	10/19/2007	10/19/2007	10/18/2007	10/18/2007
Analyte	**Units**							
1:2 Conductivity	mmhos							
Acid-Base Accounting	t CaCO3/1000t							
Aluminum	mg/kg	7500	7000	13000	12000	18000	2700	8500
Antimony	mg/kg	1.1 J	11 U	1 J	13 U	13 U	0.44 J	0.84 J
Arsenic	mg/kg	1.8 J	2.3	7.5	2.5 J	2.7 U	1.4	2.4 U
Barium	mg/kg	63	31	45	29	37	23 J	50 J
Beryllium	mg/kg	0.39 UJ	0.27 UJ	0.41 J	0.45 J	0.54 J	0.13 J	0.42 J
Cadmium	mg/kg	0.6 J	2.3 U	0.32 J	0.39 J	0.3 J	0.64 J	0.34 J
Calcium	mg/kg	240	640	950	900	1200	2300	350
Chromium	mg/kg	39	24 J	27 J	59 J	78 J	12 J	55 J
Cobalt	mg/kg	11	5.4	8.3	15	20	5.6	14
Copper	mg/kg	860	380	1700	440	640	260	700
CYANIDE	mg/kg							
Iron	mg/kg	84000	28000	26000	30000	31000	22000	85000
Lead	mg/kg	21	4.8 J	24	31	8 J	14	23
Magnesium	mg/kg	3800	4000	4000	5500	7100	1100 J	4700 J
Manganese	mg/kg	100 J	95 J	140 J	160 J	280 J	42	120
Mercury	mg/kg	0.11	0.009 J	0.11 J	0.14	0.11	0.2 J	0.041 J
Molybdenum	mg/kg	7.6 J	1.6 UJ	1.4 J	1.6 UJ	1.8 UJ	1.4 J	6.2 J
Nickel	mg/kg	15	13	18	24	33	7.4 J	14 J
pH	SU							
Potassium	mg/kg	3200 J	1900 J	2700 J	1700 J	1500 J	2400	5700
Saturated Paste Conductivity	mmhos/cm							
Selenium	mg/kg	34	5.9	7.8	4.7 J	2.7 J	9.2	25
Silver	mg/kg	5.1	0.36 J	1.2 J	2.6 J	1.1 J	7.1	2.6
Sodium	mg/kg	530 U	450 U	1100	540 U	540 U	260 U	470 U
Strontium	mg/kg							
Thallium	mg/kg	5.3	1.4 UJ	4.6 U	2.1 UJ	5.4 U	2.6 U	4.7 U
Vanadium	mg/kg	54	26	28	58	67	21 J	72 J
Zinc	mg/kg	78	57 J	67 J	97 J	100 J	97	100

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	ELY-SS-TZ-41	ELY-SS-TZ-41	ELY-SS-TZ-44	ELY-SS-TZ-44	ELY-SS-TZ-45	ELY-SS-TZ-45
	Depth (ft):	0-0.13	0.13-0.92	0-0.25	0.25-1	0-0.17	0.17-1
	Sample Date:	10/18/2007	10/18/2007	10/17/2007	10/17/2007	10/17/2007	10/17/2007
Analyte	**Units**						
1:2 Conductivity	mmhos						
Acid-Base Accounting	t CaCO3/1000t						
Aluminum	mg/kg	8200	14000	6700 J	18000 J	1900 J	13000 J
Antimony	mg/kg	1.2 J	12 U	18 U	12 U	4.5 U	5.8 U
Arsenic	mg/kg	1.5 J	2.3 J	1.9 J	3.4	1.8	1.1 UJ
Barium	mg/kg	120 J	63 J	66 J	43 J	66 J	29 J
Beryllium	mg/kg	0.43 J	0.72 J	0.4 J	0.83 J	0.12 J	0.75
Cadmium	mg/kg	0.67 J	0.28 J	0.62 J	0.24 J	0.67 J	0.66 J
Calcium	mg/kg	940	490	430 J	810 J	1600 J	220 J
Chromium	mg/kg	38 J	40 J	10 J	45 J	3.8	36
Cobalt	mg/kg	13	11	7.5 J	9.2 J	2.2	4.8
Copper	mg/kg	1000 J	510 J	98 J	63 J	16	12
CYANIDE	mg/kg						
Iron	mg/kg	86000	48000	12000 J	25000 J	2900	41000
Lead	mg/kg	48	20	620 J	680 J	55	16
Magnesium	mg/kg	3600	5500	1300 J	6800 J	920 J	2800 J
Manganese	mg/kg	340 J	240 J	86 J	180 J	460 J	89 J
Mercury	mg/kg	0.17	0.062 J	0.064 J	0.057 J	0.22	0.05 J
Molybdenum	mg/kg	5.6 J	2.1 J	1.6 J	12 U	0.37 J	0.53 J
Nickel	mg/kg	11	23	15 J	25 J	5.9 J	13 J
pH	SU						
Potassium	mg/kg	7000 J	3000 J	840 J	1700 J	850 J	540 J
Saturated Paste Conductivity	mmhos/cm						
Selenium	mg/kg	26	11	14	58	2.7	3.9
Silver	mg/kg	3.2	1.2 J	0.64 UJ	0.26 UJ	0.28 J	0.18 J
Sodium	mg/kg	610 UJ	480 UJ	730 U	500 U	180 U	230 U
Strontium	mg/kg						
Thallium	mg/kg	6.1 U	4.8 U	7.3 U	5 U	1.8 U	2 J
Vanadium	mg/kg	80	55	16 J	61 J	7.9 J	120 J
Zinc	mg/kg	120	69	67	50	68	39

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	TD-03X-082809-AX	TD-05X-082809-DX	TF-11X-090209AX	TF-11X-090909AX	TH-01X-082509AX
	Depth (ft):	0-1	0-1	0-0.5	0-0.5	0-1
	Sample Date:	8/28/2009	8/28/2009	9/2/2009	9/2/2009	8/25/2009
Analyte	**Units**					
1:2 Conductivity	mmhos					
Acid-Base Accounting	t CaCO3/1000t					
Aluminum	mg/kg	4180	14800		13600	8460
Antimony	mg/kg	0.11	0.052	0.088		0.27
Arsenic	mg/kg	1 UJ	1 UJ		1 U	0.99 U
Barium	mg/kg	49.2	58.3		99.4	99.3
Beryllium	mg/kg	0.5 U	0.23 J		0.18 J	0.04
Cadmium	mg/kg	0.092	0.27	0.31		0.23
Calcium	mg/kg	113 J	500 J		130 J	252
Chromium	mg/kg	25.4	57.6		57.8	50.3
Cobalt	mg/kg	5.5	8.4		17.8	11.1
Copper	mg/kg	2750 J	420 J		5610	1920
CYANIDE	mg/kg	1.2 U	1.2 U	1.2 U		1.2 U
Iron	mg/kg	100000	18800		135000	96600
Lead	mg/kg	29 J	9.5 J		46.1 J	29.5
Magnesium	mg/kg	2260	7110		5420	5070
Manganese	mg/kg	60.3 J	103 J		108 J	139
Mercury	mg/kg	0.096 U	0.094 U	0.045		0.053
Molybdenum	mg/kg	1.6	0.33	0.37		7.3
Nickel	mg/kg	11	27.3		19.8	16.6
pH	SU					
Potassium	mg/kg	3250	1830		3940	5940
Saturated Paste Conductivity	mmhos/cm					
Selenium	mg/kg	3.8	0.58	33.2		18.2
Silver	mg/kg	2.1	0.23 J		7.4	5.2
Sodium	mg/kg	115 J	40.2 J		79.1 JEB	199
Strontium	mg/kg	2.8	3.9		2.2	5.2
Thallium	mg/kg	0.1	0.13	0.32		0.32
Vanadium	mg/kg	43.8	35.9		91.9	64.7
Zinc	mg/kg	184	70.5		140	107

TABLE F-3
ANALYTICAL RESULTS - BARREN SURFACE SOIL
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	TP-16X-080309AX
	Depth (ft):	0-1
	Sample Date:	8/3/2009
Analyte	**Units**	
1:2 Conductivity	mmhos	
Acid-Base Accounting	t CaCO3/1000t	1
Aluminum	mg/kg	17800
Antimony	mg/kg	0.5 UJ
Arsenic	mg/kg	0.36 J
Barium	mg/kg	119
Beryllium	mg/kg	0.36 J
Cadmium	mg/kg	0.7 J
Calcium	mg/kg	1390
Chromium	mg/kg	43.4
Cobalt	mg/kg	23.1
Copper	mg/kg	554
CYANIDE	mg/kg	1.3 U
Iron	mg/kg	30600
Lead	mg/kg	48.7
Magnesium	mg/kg	6640
Manganese	mg/kg	1070
Mercury	mg/kg	0.84
Molybdenum	mg/kg	1.3
Nickel	mg/kg	37
pH	SU	4.98
Potassium	mg/kg	1470
Saturated Paste Conductivity	mmhos/cm	0.22
Selenium	mg/kg	1.3 J
Silver	mg/kg	0.18 J
Sodium	mg/kg	
Strontium	mg/kg	6.5
Thallium	mg/kg	0.24 J
Vanadium	mg/kg	48.8
Zinc	mg/kg	118

TABLE F-4
ANALYTICAL RESULTS - SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample ID:	D01525	D01529	D01530	D01531	D01532	D01533	D01538	D01544
	Station ID:	MA-01X-091509KX	IV-01X-091609AX	IV-01X-091709AX	IV-REF-091609AX	IV-REF-091609BX	IV-03X-091609AX	IV-02X-091709AX	IV-03X-091609BX
	Sample Date:	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009
Analyte	Units								
Aluminum	mg/kg WW	20 U	150	21	20 U	20 U	240	42	170
Antimony	mg/kg WW	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Arsenic	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Barium	mg/kg WW	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ	20 UJ
Beryllium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.1	0.75	0.5 U
Calcium	mg/kg WW	10000 J	3000 J	1300 J	440 J	360 J	1500 J	1500 J	740 J
Chromium	mg/kg WW	1 U	1 U	1 U	1 U	1 U	2.9	1 U	1.7
Cobalt	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	mg/kg WW	8.4	20	16	14	15	35	26	43
Iron	mg/kg WW	160 J	220 J	43 J	22 J	29 J	530 J	350 J	730 J
Lead	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Magnesium	mg/kg WW	400	520	360	270	280	380	250 U	390
Manganese	mg/kg WW	17 J	34 J	21 J	5.4 J	4.8 J	21 J	33 J	20 J
Mercury	mg/kg WW	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Nickel	mg/kg WW	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Potassium	mg/kg WW	2700	3300	3200	3300	3300	2900	3200	3100
Selenium	mg/kg WW	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Silver	mg/kg WW	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 J	1 UJ
Sodium	mg/kg WW	1400	500	320	270	250	570	460	550
Thallium	mg/kg WW	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Zinc	mg/kg WW	31 J	54 J	47 J	50 J	51 J	95 J	72 J	52 J
Percent Moisture	%	73.9	71.8	69.9	67.5	69.3	70.1	72.9	70.1
% Lipids	%	3.6							

TABLE F-5
ANALYTICAL RESULTS - SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample Location:	MA-01		MA-01		MA-01		MA-01		MA-01		MA-01		MA-01	
	Exposure Area:	1		1		1		1		1		1		1	
	Transect No:	1		1		1		1		1		5		3	
	Sample ID:	D01484		D01485		D01486		D01487		D01488		D01489		D01490	
	Station ID:	MA-01X-091509AX		MA-01X-091509BX		MA-01X-091509CX		MA-01X-091509DX		MA-01X-091509EX		MA-01X-091509FX		MA-01X-091509GX	
	Species:	DM		SS		DM		DM		SS		DM		SS	
	Sample Date:	9/15/2009		9/15/2009		9/15/2009		9/15/2009		9/15/2009		9/15/2009		9/15/2009	
Analyte	Units														
Aluminum	mg/kg WW	20	U	20	U	28		20	U	77		20	U	20	U
Antimony	mg/kg WW	6	UJ	6	UJ	6	UJ	6	UJ	6	UJ	6	UJ	6	UJ
Arsenic	mg/kg WW	1	U	1	U	1	U	1	U	1.2		1.2		1.2	
Barium	mg/kg WW	20	U	20	U	20	U	20	U	20	U	20	U	20	U
Beryllium	mg/kg WW	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cadmium	mg/kg WW	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Calcium	mg/kg WW	9200		8100		7000		9000		7200		12000		9800	
Chromium	mg/kg WW	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Cobalt	mg/kg WW	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Copper	mg/kg WW	4.6		4		12		3.5		6.8		3.2		4	
Iron	mg/kg WW	83	J	130	J	640	J	97	J	190	J	55	J	130	J
Lead	mg/kg WW	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Magnesium	mg/kg WW	390	J	340	J	360	J	340	J	370	J	430	J	360	J
Manganese	mg/kg WW	12	J	4.6	J	3.9	J	4.3	J	9.6	J	9.8	J	1.5	UJ
Mercury	mg/kg WW	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Nickel	mg/kg WW	4	U	4	U	4	U	4	U	4	U	4	U	4	U
Potassium	mg/kg WW	3300		2800		2800		2900		2800		3300		3100	
Selenium	mg/kg WW	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U
Silver	mg/kg WW	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ
Sodium	mg/kg WW	1500		1300		1300		1300		1400		1500		1600	
Thallium	mg/kg WW	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Vanadium	mg/kg WW	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Zinc	mg/kg WW	28		31		26		27		33		38		32	
Percent Moisture	%	74.4		71.4		71.3		74.3		72.9		72.5		75.3	
% Lipids	%	4.31		3.27		5.31		5.29		5.07		3.63		3.13	

DM = deer mouse
LM = woodland jumping mouse
SS = short-tailed shrew

TABLE F-5
ANALYTICAL RESULTS - SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample Location:	MA-01	MA-01	MA-02	MA-02	MA-02	MA-02	MA-02
	Exposure Area:	1	1	2	2	2	2	2
	Transect No:	4	2	1	2	2	2	3
	Sample ID:	D01491	D01492	D01493	D01494	D01495	D01496	D01497
	Station ID:	MA-01X-091509HX	MA-01X-091509JX	MA-02X-091509AX	MA-02X-091509BX	MA-02X-091509CX	MA-02X-091509DX	MA-02X-091509EX
	Species:	DM	DM	DM	LM	DM	DM	DM
	Sample Date:	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009
Analyte	Units							
Aluminum	mg/kg WW	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Antimony	mg/kg WW	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Arsenic	mg/kg WW	1 U	1 U	1.1	1.6	1.2	1 U	1 U
Barium	mg/kg WW	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Beryllium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	mg/kg WW	9500	10000	7700	8000	5400	5600	8100
Chromium	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1.4	1 U
Cobalt	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	mg/kg WW	3.8	5.5	7.7	4	3.3	4.3	3.3
Iron	mg/kg WW	87 J	82 J	110 J	83 J	59 J	88 J	58 J
Lead	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Magnesium	mg/kg WW	380 J	410 J	310 J	330 J	280 J	310 J	350 J
Manganese	mg/kg WW	4.4 J	8.2 J	5 J	11 J	10 J	5 J	4.8 J
Mercury	mg/kg WW	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Nickel	mg/kg WW	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Potassium	mg/kg WW	2800	3400	2700	2500	2800	2900	2800
Selenium	mg/kg WW	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Silver	mg/kg WW	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Sodium	mg/kg WW	1400	1400	1300	1000	1300	1300	1300
Thallium	mg/kg WW	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Zinc	mg/kg WW	29	37	26	29	27	28	30
Percent Moisture	%	72	72.3	74.5	60.7	76	74.9	72.8
% Lipids	%	4.68	4.83	4.35	17.4	3.14	3.78	3.97

DM = deer mouse
LM = woodland jumping mouse
SS = short-tailed shrew

TABLE F-5
ANALYTICAL RESULTS - SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample Location:	MA-02	MA-02	MA-02	MA-02	MA-02	MA-02	MA-03
	Exposure Area:	2	2	2	2	2	2	3
	Transect No:	3	3	3	3	3	3	1
	Sample ID:	D01498	D01499	D01500	D01501	D01502	D01503	D01504
	Station ID:	MA-02X-091509FX	MA-02X-091509GX	MA-02X-091509HX	MA-02X-091509JX	MA-02X-091509KX	MA-02X-091509KD	MA-03X-091509AX
	Species:	DM	DM	DM	LM	LM	LM	DM
	Sample Date:	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009
Analyte	Units							
Aluminum	mg/kg WW	20 U	20 U	20 U	37	20 U	24	20 U
Antimony	mg/kg WW	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Arsenic	mg/kg WW	1 U	1	1 U	1 U	1 U	1	1 U
Barium	mg/kg WW	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Beryllium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	mg/kg WW	5300	9400	5200	7700	6300	8700	8800
Chromium	mg/kg WW	1 U	1	1 U	1 U	3.7	1 U	1 U
Cobalt	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	mg/kg WW	4.9	7.8	3.9	4.4	4.6	5.6	5.3
Iron	mg/kg WW	80 J	140 J	65 J	120 J	97 J	83 J	96 J
Lead	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Magnesium	mg/kg WW	290 J	490 J	290 J	350 J	270 J	370 J	350 J
Manganese	mg/kg WW	5 J	11 J	4.2 J	9.4 J	3.9 J	9.5 J	7.4 J
Mercury	mg/kg WW	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Nickel	mg/kg WW	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Potassium	mg/kg WW	2600	3200	2800	2500	2000	2500	2900
Selenium	mg/kg WW	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Silver	mg/kg WW	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Sodium	mg/kg WW	1200	1500	1100	1000	1100	1100	1400
Thallium	mg/kg WW	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Zinc	mg/kg WW	28	37	28	35	28	32	31
Percent Moisture	%	71.7	72.8	73.4	70.6	67.3	67.3	70.2
% Lipids	%	4.77	3.26	4.15	7.6	11.7	7.82	6.83

DM = deer mouse
LM = woodland jumping mouse
SS = short-tailed shrew

TABLE F-5
ANALYTICAL RESULTS - SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample Location:	MA-03	MA-03	MA-03	MA-03	MA-03	MA-03	MA-03
	Exposure Area:	3	3	3	3	3	3	3
	Transect No:	2	2	3	3	3	3	3
	Sample ID:	D01505	D01506	D01507	D01508	D01509	D01510	D01511
	Station ID:	MA-03X-091509BX	MA-03X-091509CX	MA-03X-091509DX	MA-03X-091509EX	MA-03X-091509FX	MA-03X-091509GX	MA-03X-091509HX
	Species:	DM	SS	SS	DM	DM	DM	DM
	Sample Date:	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009
Analyte	Units							
Aluminum	mg/kg WW	20 U	22	20 U	20 U	20 U	20	20 U
Antimony	mg/kg WW	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Arsenic	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Barium	mg/kg WW	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Beryllium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	mg/kg WW	0.5 U	1.2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	mg/kg WW	8300	9700	7700	5700	8400	8800	9700
Chromium	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cobalt	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	mg/kg WW	3.4	3.5	3.7	3.6	4.5	7.4	4.6
Iron	mg/kg WW	57 J	130 J	140 J	41 J	73 J	80 J	97 J
Lead	mg/kg WW	1 U	1 U	1.6	1 U	1 U	1 U	1 U
Magnesium	mg/kg WW	390 J	350 J	330 J	350 J	440 J	490 J	380 J
Manganese	mg/kg WW	18 J	34 J	1.5 UJ	4.6 J	14 J	15 J	11 J
Mercury	mg/kg WW	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Nickel	mg/kg WW	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Potassium	mg/kg WW	2800	2600	2700	2900	3100	3200	2900
Selenium	mg/kg WW	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Silver	mg/kg WW	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Sodium	mg/kg WW	1300	1400	1400	1200	1300	1400	1200
Thallium	mg/kg WW	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Zinc	mg/kg WW	27	46	32	27	29	30	29
Percent Moisture	%	70.5	71.9	72.1	65.7	69.9	69.5	72.7
% Lipids	%	6.93	4.85	3.22	5.07	7.26	7.34	5.14

DM = deer mouse
LM = woodland jumping mouse
SS = short-tailed shrew

TABLE F-5
ANALYTICAL RESULTS - SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample Location:	MA-03	MA-03	MA-REF	MA-REF	MA-REF	MA-REF	MA-REF
	Exposure Area:	3	3	REF	REF	REF	REF	REF
	Transect No:	3	3	REF	REF	REF	REF	REF
	Sample ID:	D01512	D01513	D01514	D01515	D01516	D01517	D01518
	Station ID:	MA-03X-091509JX	MA-03X-091509KX	MA-REF-091509AX	MA-REF-091509BX	MA-REF-091509CX	MA-REF-091509CD	MA-REF-091509DX
	Species:	DM	SS	REF	REF	REF	REF	REF
	Sample Date:	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009	9/15/2009
Analyte	Units							
Aluminum	mg/kg WW	27	20 U	34	20 U	20 U	33	33
Antimony	mg/kg WW	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ	6 UJ
Arsenic	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Barium	mg/kg WW	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Beryllium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cadmium	mg/kg WW	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Calcium	mg/kg WW	8500	7400	6900	7800	4600	7500	7200
Chromium	mg/kg WW	1 U	1 U	1.4	1 U	1 U	1 U	1 U
Cobalt	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Copper	mg/kg WW	6.3	4	2.7	3.9	3.4	3.6	3.7
Iron	mg/kg WW	150 J	83 J	130 J	76 J	92 J	180 J	100 J
Lead	mg/kg WW	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Magnesium	mg/kg WW	380 J	350 J	330 J	370 J	260 J	350 J	330 J
Manganese	mg/kg WW	16 J	4.2 J	4.9 J	4 J	1.5 UJ	14 J	1.5 UJ
Mercury	mg/kg WW	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Nickel	mg/kg WW	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Potassium	mg/kg WW	2900	2500	2600	2900	2500	2500	2300
Selenium	mg/kg WW	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U
Silver	mg/kg WW	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ	1 UJ
Sodium	mg/kg WW	1400	1300	1300	1200	1200	1300	1000
Thallium	mg/kg WW	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vanadium	mg/kg WW	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Zinc	mg/kg WW	29	29	35	27	29	30	30
Percent Moisture	%	72.2	71.5	73.1	74.4	72.2	72.2	62.3
% Lipids	%	4.75	5.13	3.95	4.62	3.59	5.18	18.1

DM = deer mouse
LM = woodland jumping mouse
SS = short-tailed shrew

TABLE F-5
ANALYTICAL RESULTS - SMALL MAMMALS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

	Sample Location:	MA-REF		MA-REF		MA-REF		MA-REF		MA-REF		MA-REF	
	Exposure Area:	REF		REF		REF		REF		REF		REF	
	Transect No:	REF		REF		REF		REF		REF		REF	
	Sample ID:	D01519		D01520		D01521		D01522		D01523		D01524	
	Station ID:	MA-REF-091509EX		MA-REF-091509FX		MA-REF-091509GX		MA-REF-091509HX		MA-REF-091509JX		MA-REF-091609KX	
	Species:	REF		REF		REF		REF		REF		REF	
	Sample Date:	9/15/2009		9/15/2009		9/15/2009		9/15/2009		9/15/2009		9/15/2009	
Analyte	Units												
Aluminum	mg/kg WW	24		20	U	20	U	20	U	26		20	U
Antimony	mg/kg WW	6	UJ	6	UJ	6	UJ	6	UJ	6	UJ	6	UJ
Arsenic	mg/kg WW	1	U	1	U	1	U	1	U	1	U	1	U
Barium	mg/kg WW	20	U	20	U	20	U	20	U	20	U	20	UJ
Beryllium	mg/kg WW	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Cadmium	mg/kg WW	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
Calcium	mg/kg WW	10000		3400		9100		11000		9800		9300	J
Chromium	mg/kg WW	1	U	1	U	1	U	1	U	1.5		1	U
Cobalt	mg/kg WW	5	U	5	U	5	U	5	U	5	U	5	U
Copper	mg/kg WW	3.5		2.7		4.3		4.3		5.9		2.8	
Iron	mg/kg WW	90	J	100	J	62	J	140	J	87	J	46	J
Lead	mg/kg WW	1	U	1	U	1	U	1	U	1	U	1	U
Magnesium	mg/kg WW	430	J	280	J	370	J	410	J	410	J	410	
Manganese	mg/kg WW	4.7	J	1.5	UJ	11	J	4.2	J	5.1	J	13	J
Mercury	mg/kg WW	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U	0.02	U
Nickel	mg/kg WW	4	U	4	U	4	U	4	U	4	U	4	U
Potassium	mg/kg WW	2600		2600		2600		2800		2800		2700	
Selenium	mg/kg WW	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U	3.5	U
Silver	mg/kg WW	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ
Sodium	mg/kg WW	1300		1300		1000		1500		1200		1300	
Thallium	mg/kg WW	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
Vanadium	mg/kg WW	5	U	5	U	5	U	5	U	5	U	5	U
Zinc	mg/kg WW	31		30		34		36		36		24	J
Percent Moisture	%	72.3		74.4		64.8		72.9		71.1		72.1	
% Lipids	%	5.06		3.37		11.7		4.37		6.52		4.79	

DM = deer mouse
LM = woodland jumping mouse
SS = short-tailed shrew

TABLE F-6
ANALYTICAL RESULTS - VERNAL POOLS
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

		Vernal Pool:	VP-1	VP-2	VP-3	VP-3	VP-4
		Sample ID:	VP-01X-072909AX	VP-02X-072809AX	VP-03X-072809AX	VP-03X-072809AD	VP-04X-072809AX
		Sample Date:	7/29/2009	7/28/2009	7/28/2009	7/28/2009	7/28/2009
Analyte	Fraction	Units					
Aluminum	Total	µg/L	200 U	200 U	200 U	200 U	200 U
Antimony	Total	µg/L	2 U	2 U	2 U	2 U	2 U
Arsenic	Total	µg/L	1 U	1 U	1 U	1 U	1 U
Barium	Total	µg/L	24 J	12.4 J	13.4	13.7 J	15.9 J
Beryllium	Total	µg/L	5 U	5 U	5 U	5 U	5 U
Cadmium	Total	µg/L	0.39 J	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Calcium	Total	µg/L	12000	12300	3150 J	9990	9910
Chromium	Total	µg/L	10 U	0.38 J	10 U	10 U	10 U
Cobalt	Total	µg/L	9.4 J	50 U	50 U	50 U	50 U
Copper	Total	µg/L	171	5.7	2.5	3.6	0.26 J
Iron	Total	µg/L	1070 J	80.8 J	42.9 J	743 J	477 J
Lead	Total	µg/L	0.11 J	1 UJ	0.089 J	0.24 J	1 UJ
Magnesium	Total	µg/L	1630 J	924 J	647 J	853 J	831 J
Manganese	Total	µg/L	188 J	11 J	9.8 J	88 J	97.8 J
Mercury	Total	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Molybdenum	Total	µg/L	10 U	10 U	10 U	10 U	10 U
Nickel	Total	µg/L	2.5 J	0.98 J	0.81 J	0.6 J	0.59 J
Potassium	Total	µg/L	2760 J	971 J	629 J	1310 J	1370 J
Selenium	Total	µg/L	1.7 J	5 UJ	5 UJ	5 UJ	5 UJ
Silver	Total	µg/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Sodium	Total	µg/L	1690 J	1290 J	856 J	1350 J	1400 J
Strontium	Total	µg/L	55.2 J	67.4 J	13.9 J	38.2 J	38.4 J
Thallium	Total	µg/L	0.073 J	1 U	1 U	1 U	1 U
Vanadium	Total	µg/L	5 UJ	5 UJ	0.34 J	0.58 J	0.29 J
Zinc	Total	µg/L	70.2	3.3 J	10.3 J	6.4 J	4.9 J
Aluminum	Dissolved	µg/L	200 U	200 U	200 U	200 U	200 U
Antimony	Dissolved	µg/L	2 U	2 U	2 U	2 U	2 U
Arsenic	Dissolved	µg/L	1 U	1 U	1 U	1 U	1 U
Barium	Dissolved	µg/L	24.3	12.6 J	13.8 J	13 J	16.1 J
Beryllium	Dissolved	µg/L	5 U	5 U	5 U	5 U	5 U
Cadmium	Dissolved	µg/L	0.36 J	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Calcium	Dissolved	µg/L	12400	12500	10600	10700	3360 J
Chromium	Dissolved	µg/L	10 U	10 U	10 U	10 U	10 U
Cobalt	Dissolved	µg/L	9.4 J	50 U	50 U	50 U	50 U
Copper	Dissolved	µg/L	145	4.7	1.5 J	1.7 J	2 U
Iron	Dissolved	µg/L	418	45.5 J	177	150	22.2 J
Lead	Dissolved	µg/L	1 U	1 U	1 U	1 U	1 U
Magnesium	Dissolved	µg/L	1630 J	923 J	803 J	853 J	617 J
Manganese	Dissolved	µg/L	184	10.9 J	114	84.9	8.6 J
Mercury	Dissolved	µg/L	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Molybdenum	Dissolved	µg/L	10 U	10 U	10 U	10 U	10 U
Nickel	Dissolved	µg/L	2.3 J	40 U	40 U	40 U	40 U
Potassium	Dissolved	µg/L	2730 J	980 J	1460 J	1290 J	697 J
Selenium	Dissolved	µg/L	1.7 J	5 U	5 U	5 U	5 U
Silver	Dissolved	µg/L	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ	0.5 UJ
Sodium	Dissolved	µg/L	1700 J	1300 J	1450 J	1490 J	891 J
Strontium	Dissolved	µg/L	53.9	64.3	37.1	37.5	13.3
Thallium	Dissolved	µg/L	0.069 J	1 U	1 U	1 U	1 U
Vanadium	Dissolved	µg/L	5 UJ	5 UJ	0.29 J	0.36 J	5 UJ
Zinc	Dissolved	µg/L	77.6	13.6 J	68.9	23.8 J	31.5 J
Acidity, Total	---	mg/L	10	18	8.7	13	9.4
Alkalinity (As CaCO3)	---	mg/L	9.5	35	26	29	5
Alkalinity, Bicarbonate (As CaCO3)	---	mg/L	9.5	35	26	29	5
Alkalinity, Carbonate (As CaCO3)	---	mg/L	5	5	5	5	5
Alkalinity, Hydroxide (As CaCO3)	---	mg/L	5	5	5	5	5
Chloride	---	mg/L	0.34	0.2	0.23	0.23	0.22
Nitrogen, Nitrite + Nitrate	---	mg/L	0.02	0.02	0.02	0.02	0.086
pH	---	pH units	6.33	6.39	7.27	7.46	6.33
Specific Conductivity	---	umhos/cm	98	67	62	62	29
Sulfate	---	mg/L	31	1.8	5.6	5.6	4.3

APPENDIX G

General UCL Statistics for Data Sets with Non-Detects

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Aluminum_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	101
Raw Statistics		**Log-transformed Statistics**	
Minimum	940	Minimum of Log Data	6.846
Maximum	100000	Maximum of Log Data	11.51
Mean	11586	Mean of log Data	9.097
Median	10000	SD of log Data	0.767
SD	9652		
Coefficient of Variation	0.833		
Skewness	4.9		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.137	Lilliefors Test Statistic	0.0913
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	12810	95% H-UCL	13460
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15409
95% Adjusted-CLT UCL (Chen-1995)	13101	97.5% Chebyshev (MVUE) UCL	16906
95% Modified-t UCL (Johnson-1978)	12857	99% Chebyshev (MVUE) UCL	19846
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.037	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	5687		
MLE of Mean	11586		
MLE of Standard Deviation	8117		
nu star	692.7		
Approximate Chi Square Value (.05)	632.7	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	12804
Adjusted Chi Square Value	632.2	95% Jackknife UCL	12810
		95% Standard Bootstrap UCL	12762
Anderson-Darling Test Statistic	0.931	95% Bootstrap-t UCL	13223
Anderson-Darling 5% Critical Value	0.766	95% Hall's Bootstrap UCL	14031
Kolmogorov-Smirnov Test Statistic	0.0557	95% Percentile Bootstrap UCL	12874
Kolmogorov-Smirnov 5% Critical Value	0.0723	95% BCA Bootstrap UCL	13190
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	14813
		97.5% Chebyshev(Mean, Sd) UCL	16209
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	18951
95% Approximate Gamma UCL	12686		
95% Adjusted Gamma UCL	12696		
Potential UCL to Use		Use 95% Approximate Gamma UCL	12686

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Aluminum_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	12
Raw Statistics		**Log-transformed Statistics**	
Minimum	840	Minimum of Log Data	6.733
Maximum	12000	Maximum of Log Data	9.393
Mean	7669	Mean of log Data	8.7
Median	8200	SD of log Data	0.869
SD	4043		
Coefficient of Variation	0.527		
Skewness	-0.526		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.885	Shapiro Wilk Test Statistic	0.781
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	9508	95% H-UCL	15791
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	17382
95% Adjusted-CLT UCL (Chen-1995)	9235	97.5% Chebyshev (MVUE) UCL	21237
95% Modified-t UCL (Johnson-1978)	9484	99% Chebyshev (MVUE) UCL	28811
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.796	**Data appear Normal at 5% Significance Level**	
Theta Star	4270		
MLE of Mean	7669		
MLE of Standard Deviation	5722		
nu star	53.89		
Approximate Chi Square Value (.05)	38.02	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	9386
Adjusted Chi Square Value	36.39	95% Jackknife UCL	9508
		95% Standard Bootstrap UCL	9314
Anderson-Darling Test Statistic	1.06	95% Bootstrap-t UCL	9353
Anderson-Darling 5% Critical Value	0.746	95% Hall's Bootstrap UCL	9212
Kolmogorov-Smirnov Test Statistic	0.187	95% Percentile Bootstrap UCL	9280
Kolmogorov-Smirnov 5% Critical Value	0.224	95% BCA Bootstrap UCL	9240
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	12219
		97.5% Chebyshev(Mean, Sd) UCL	14188
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	18056
95% Approximate Gamma UCL	10870		
95% Adjusted Gamma UCL	11359		
Potential UCL to Use		Use 95% Student's-t UCL	9508

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Aluminum - Soil Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Aluminum_Veg

Background Data: Aluminum_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	101	12
Minimum	940	840
Maximum	100000	12000
Mean	11586	7669
Median	10000	8200
SD	9652	4043
SE of Mean	740.3	1044

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16187
WMW Test U-Stat	1.894
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.0583

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Aluminum - Small Mammals Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: ALUMINUM_VEG

Background Data: ALUMINUM_BKGD

Raw Statistics

	Site	Background
Number of Valid Observations	30	10
Number of Distinct Observations	7	5
Minimum	20	20
Maximum	77	34
Mean	23.17	25
Median	20	22
SD	10.78	6.11
SE of Mean	1.968	1.932

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	569.5
WMW Test U-Stat	1.406
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.151

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Antimony_Veg

General Statistics

Number of Valid Data	169	Number of Detected Data	63
Number of Distinct Detected Data	48	Number of Non-Detect Data	106
		Percent Non-Detects	62.72%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.048	Minimum Detected	-3.037
Maximum Detected	8.1	Maximum Detected	2.092
Mean of Detected	1.116	Mean of Detected	-0.776
SD of Detected	1.638	SD of Detected	1.373
Minimum Non-Detect	0.46	Minimum Non-Detect	-0.777
Maximum Non-Detect	43	Maximum Non-Detect	3.761
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	169
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.257	Lilliefors Test Statistic	0.0877
5% Lilliefors Critical Value	0.112	5% Lilliefors Critical Value	0.112
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	3.816	Mean	0.551
SD	3.874	SD	1.536
95% DL/2 (t) UCL	4.309	95% H-Stat (DL/2) UCL	7.752
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.939
		SD in Log Scale	1.02
		Mean in Original Scale	0.709
		SD in Original Scale	1.097
		95% t UCL	0.849
		95% Percentile Bootstrap UCL	0.851
		95% BCA Bootstrap UCL	0.864
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.663	**Data appear Lognormal at 5% Significance Level**	
Theta Star	1.683		
nu star	83.51		
A-D Test Statistic	1.68	**Nonparametric Statistics**	
5% A-D Critical Value	0.798	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.798	Mean	0.898
5% K-S Critical Value	0.117	SD	1.377
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.146
		95% KM (t) UCL	1.14
Assuming Gamma Distribution		95% KM (z) UCL	1.139
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.14
Minimum	1E-12	95% KM (bootstrap t) UCL	1.203
Maximum	8.1	95% KM (BCA) UCL	1.153
Mean	1.189	95% KM (Percentile Bootstrap) UCL	1.149
Median	1.038	95% KM (Chebyshev) UCL	1.535
SD	1.163	97.5% KM (Chebyshev) UCL	1.811
k star	0.897	99% KM (Chebyshev) UCL	2.352
Theta star	1.326		
Nu star	303	**Potential UCLs to Use**	
AppChi2	263.7	95% KM (BCA) UCL	1.153
95% Gamma Approximate UCL	1.366		
95% Adjusted Gamma UCL	1.368		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Arsenic_Veg

General Statistics

Number of Valid Data	170	Number of Detected Data	135
Number of Distinct Detected Data	53	Number of Non-Detect Data	35
		Percent Non-Detects	20.59%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.48	Minimum Detected	-0.734
Maximum Detected	22	Maximum Detected	3.091
Mean of Detected	2.788	Mean of Detected	0.767
SD of Detected	2.823	SD of Detected	0.663
Minimum Non-Detect	0.59	Minimum Non-Detect	-0.528
Maximum Non-Detect	8.6	Maximum Non-Detect	2.152

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	164
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	6
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	96.47%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.26	Lilliefors Test Statistic	0.091
5% Lilliefors Critical Value	0.0763	5% Lilliefors Critical Value	0.0763
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.5	Mean	0.631
SD	2.612	SD	0.718
95% DL/2 (t) UCL	2.831	95% H-Stat (DL/2) UCL	2.708
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.639
		SD in Log Scale	0.674
		Mean in Original Scale	2.474
		SD in Original Scale	2.598
		95% t UCL	2.804
		95% Percentile Bootstrap UCL	2.818
		95% BCA Bootstrap UCL	2.909
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.043	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	1.364		
nu star	551.7		
A-D Test Statistic	4.241	**Nonparametric Statistics**	
5% A-D Critical Value	0.765	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.765	Mean	2.489
5% K-S Critical Value	0.0814	SD	2.6
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.202
		95% KM (t) UCL	2.823
Assuming Gamma Distribution		95% KM (z) UCL	2.821
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.821
Minimum	1E-12	95% KM (bootstrap t) UCL	2.924
Maximum	22	95% KM (BCA) UCL	2.836
Mean	2.623	95% KM (Percentile Bootstrap) UCL	2.855
Median	2.2	95% KM (Chebyshev) UCL	3.368
SD	2.602	97.5% KM (Chebyshev) UCL	3.749
k star	0.667	99% KM (Chebyshev) UCL	4.496
Theta star	3.934		
Nu star	226.7	**Potential UCLs to Use**	
AppChi2	192.9	95% KM (BCA) UCL	2.836
95% Gamma Approximate UCL	3.084		
95% Adjusted Gamma UCL	3.088		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Arsenic_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	13
Raw Statistics		**Log-transformed Statistics**	
Minimum	1	Minimum of Log Data	0
Maximum	4.3	Maximum of Log Data	1.459
Mean	2.11	Mean of log Data	0.672
Median	1.9	SD of log Data	0.396
SD	0.879		
Coefficient of Variation	0.417		
Skewness	1.176		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.917	Shapiro Wilk Test Statistic	0.987
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.51	95% H-UCL	2.609
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3.065
95% Adjusted-CLT UCL (Chen-1995)	2.557	97.5% Chebyshev (MVUE) UCL	3.48
95% Modified-t UCL (Johnson-1978)	2.522	99% Chebyshev (MVUE) UCL	4.294
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	5.535	**Data appear Normal at 5% Significance Level**	
Theta Star	0.381		
MLE of Mean	2.11		
MLE of Standard Deviation	0.897		
nu star	166		
Approximate Chi Square Value (.05)	137.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	2.484
Adjusted Chi Square Value	134	95% Jackknife UCL	2.51
		95% Standard Bootstrap UCL	2.472
Anderson-Darling Test Statistic	0.179	95% Bootstrap-t UCL	2.636
Anderson-Darling 5% Critical Value	0.738	95% Hall's Bootstrap UCL	2.735
Kolmogorov-Smirnov Test Statistic	0.0961	95% Percentile Bootstrap UCL	2.474
Kolmogorov-Smirnov 5% Critical Value	0.222	95% BCA Bootstrap UCL	2.547
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.1
		97.5% Chebyshev(Mean, Sd) UCL	3.528
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	4.369
95% Approximate Gamma UCL	2.553		
95% Adjusted Gamma UCL	2.614		
Potential UCL to Use		Use 95% Student's-t UCL	2.51

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Arsenic_Veg

Background Data: Arsenic_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	62	13
Minimum	0.48	1
Maximum	22	4.3
Mean	2.786	2.11
Median	2.3	1.9
SD	2.653	0.879
SE of Mean	0.203	0.227

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	15955
WMW Test U-Stat	0.724
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.469

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Cadmium_Veg

General Statistics

Number of Valid Data	169	Number of Detected Data	135
Number of Distinct Detected Data	76	Number of Non-Detect Data	34
		Percent Non-Detects	20.12%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.017	Minimum Detected	-4.075
Maximum Detected	7.2	Maximum Detected	1.974
Mean of Detected	0.974	Mean of Detected	-0.477
SD of Detected	1.047	SD of Detected	0.966
Minimum Non-Detect	0.21	Minimum Non-Detect	-1.561
Maximum Non-Detect	10	Maximum Non-Detect	2.303

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect 169
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected 0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage 100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.209	Lilliefors Test Statistic	0.0822
5% Lilliefors Critical Value	0.0763	5% Lilliefors Critical Value	0.0763
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.081	Mean	-0.369
SD	1.068	SD	0.996
95% DL/2 (t) UCL	1.217	95% H-Stat (DL/2) UCL	1.34
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.548
		SD in Log Scale	0.904
		Mean in Original Scale	0.877
		SD in Original Scale	0.96
		95% t UCL	0.999
		95% Percentile Bootstrap UCL	0.995
		95% BCA Bootstrap UCL	1.024

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.227	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.794		
nu star	331.2		
A-D Test Statistic	2.679	**Nonparametric Statistics**	
5% A-D Critical Value	0.777	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.777	Mean	0.908
5% K-S Critical Value	0.0824	SD	0.987
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0795
		95% KM (t) UCL	1.039
Assuming Gamma Distribution		95% KM (z) UCL	1.038
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.039
Minimum	0.017	95% KM (bootstrap t) UCL	1.061
Maximum	7.2	95% KM (BCA) UCL	1.039
Mean	0.958	95% KM (Percentile Bootstrap) UCL	1.038
Median	0.737	95% KM (Chebyshev) UCL	1.254
SD	0.953	97.5% KM (Chebyshev) UCL	1.404
k star	1.356	99% KM (Chebyshev) UCL	1.699
Theta star	0.707		
Nu star	458.4	**Potential UCLs to Use**	
AppChi2	409.7	95% KM (BCA) UCL	1.039
95% Gamma Approximate UCL	1.072		
95% Adjusted Gamma UCL	1.073		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Cadmium_Bkgd

General Statistics

Number of Valid Data	15	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	7
		Percent Non-Detects	46.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	0.52	Maximum Detected	-0.654
Mean of Detected	0.338	Mean of Detected	-1.149
SD of Detected	0.129	SD of Detected	0.378
Minimum Non-Detect	0.225	Minimum Non-Detect	-1.492
Maximum Non-Detect	1.8	Maximum Non-Detect	0.588

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 8 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.876	Shapiro Wilk Test Statistic	0.913
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.393	Mean	-1.069
SD	0.205	SD	0.556
95% DL/2 (t) UCL	0.486	95% H-Stat (DL/2) UCL	0.55
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.222
		SD in Log Scale	0.303
		Mean in Original Scale	0.308
		SD in Original Scale	0.102
		95% t UCL	0.355
		95% Percentile Bootstrap UCL	0.354
		95% BCA Bootstrap UCL	0.359
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	5.151	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0655		
nu star	82.42		
A-D Test Statistic	0.368	**Nonparametric Statistics**	
5% A-D Critical Value	0.717	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.717	Mean	0.315
5% K-S Critical Value	0.295	SD	0.118
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0403
		95% KM (t) UCL	0.386
Assuming Gamma Distribution		95% KM (z) UCL	0.381
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.387
Minimum	0.2	95% KM (bootstrap t) UCL	0.424
Maximum	0.52	95% KM (BCA) UCL	0.387
Mean	0.347	95% KM (Percentile Bootstrap) UCL	0.385
Median	0.332	95% KM (Chebyshev) UCL	0.491
SD	0.101	97.5% KM (Chebyshev) UCL	0.567
k star	9.916	99% KM (Chebyshev) UCL	0.716
Theta star	0.035		
Nu star	297.5	**Potential UCLs to Use**	
AppChi2	258.5	95% KM (t) UCL	0.386
95% Gamma Approximate UCL	0.399	95% KM (Percentile Bootstrap) UCL	0.385
95% Adjusted Gamma UCL	0.406		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Cadmium_Veg

Background Data: Cadmium_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	169	15
Number of Distinct Observations	88	13
Minimum	0.017	0.2
Maximum	10	1.8
Mean	1.384	0.606
Median	0.82	0.4
SD	1.558	0.465
SE of Mean	0.12	0.12

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16008
WMW Test U-Stat	1.897
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.0578

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Chromium_Veg

neral Statistics

Number of Valid Observations	170	Number of Distinct Observations	111
Raw Statistics		**Log-transformed Statistics**	
Minimum	2.5	Minimum of Log Data	0.916
Maximum	440	Maximum of Log Data	6.087
Mean	38.05	Mean of log Data	3.357
Median	34	SD of log Data	0.796
SD	38.13		
Coefficient of Variation	1.002		
Skewness	7.215		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.197	Lilliefors Test Statistic	0.14
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	42.89	95% H-UCL	44.54
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	51.22
95% Adjusted-CLT UCL (Chen-1995)	44.59	97.5% Chebyshev (MVUE) UCL	56.37
95% Modified-t UCL (Johnson-1978)	43.16	99% Chebyshev (MVUE) UCL	66.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.894	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	20.09		
MLE of Mean	38.05		
MLE of Standard Deviation	27.65		
nu star	644		
Approximate Chi Square Value (.05)	586.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	42.86
Adjusted Chi Square Value	585.6	95% Jackknife UCL	42.89
		95% Standard Bootstrap UCL	42.85
Anderson-Darling Test Statistic	1.945	95% Bootstrap-t UCL	45.91
Anderson-Darling 5% Critical Value	0.767	95% Hall's Bootstrap UCL	65.57
Kolmogorov-Smirnov Test Statistic	0.0906	95% Percentile Bootstrap UCL	43.34
Kolmogorov-Smirnov 5% Critical Value	0.0724	95% BCA Bootstrap UCL	45.83
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	50.8
		97.5% Chebyshev(Mean, Sd) UCL	56.31
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	67.14
95% Approximate Gamma UCL	41.81		
95% Adjusted Gamma UCL	41.84		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	50.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Chromium_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	11
Raw Statistics		**Log-transformed Statistics**	
Minimum	1.4	Minimum of Log Data	0.336
Maximum	32	Maximum of Log Data	3.466
Mean	20.41	Mean of log Data	2.705
Median	23	SD of log Data	1.029
SD	10.95		
Coefficient of Variation	0.537		
Skewness	-0.756		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.864	Shapiro Wilk Test Statistic	0.731
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	25.39	95% H-UCL	54.72
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	54.86
95% Adjusted-CLT UCL (Chen-1995)	24.48	97.5% Chebyshev (MVUE) UCL	68.14
95% Modified-t UCL (Johnson-1978)	25.3	99% Chebyshev (MVUE) UCL	94.23
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.448	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	14.1		
MLE of Mean	20.41		
MLE of Standard Deviation	16.96		
nu star	43.45		
Approximate Chi Square Value (.05)	29.33	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	25.07
Adjusted Chi Square Value	27.91	95% Jackknife UCL	25.39
		95% Standard Bootstrap UCL	24.87
Anderson-Darling Test Statistic	1.471	95% Bootstrap-t UCL	24.96
Anderson-Darling 5% Critical Value	0.75	95% Hall's Bootstrap UCL	24.38
Kolmogorov-Smirnov Test Statistic	0.27	95% Percentile Bootstrap UCL	24.67
Kolmogorov-Smirnov 5% Critical Value	0.225	95% BCA Bootstrap UCL	24.49
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	32.74
		97.5% Chebyshev(Mean, Sd) UCL	38.08
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	48.55
95% Approximate Gamma UCL	30.24		
95% Adjusted Gamma UCL	31.78		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	32.74

Recommended UCL exceeds the maximum observation

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Chromium - Soil Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Chromium_Veg

Background Data: Chromium_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	111	11
Minimum	2.5	1.4
Maximum	440	32
Mean	38.05	20.41
Median	34	23
SD	38.13	10.95
SE of Mean	2.924	2.828

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16407
WMW Test U-Stat	2.998
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.00272

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Chromium - Small Mammals Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: CHROMIUM_VEG

Background Data: CHROMIUM_BKGD

Raw Statistics

	Site	Background
Number of Valid Observations	30	10
Number of Distinct Observations	3	3
Minimum	1	1
Maximum	3.7	1.5
Mean	1.103	1.09
Median	1	1
SD	0.496	0.191
SE of Mean	0.0905	0.0605

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	595.5
WMW Test U-Stat	0.593
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.532

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Cobalt_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	99
Raw Statistics		**Log-transformed Statistics**	
Minimum	1.8	Minimum of Log Data	0.588
Maximum	120	Maximum of Log Data	4.787
Mean	16.29	Mean of log Data	2.478
Median	11	SD of log Data	0.727
SD	17.41		
Coefficient of Variation	1.068		
Skewness	3.214		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.287	Lilliefors Test Statistic	0.116
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	18.5	95% H-UCL	17.31
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	19.7
95% Adjusted-CLT UCL (Chen-1995)	18.84	97.5% Chebyshev (MVUE) UCL	21.52
95% Modified-t UCL (Johnson-1978)	18.56	99% Chebyshev (MVUE) UCL	25.1
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.718	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	9.481		
MLE of Mean	16.29		
MLE of Standard Deviation	12.43		
nu star	584.3		
Approximate Chi Square Value (.05)	529.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	18.49
Adjusted Chi Square Value	528.8	95% Jackknife UCL	18.5
		95% Standard Bootstrap UCL	18.5
Anderson-Darling Test Statistic	7.252	95% Bootstrap-t UCL	18.95
Anderson-Darling 5% Critical Value	0.768	95% Hall's Bootstrap UCL	19
Kolmogorov-Smirnov Test Statistic	0.181	95% Percentile Bootstrap UCL	18.51
Kolmogorov-Smirnov 5% Critical Value	0.0725	95% BCA Bootstrap UCL	18.82
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	22.11
		97.5% Chebyshev(Mean, Sd) UCL	24.63
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	29.58
95% Approximate Gamma UCL	17.99		
95% Adjusted Gamma UCL	18		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	22.11

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Cobalt_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	15
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.35	Minimum of Log Data	-1.05
Maximum	16	Maximum of Log Data	2.773
Mean	6.601	Mean of log Data	1.546
Median	7.35	SD of log Data	1.049
SD	4.352		
Coefficient of Variation	0.659		
Skewness	0.641		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.923	Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	8.58	95% H-UCL	17.92
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	17.72
95% Adjusted-CLT UCL (Chen-1995)	8.648	97.5% Chebyshev (MVUE) UCL	22.05
95% Modified-t UCL (Johnson-1978)	8.611	99% Chebyshev (MVUE) UCL	30.55
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.332	**Data appear Normal at 5% Significance Level**	
Theta Star	4.956		
MLE of Mean	6.601		
MLE of Standard Deviation	5.72		
nu star	39.96		
Approximate Chi Square Value (.05)	26.48	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	8.45
Adjusted Chi Square Value	25.13	95% Jackknife UCL	8.58
		95% Standard Bootstrap UCL	8.384
Anderson-Darling Test Statistic	0.73	95% Bootstrap-t UCL	8.968
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	9.269
Kolmogorov-Smirnov Test Statistic	0.193	95% Percentile Bootstrap UCL	8.517
Kolmogorov-Smirnov 5% Critical Value	0.225	95% BCA Bootstrap UCL	8.537
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	11.5
		97.5% Chebyshev(Mean, Sd) UCL	13.62
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	17.78
95% Approximate Gamma UCL	9.963		
95% Adjusted Gamma UCL	10.5		
Potential UCL to Use		Use 95% Student's-t UCL	8.58

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Cobalt_Veg

Background Data: Cobalt_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	99	15
Minimum	1.8	0.35
Maximum	120	16
Mean	16.29	6.601
Median	11	7.35
SD	17.41	4.352
SE of Mean	1.335	1.124

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16526
WMW Test U-Stat	3.599
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.0003195

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Copper_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	129
Raw Statistics		**Log-transformed Statistics**	
Minimum	16	Minimum of Log Data	2.773
Maximum	7850	Maximum of Log Data	8.968
Mean	664.9	Mean of log Data	5.744
Median	415	SD of log Data	1.356
SD	899.1		
Coefficient of Variation	1.352		
Skewness	4.038		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.235	Lilliefors Test Statistic	0.0947
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	778.9	95% H-UCL	1017
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1251
95% Adjusted-CLT UCL (Chen-1995)	801.1	97.5% Chebyshev (MVUE) UCL	1457
95% Modified-t UCL (Johnson-1978)	782.5	99% Chebyshev (MVUE) UCL	1861
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.777	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	855.4		
MLE of Mean	664.9		
MLE of Standard Deviation	754.2		
nu star	264.3		
Approximate Chi Square Value (.05)	227.6	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	778.3
Adjusted Chi Square Value	227.3	95% Jackknife UCL	778.9
		95% Standard Bootstrap UCL	781.6
Anderson-Darling Test Statistic	1.23	95% Bootstrap-t UCL	804.4
Anderson-Darling 5% Critical Value	0.794	95% Hall's Bootstrap UCL	816.9
Kolmogorov-Smirnov Test Statistic	0.0719	95% Percentile Bootstrap UCL	780.3
Kolmogorov-Smirnov 5% Critical Value	0.0741	95% BCA Bootstrap UCL	796.1
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	965.4
		97.5% Chebyshev(Mean, Sd) UCL	1095
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1351
95% Approximate Gamma UCL	771.9		
95% Adjusted Gamma UCL	772.9		
Potential UCL to Use		Use 95% Approximate Gamma UCL	771.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Copper_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14
Raw Statistics		**Log-transformed Statistics**	
Minimum	5.5	Minimum of Log Data	1.705
Maximum	45	Maximum of Log Data	3.807
Mean	15.29	Mean of log Data	2.569
Median	13	SD of log Data	0.559
SD	10.11		
Coefficient of Variation	0.661		
Skewness	2.02		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.794	Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	19.88	95% H-UCL	20.99
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	24.92
95% Adjusted-CLT UCL (Chen-1995)	21.03	97.5% Chebyshev (MVUE) UCL	29.17
95% Modified-t UCL (Johnson-1978)	20.11	99% Chebyshev (MVUE) UCL	37.53
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.702	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	5.658		
MLE of Mean	15.29		
MLE of Standard Deviation	9.3		
nu star	81.05		
Approximate Chi Square Value (.05)	61.31	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	19.58
Adjusted Chi Square Value	59.2	95% Jackknife UCL	19.88
		95% Standard Bootstrap UCL	19.48
Anderson-Darling Test Statistic	0.425	95% Bootstrap-t UCL	22.72
Anderson-Darling 5% Critical Value	0.743	95% Hall's Bootstrap UCL	38.36
Kolmogorov-Smirnov Test Statistic	0.222	95% Percentile Bootstrap UCL	19.7
Kolmogorov-Smirnov 5% Critical Value	0.223	95% BCA Bootstrap UCL	20.96
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	26.66
		97.5% Chebyshev(Mean, Sd) UCL	31.59
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	41.26
95% Approximate Gamma UCL	20.21		
95% Adjusted Gamma UCL	20.93		
Potential UCL to Use		Use 95% Approximate Gamma UCL	20.21

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Copper - Soil Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Copper_Veg

Background Data: Copper_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	129	14
Minimum	16	5.5
Maximum	7850	45
Mean	664.9	15.29
Median	415	13
SD	899.1	10.11
SE of Mean	68.95	2.61

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	17056
WMW Test U-Stat	6.262
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	3.794E-10

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Copper - Small Mammals Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: COPPER_VEG

Background Data: COPPER_BKGD

Raw Statistics

	Site	Background
Number of Valid Observations	30	10
Number of Distinct Observations	24	7
Minimum	3.2	2.7
Maximum	12	5.9
Mean	5.027	3.73
Median	4.35	3.6
SD	1.987	0.971
SE of Mean	0.363	0.307

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	686
WMW Test U-Stat	2.202
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.0277

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Iron_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	111

Raw Statistics		**Log-transformed Statistics**	
Minimum	2400	Minimum of Log Data	7.783
Maximum	300000	Maximum of Log Data	12.61
Mean	43203	Mean of log Data	10.27
Median	25150	SD of log Data	0.919
SD	42898		
Coefficient of Variation	0.993		
Skewness	2.32		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.202	Lilliefors Test Statistic	0.0757
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	48645	95% H-UCL	50996
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	59703
95% Adjusted-CLT UCL (Chen-1995)	49241	97.5% Chebyshev (MVUE) UCL	66575
95% Modified-t UCL (Johnson-1978)	48742	99% Chebyshev (MVUE) UCL	80072
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.36	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	31775		
MLE of Mean	43203		
MLE of Standard Deviation	37051		
nu star	462.3		
Approximate Chi Square Value (.05)	413.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	48615
Adjusted Chi Square Value	413	95% Jackknife UCL	48645
		95% Standard Bootstrap UCL	48545
Anderson-Darling Test Statistic	2.571	95% Bootstrap-t UCL	49107
Anderson-Darling 5% Critical Value	0.774	95% Hall's Bootstrap UCL	49759
Kolmogorov-Smirnov Test Statistic	0.133	95% Percentile Bootstrap UCL	48788
Kolmogorov-Smirnov 5% Critical Value	0.0729	95% BCA Bootstrap UCL	49332
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	57545
		97.5% Chebyshev(Mean, Sd) UCL	63750
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	75940
95% Approximate Gamma UCL	48308		
95% Adjusted Gamma UCL	48354		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	57545

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	13
Raw Statistics		**Log-transformed Statistics**	
Minimum	780	Minimum of Log Data	6.659
Maximum	31000	Maximum of Log Data	10.34
Mean	13852	Mean of log Data	9.215
Median	15000	SD of log Data	1.023
SD	8528		
Coefficient of Variation	0.616		
Skewness	0.246		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.971	Shapiro Wilk Test Statistic	0.835
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	17730	95% H-UCL	36281
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	36528
95% Adjusted-CLT UCL (Chen-1995)	17623	97.5% Chebyshev (MVUE) UCL	45345
95% Modified-t UCL (Johnson-1978)	17754	99% Chebyshev (MVUE) UCL	62663
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.409	**Data appear Normal at 5% Significance Level**	
Theta Star	9831		
MLE of Mean	13852		
MLE of Standard Deviation	11669		
nu star	42.27		
Approximate Chi Square Value (.05)	28.37	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	17474
Adjusted Chi Square Value	26.97	95% Jackknife UCL	17730
		95% Standard Bootstrap UCL	17406
Anderson-Darling Test Statistic	0.611	95% Bootstrap-t UCL	17819
Anderson-Darling 5% Critical Value	0.751	95% Hall's Bootstrap UCL	17982
Kolmogorov-Smirnov Test Statistic	0.189	95% Percentile Bootstrap UCL	17059
Kolmogorov-Smirnov 5% Critical Value	0.225	95% BCA Bootstrap UCL	17379
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	23450
		97.5% Chebyshev(Mean, Sd) UCL	27603
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	35760
95% Approximate Gamma UCL	20642		
95% Adjusted Gamma UCL	21712		
Potential UCL to Use		Use 95% Student's-t UCL	17730

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Iron - Soil Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Iron_Veg

Background Data: Iron_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	111	13
Minimum	2400	780
Maximum	300000	31000
Mean	43203	13852
Median	25150	15000
SD	42898	8528
SE of Mean	3290	2202

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16546
WMW Test U-Stat	3.7
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.000216

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Iron - Small Mammals Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: IRON_VEG

Background Data: IRON_BKGD

Raw Statistics

	Site	Background
Number of Valid Observations	30	10
Number of Distinct Observations	23	9
Minimum	41	46
Maximum	640	180
Mean	116.5	101.1
Median	89	95
SD	104.9	39.57
SE of Mean	19.16	12.51

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	609.5
WMW Test U-Stat	0.156
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.851

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Lead_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	107
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.72	Minimum of Log Data	-0.329
Maximum	1700	Maximum of Log Data	7.438
Mean	49.61	Mean of log Data	3.295
Median	27	SD of log Data	0.991
SD	134.2		
Coefficient of Variation	2.704		
Skewness	11.22		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.358	Lilliefors Test Statistic	0.071
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	66.63	95% H-UCL	51.91
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	61.37
95% Adjusted-CLT UCL (Chen-1995)	75.99	97.5% Chebyshev (MVUE) UCL	68.95
95% Modified-t UCL (Johnson-1978)	68.1	99% Chebyshev (MVUE) UCL	83.83
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.939	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	52.81		
MLE of Mean	49.61		
MLE of Standard Deviation	51.19		
nu star	319.4		
Approximate Chi Square Value (.05)	279	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	66.54
Adjusted Chi Square Value	278.7	95% Jackknife UCL	66.63
		95% Standard Bootstrap UCL	66.3
Anderson-Darling Test Statistic	5.748	95% Bootstrap-t UCL	99.12
Anderson-Darling 5% Critical Value	0.786	95% Hall's Bootstrap UCL	131.2
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	68.78
Kolmogorov-Smirnov 5% Critical Value	0.0736	95% BCA Bootstrap UCL	83.44
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	94.46
		97.5% Chebyshev(Mean, Sd) UCL	113.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	152
95% Approximate Gamma UCL	56.8		
95% Adjusted Gamma UCL	56.86		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	94.46

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Lead_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14
Raw Statistics		**Log-transformed Statistics**	
Minimum	8.6	Minimum of Log Data	2.152
Maximum	77	Maximum of Log Data	4.344
Mean	27.69	Mean of log Data	3.049
Median	18	SD of log Data	0.735
SD	22.93		
Coefficient of Variation	0.828		
Skewness	1.37		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.777	Shapiro Wilk Test Statistic	0.911
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	38.11	95% H-UCL	43.89
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	50.73
95% Adjusted-CLT UCL (Chen-1995)	39.66	97.5% Chebyshev (MVUE) UCL	60.98
95% Modified-t UCL (Johnson-1978)	38.46	99% Chebyshev (MVUE) UCL	81.11
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.636	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	16.93		
MLE of Mean	27.69		
MLE of Standard Deviation	21.65		
nu star	49.07		
Approximate Chi Square Value (.05)	33.98	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	37.42
Adjusted Chi Square Value	32.44	95% Jackknife UCL	38.11
		95% Standard Bootstrap UCL	37.1
Anderson-Darling Test Statistic	0.767	95% Bootstrap-t UCL	42.9
Anderson-Darling 5% Critical Value	0.747	95% Hall's Bootstrap UCL	38.28
Kolmogorov-Smirnov Test Statistic	0.201	95% Percentile Bootstrap UCL	37.09
Kolmogorov-Smirnov 5% Critical Value	0.224	95% BCA Bootstrap UCL	39.17
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	53.49
		97.5% Chebyshev(Mean, Sd) UCL	64.66
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	86.59
95% Approximate Gamma UCL	39.97		
95% Adjusted Gamma UCL	41.87		
Potential UCL to Use		Use 95% Approximate Gamma UCL	39.97

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Lead_Veg

Background Data: Lead_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	107	14
Minimum	0.72	8.6
Maximum	1700	77
Mean	49.61	27.69
Median	27	18
SD	134.2	22.93
SE of Mean	10.29	5.92

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16049
WMW Test U-Stat	1.197
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.231

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Manganese_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	105
Raw Statistics		**Log-transformed Statistics**	
Minimum	29	Minimum of Log Data	3.367
Maximum	8380	Maximum of Log Data	9.034
Mean	353.9	Mean of log Data	5.344
Median	183.5	SD of log Data	0.91
SD	703.6		
Coefficient of Variation	1.988		
Skewness	9.134		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.322	Lilliefors Test Statistic	0.0661
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	443.2	95% H-UCL	366.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	429
95% Adjusted-CLT UCL (Chen-1995)	483.1	97.5% Chebyshev (MVUE) UCL	478
95% Modified-t UCL (Johnson-1978)	449.5	99% Chebyshev (MVUE) UCL	574.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.074	**Data appear Lognormal at 5% Significance Level**	
Theta Star	329.5		
MLE of Mean	353.9		
MLE of Standard Deviation	341.5		
nu star	365.2		
Approximate Chi Square Value (.05)	321.9	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	442.7
Adjusted Chi Square Value	321.6	95% Jackknife UCL	443.2
		95% Standard Bootstrap UCL	440.6
Anderson-Darling Test Statistic	6.049	95% Bootstrap-t UCL	534.6
Anderson-Darling 5% Critical Value	0.781	95% Hall's Bootstrap UCL	808.2
Kolmogorov-Smirnov Test Statistic	0.145	95% Percentile Bootstrap UCL	455.8
Kolmogorov-Smirnov 5% Critical Value	0.0733	95% BCA Bootstrap UCL	496.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	589.1
		97.5% Chebyshev(Mean, Sd) UCL	690.9
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	890.8
95% Approximate Gamma UCL	401.5		
95% Adjusted Gamma UCL	402		
Potential UCL to Use		Use 95% H-UCL	366.9

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	14
Raw Statistics		**Log-transformed Statistics**	
Minimum	26	Minimum of Log Data	3.258
Maximum	7800	Maximum of Log Data	8.962
Mean	1386	Mean of log Data	6.1
Median	620	SD of log Data	1.724
SD	2202		
Coefficient of Variation	1.588		
Skewness	2.356		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.639	Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2388	95% H-UCL	12620
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5214
95% Adjusted-CLT UCL (Chen-1995)	2691	97.5% Chebyshev (MVUE) UCL	6772
95% Modified-t UCL (Johnson-1978)	2445	99% Chebyshev (MVUE) UCL	9833
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.486	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	2855		
MLE of Mean	1386		
MLE of Standard Deviation	1989		
nu star	14.57		
Approximate Chi Square Value (.05)	6.962	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	2321
Adjusted Chi Square Value	6.324	95% Jackknife UCL	2388
		95% Standard Bootstrap UCL	2318
Anderson-Darling Test Statistic	0.417	95% Bootstrap-t UCL	4583
Anderson-Darling 5% Critical Value	0.789	95% Hall's Bootstrap UCL	7016
Kolmogorov-Smirnov Test Statistic	0.157	95% Percentile Bootstrap UCL	2335
Kolmogorov-Smirnov 5% Critical Value	0.233	95% BCA Bootstrap UCL	2554
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3864
		97.5% Chebyshev(Mean, Sd) UCL	4937
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7043
95% Approximate Gamma UCL	2901		
95% Adjusted Gamma UCL	3193		
Potential UCL to Use		Use 95% Approximate Gamma UCL	2901

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Manganese - Soil Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Manganese_Veg

Background Data: Manganese_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	105	14
Minimum	29	26
Maximum	8380	7800
Mean	353.9	1386
Median	183.5	620
SD	703.6	2202
SE of Mean	53.96	568.5

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	15425
WMW Test U-Stat	1.934
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.0525

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Manganese - Small Mammals Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: MANGANESE_VEG

Background Data: MANGANESE_BKGD

Raw Statistics

	Site	Background
Number of Valid Observations	30	10
Number of Distinct Observations	23	9
Minimum	1.5	1.5
Maximum	34	14
Mean	9.197	6.39
Median	8.8	4.8
SD	6.533	4.57
SE of Mean	1.193	1.445

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	654
WMW Test U-Stat	1.203
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.229

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Mercury_Veg

General Statistics

Number of Valid Data	169	Number of Detected Data	161
Number of Distinct Detected Data	87	Number of Non-Detect Data	8
		Percent Non-Detects	4.73%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.007	Minimum Detected	-4.962
Maximum Detected	2.8	Maximum Detected	1.03
Mean of Detected	0.142	Mean of Detected	-2.373
SD of Detected	0.237	SD of Detected	0.861
Minimum Non-Detect	0.014	Minimum Non-Detect	-4.269
Maximum Non-Detect	0.0995	Maximum Non-Detect	-2.308
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	96
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	73
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	56.80%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.286	Lilliefors Test Statistic	0.0618
5% Lilliefors Critical Value	0.0698	5% Lilliefors Critical Value	0.0698
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.137	Mean	-2.437
SD	0.232	SD	0.9
95% DL/2 (t) UCL	0.167	95% H-Stat (DL/2) UCL	0.151
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-2.428
		SD in Log Scale	0.883
		Mean in Original Scale	0.137
		SD in Original Scale	0.232
		95% t UCL	0.167
		95% Percentile Bootstrap UCL	0.172
		95% BCA Bootstrap UCL	0.189
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	1.3	**Data appear Lognormal at 5% Significance Level**	
Theta Star	0.11		
nu star	418.7		
A-D Test Statistic	3.104	**Nonparametric Statistics**	
5% A-D Critical Value	0.775	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.775	Mean	0.137
5% K-S Critical Value	0.0754	SD	0.232
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.0179
		95% KM (t) UCL	0.167
Assuming Gamma Distribution		95% KM (z) UCL	0.167
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.167
Minimum	1E-12	95% KM (bootstrap t) UCL	0.196
Maximum	2.8	95% KM (BCA) UCL	0.167
Mean	0.137	95% KM (Percentile Bootstrap) UCL	0.17
Median	0.079	95% KM (Chebyshev) UCL	0.215
SD	0.232	97.5% KM (Chebyshev) UCL	0.249
k star	0.545	99% KM (Chebyshev) UCL	0.315
Theta star	0.252		
Nu star	184.1	**Potential UCLs to Use**	
AppChi2	153.7	95% KM (BCA) UCL	0.167
95% Gamma Approximate UCL	0.164		
95% Adjusted Gamma UCL	0.164		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Mercury_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	15
Raw Statistics		**Log-transformed Statistics**	
Minimum	0.02	Minimum of Log Data	-3.912
Maximum	0.29	Maximum of Log Data	-1.238
Mean	0.13	Mean of log Data	-2.244
Median	0.12	SD of log Data	0.714
SD	0.0805		
Coefficient of Variation	0.618		
Skewness	0.745		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.932	Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	0.167	95% H-UCL	0.213
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	0.248
95% Adjusted-CLT UCL (Chen-1995)	0.169	97.5% Chebyshev (MVUE) UCL	0.297
95% Modified-t UCL (Johnson-1978)	0.168	99% Chebyshev (MVUE) UCL	0.393
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.108	**Data appear Normal at 5% Significance Level**	
Theta Star	0.0618		
MLE of Mean	0.13		
MLE of Standard Deviation	0.0897		
nu star	63.24		
Approximate Chi Square Value (.05)	45.95	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	0.164
Adjusted Chi Square Value	44.13	95% Jackknife UCL	0.167
		95% Standard Bootstrap UCL	0.164
Anderson-Darling Test Statistic	0.169	95% Bootstrap-t UCL	0.176
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	0.169
Kolmogorov-Smirnov Test Statistic	0.113	95% Percentile Bootstrap UCL	0.166
Kolmogorov-Smirnov 5% Critical Value	0.224	95% BCA Bootstrap UCL	0.167
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	0.221
		97.5% Chebyshev(Mean, Sd) UCL	0.26
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	0.337
95% Approximate Gamma UCL	0.179		
95% Adjusted Gamma UCL	0.187		
Potential UCL to Use		Use 95% Student's-t UCL	0.167

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Mercury_Veg

Background Data: Mercury_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	169	15
Number of Distinct Observations	92	15
Minimum	0.007	0.02
Maximum	2.8	0.29
Mean	0.138	0.13
Median	0.081	0.12
SD	0.232	0.0805
SE of Mean	0.0178	0.0208

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	15435
WMW Test U-Stat	0.997
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.317

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Molybdenum_Veg

General Statistics

Number of Valid Data	169	Number of Detected Data	129
Number of Distinct Detected Data	89	Number of Non-Detect Data	40
		Percent Non-Detects	23.67%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	27	Maximum Detected	3.296
Mean of Detected	3.887	Mean of Detected	0.687
SD of Detected	5.123	SD of Detected	1.156
Minimum Non-Detect	0.24	Minimum Non-Detect	-1.427
Maximum Non-Detect	43	Maximum Non-Detect	3.761

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	169
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	0
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	100.00%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.236	Lilliefors Test Statistic	0.0949
5% Lilliefors Critical Value	0.078	5% Lilliefors Critical Value	0.078
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	4.026	Mean	0.736
SD	4.878	SD	1.21
95% DL/2 (t) UCL	4.647	95% H-Stat (DL/2) UCL	5.409
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.514
		SD in Log Scale	1.134
		Mean in Original Scale	3.278
		SD in Original Scale	4.633
		95% t UCL	3.867
		95% Percentile Bootstrap UCL	3.876
		95% BCA Bootstrap UCL	3.939

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.859	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	4.524		
nu star	221.7		
A-D Test Statistic	3.402	**Nonparametric Statistics**	
5% A-D Critical Value	0.789	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.789	Mean	3.384
5% K-S Critical Value	0.0848	SD	4.686
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.372
		95% KM (t) UCL	3.999
Assuming Gamma Distribution		95% KM (z) UCL	3.995
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3.997
Minimum	1E-12	95% KM (bootstrap t) UCL	4.113
Maximum	27	95% KM (BCA) UCL	4.011
Mean	3.671	95% KM (Percentile Bootstrap) UCL	4.011
Median	2	95% KM (Chebyshev) UCL	5.004
SD	4.658	97.5% KM (Chebyshev) UCL	5.705
k star	0.352	99% KM (Chebyshev) UCL	7.082
Theta star	10.43		
Nu star	119	**Potential UCLs to Use**	
AppChi2	94.78	95% KM (Chebyshev) UCL	5.004
95% Gamma Approximate UCL	4.608		
95% Adjusted Gamma UCL	4.617		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Molybdenum_Bkgd

General Statistics

Number of Valid Data	15	Number of Detected Data	4
Number of Distinct Detected Data	3	Number of Non-Detect Data	11
		Percent Non-Detects	73.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.29	Minimum Detected	-1.238
Maximum Detected	0.64	Maximum Detected	-0.446
Mean of Detected	0.485	Mean of Detected	-0.781
SD of Detected	0.182	SD of Detected	0.399
Minimum Non-Detect	0.43	Minimum Non-Detect	-0.844
Maximum Non-Detect	8.8	Maximum Non-Detect	2.175

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 3 Distinct Detected Values in this data set
The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.823	Shapiro Wilk Test Statistic	0.845
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.872	Mean	0.21
SD	1.413	SD	1.063
95% DL/2 (t) UCL	2.514	95% H-Stat (DL/2) UCL	4.871
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.893
		SD in Log Scale	0.208
		Mean in Original Scale	0.418
		SD in Original Scale	0.0969
		95% t UCL	0.462
		95% Percentile Bootstrap UCL	0.459
		95% BCA Bootstrap UCL	0.468
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.379	**Data appear Normal at 5% Significance Level**	
Theta Star	0.204		
nu star	19.03		
A-D Test Statistic	0.496	**Nonparametric Statistics**	
5% A-D Critical Value	0.658	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.658	Mean	0.433
5% K-S Critical Value	0.395	SD	0.15
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0722
		95% KM (t) UCL	0.561
Assuming Gamma Distribution		95% KM (z) UCL	0.552
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.568
Minimum	0.29	95% KM (bootstrap t) UCL	0.561
Maximum	0.64	95% KM (BCA) UCL	0.64
Mean	0.529	95% KM (Percentile Bootstrap) UCL	0.64
Median	0.557	95% KM (Chebyshev) UCL	0.748
SD	0.0917	97.5% KM (Chebyshev) UCL	0.885
k star	22.9	99% KM (Chebyshev) UCL	1.152
Theta star	0.0231		
Nu star	687	**Potential UCLs to Use**	
AppChi2	627.2	95% KM (t) UCL	0.561
95% Gamma Approximate UCL	0.579	95% KM (Percentile Bootstrap) UCL	0.64
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Molybdenum_Veg

Background Data: Molybdenum_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	169	15
Number of Distinct Observations	102	13
Minimum	0.2	0.29
Maximum	43	8.8
Mean	5.085	3.614
Median	2.4	4
SD	6.292	2.964
SE of Mean	0.484	0.765

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	15741
WMW Test U-Stat	0.546
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.585

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Nickel_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	101
Raw Statistics		**Log-transformed Statistics**	
Minimum	3.9	Minimum of Log Data	1.361
Maximum	110	Maximum of Log Data	4.7
Mean	21.45	Mean of log Data	2.886
Median	19	SD of log Data	0.616
SD	13.56		
Coefficient of Variation	0.632		
Skewness	2.216		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.101	Lilliefors Test Statistic	0.0715
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	23.17	95% H-UCL	23.69
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	26.48
95% Adjusted-CLT UCL (Chen-1995)	23.35	97.5% Chebyshev (MVUE) UCL	28.58
95% Modified-t UCL (Johnson-1978)	23.2	99% Chebyshev (MVUE) UCL	32.7
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.886	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	7.434		
MLE of Mean	21.45		
MLE of Standard Deviation	12.63		
nu star	981.2		
Approximate Chi Square Value (.05)	909.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	23.16
Adjusted Chi Square Value	908.9	95% Jackknife UCL	23.17
		95% Standard Bootstrap UCL	23.15
Anderson-Darling Test Statistic	0.682	95% Bootstrap-t UCL	23.44
Anderson-Darling 5% Critical Value	0.76	95% Hall's Bootstrap UCL	23.38
Kolmogorov-Smirnov Test Statistic	0.06	95% Percentile Bootstrap UCL	23.29
Kolmogorov-Smirnov 5% Critical Value	0.0719	95% BCA Bootstrap UCL	23.21
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	25.99
		97.5% Chebyshev(Mean, Sd) UCL	27.95
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	31.8
95% Approximate Gamma UCL	23.14		
95% Adjusted Gamma UCL	23.16		
Potential UCL to Use		Use 95% Approximate Gamma UCL	23.14

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Nickel_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	13
Raw Statistics		**Log-transformed Statistics**	
Minimum	3.5	Minimum of Log Data	1.253
Maximum	30	Maximum of Log Data	3.401
Mean	15.35	Mean of log Data	2.574
Median	15	SD of log Data	0.631
SD	7.871		
Coefficient of Variation	0.513		
Skewness	0.281		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.965	Shapiro Wilk Test Statistic	0.925
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	18.93	95% H-UCL	23.26
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	27.45
95% Adjusted-CLT UCL (Chen-1995)	18.85	97.5% Chebyshev (MVUE) UCL	32.51
95% Modified-t UCL (Johnson-1978)	18.95	99% Chebyshev (MVUE) UCL	42.45
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.718	**Data appear Normal at 5% Significance Level**	
Theta Star	5.646		
MLE of Mean	15.35		
MLE of Standard Deviation	9.308		
nu star	81.55		
Approximate Chi Square Value (.05)	61.74	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	18.69
Adjusted Chi Square Value	59.62	95% Jackknife UCL	18.93
		95% Standard Bootstrap UCL	18.55
Anderson-Darling Test Statistic	0.283	95% Bootstrap-t UCL	18.99
Anderson-Darling 5% Critical Value	0.743	95% Hall's Bootstrap UCL	18.93
Kolmogorov-Smirnov Test Statistic	0.151	95% Percentile Bootstrap UCL	18.53
Kolmogorov-Smirnov 5% Critical Value	0.223	95% BCA Bootstrap UCL	18.78
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	24.2
		97.5% Chebyshev(Mean, Sd) UCL	28.04
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	35.57
95% Approximate Gamma UCL	20.27		
95% Adjusted Gamma UCL	20.99		
Potential UCL to Use		Use 95% Student's-t UCL	18.93

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Nickel_Veg

Background Data: Nickel_bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	101	13
Minimum	3.9	3.5
Maximum	110	30
Mean	21.45	15.35
Median	19	15
SD	13.56	7.871
SE of Mean	1.04	2.032

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16148
WMW Test U-Stat	1.698
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.0896

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Selenium_Veg

General Statistics

Number of Valid Data	169	Number of Detected Data	154
Number of Distinct Detected Data	105	Number of Non-Detect Data	15
		Percent Non-Detects	8.88%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.42	Minimum Detected	-0.868
Maximum Detected	83	Maximum Detected	4.419
Mean of Detected	11.6	Mean of Detected	1.625
SD of Detected	16.11	SD of Detected	1.33
Minimum Non-Detect	1.3	Minimum Non-Detect	0.262
Maximum Non-Detect	3.6	Maximum Non-Detect	1.281

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	86
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	83
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	50.89%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.244	Lilliefors Test Statistic	0.0815
5% Lilliefors Critical Value	0.0714	5% Lilliefors Critical Value	0.0714
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	10.66	Mean	1.478
SD	15.67	SD	1.357
95% DL/2 (t) UCL	12.65	95% H-Stat (DL/2) UCL	14.29
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	0.858	Mean in Log Scale	1.483
SD	25.27	SD in Log Scale	1.352
95% MLE (t) UCL	4.072	Mean in Original Scale	10.67
95% MLE (Tiku) UCL	4.879	SD in Original Scale	15.66
		95% t UCL	12.66
		95% Percentile Bootstrap UCL	12.71
		95% BCA Bootstrap UCL	12.95

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.718	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	16.16		
nu star	221		
A-D Test Statistic	3.484	**Nonparametric Statistics**	
5% A-D Critical Value	0.798	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.798	Mean	10.66
5% K-S Critical Value	0.0786	SD	15.62
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.205
		95% KM (t) UCL	12.66
Assuming Gamma Distribution		95% KM (z) UCL	12.65
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	12.66
Minimum	1E-12	95% KM (bootstrap t) UCL	13.01
Maximum	83	95% KM (BCA) UCL	12.6
Mean	10.57	95% KM (Percentile Bootstrap) UCL	12.65
Median	3.3	95% KM (Chebyshev) UCL	15.92
SD	15.72	97.5% KM (Chebyshev) UCL	18.19
k star	0.227	99% KM (Chebyshev) UCL	22.66
Theta star	46.49		
Nu star	76.86	**Potential UCLs to Use**	
AppChi2	57.66	95% KM (Chebyshev) UCL	15.92
95% Gamma Approximate UCL	14.09		
95% Adjusted Gamma UCL	14.13		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Selenium_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	11

Raw Statistics		**Log-transformed Statistics**	
Minimum	0.97	Minimum of Log Data	-0.0305
Maximum	2.9	Maximum of Log Data	1.065
Mean	1.77	Mean of log Data	0.518
Median	1.8	SD of log Data	0.342
SD	0.584		
Coefficient of Variation	0.33		
Skewness	0.295		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.954	Shapiro Wilk Test Statistic	0.952
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.035	95% H-UCL	2.12
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	2.465
95% Adjusted-CLT UCL (Chen-1995)	2.03	97.5% Chebyshev (MVUE) UCL	2.764
95% Modified-t UCL (Johnson-1978)	2.037	99% Chebyshev (MVUE) UCL	3.352
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	7.723	**Data appear Normal at 5% Significance Level**	
Theta Star	0.229		
MLE of Mean	1.77		
MLE of Standard Deviation	0.637		
nu star	231.7		
Approximate Chi Square Value (.05)	197.4	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	2.018
Adjusted Chi Square Value	193.6	95% Jackknife UCL	2.035
		95% Standard Bootstrap UCL	2.012
Anderson-Darling Test Statistic	0.293	95% Bootstrap-t UCL	2.065
Anderson-Darling 5% Critical Value	0.737	95% Hall's Bootstrap UCL	2.017
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	2.003
Kolmogorov-Smirnov 5% Critical Value	0.222	95% BCA Bootstrap UCL	2.019
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2.427
		97.5% Chebyshev(Mean, Sd) UCL	2.711
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3.269
95% Approximate Gamma UCL	2.077		
95% Adjusted Gamma UCL	2.119		
Potential UCL to Use		Use 95% Student's-t UCL	2.035

**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Selenium_Veg

Background Data: Selenium_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	169	15
Number of Distinct Observations	108	11
Minimum	0.42	0.97
Maximum	83	2.9
Mean	10.75	1.77
Median	3.5	1.8
SD	15.61	0.584
SE of Mean	1.201	0.151

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16281
WMW Test U-Stat	3.275
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.00106

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Silver_Veg

General Statistics

Number of Valid Data	170	Number of Detected Data	139
Number of Distinct Detected Data	90	Number of Non-Detect Data	31
		Percent Non-Detects	18.24%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.11	Minimum Detected	-2.207
Maximum Detected	22	Maximum Detected	3.091
Mean of Detected	2.999	Mean of Detected	0.34
SD of Detected	3.73	SD of Detected	1.314
Minimum Non-Detect	0.14	Minimum Non-Detect	-1.966
Maximum Non-Detect	2.4	Maximum Non-Detect	0.875

Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	113
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	57
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	66.47%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.219	Lilliefors Test Statistic	0.086
5% Lilliefors Critical Value	0.0751	5% Lilliefors Critical Value	0.0751
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.524	Mean	0.0642
SD	3.521	SD	1.358
95% DL/2 (t) UCL	2.971	95% H-Stat (DL/2) UCL	3.481
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	0.0439
		SD in Log Scale	1.366
		Mean in Original Scale	2.512
		SD in Original Scale	3.527
		95% t UCL	2.959
		95% Percentile Bootstrap UCL	2.971
		95% BCA Bootstrap UCL	3.032

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.772	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	3.885		
nu star	214.6		
A-D Test Statistic	2.199	**Nonparametric Statistics**	
5% A-D Critical Value	0.794	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.794	Mean	2.511
5% K-S Critical Value	0.0824	SD	3.518
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.271
		95% KM (t) UCL	2.959
Assuming Gamma Distribution		95% KM (z) UCL	2.956
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	2.958
Minimum	1E-12	95% KM (bootstrap t) UCL	3.051
Maximum	22	95% KM (BCA) UCL	2.972
Mean	2.56	95% KM (Percentile Bootstrap) UCL	2.968
Median	1.05	95% KM (Chebyshev) UCL	3.692
SD	3.516	97.5% KM (Chebyshev) UCL	4.203
k star	0.231	99% KM (Chebyshev) UCL	5.206
Theta star	11.1		
Nu star	78.44	**Potential UCLs to Use**	
AppChi2	59.04	95% KM (Chebyshev) UCL	3.692
95% Gamma Approximate UCL	3.401		
95% Adjusted Gamma UCL	3.41		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Silver_Bkgd

General Statistics

Number of Valid Data	15	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	11
		Percent Non-Detects	73.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.079	Minimum Detected	-2.538
Maximum Detected	1.4	Maximum Detected	0.336
Mean of Detected	0.485	Mean of Detected	-1.297
SD of Detected	0.616	SD of Detected	1.209
Minimum Non-Detect	0.078	Minimum Non-Detect	-2.551
Maximum Non-Detect	0.65	Maximum Non-Detect	-0.431

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	1
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	93.33%

Warning: There are only 4 Distinct Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.752	Shapiro Wilk Test Statistic	0.958
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.262	Mean	-1.731
SD	0.328	SD	0.843
95% DL/2 (t) UCL	0.411	95% H-Stat (DL/2) UCL	0.445
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-2.461
		SD in Log Scale	0.999
		Mean in Original Scale	0.174
		SD in Original Scale	0.345
		95% t UCL	0.331
		95% Percentile Bootstrap UCL	0.343
		95% BCA Bootstrap UCL	0.455
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.418	**Data appear Normal at 5% Significance Level**	
Theta Star	1.159		
nu star	3.346		
A-D Test Statistic	0.389	**Nonparametric Statistics**	
5% A-D Critical Value	0.667	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.667	Mean	0.211
5% K-S Critical Value	0.402	SD	0.325
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.0994
		95% KM (t) UCL	0.386
Assuming Gamma Distribution		95% KM (z) UCL	0.375
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.356
Minimum	0.0117	95% KM (bootstrap t) UCL	0.568
Maximum	1.4	95% KM (BCA) UCL	1.4
Mean	0.401	95% KM (Percentile Bootstrap) UCL	0.435
Median	0.464	95% KM (Chebyshev) UCL	0.645
SD	0.335	97.5% KM (Chebyshev) UCL	0.832
k star	1.146	99% KM (Chebyshev) UCL	1.201
Theta star	0.35		
Nu star	34.38	**Potential UCLs to Use**	
AppChi2	21.96	95% KM (t) UCL	0.386
95% Gamma Approximate UCL	0.628	95% KM (Percentile Bootstrap) UCL	0.435
95% Adjusted Gamma UCL	N/A		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Silver_Veg

Background Data: Silver_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	103	14
Minimum	0.11	0.078
Maximum	22	1.4
Mean	2.596	0.394
Median	1.05	0.28
SD	3.486	0.337
SE of Mean	0.267	0.087

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16609
WMW Test U-Stat	4.016
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	5.909E-05

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Strontium_Veg

General Statistics

Number of Valid Observations	43	Number of Distinct Observations	36
Raw Statistics		**Log-transformed Statistics**	
Minimum	1.2	Minimum of Log Data	0.182
Maximum	107	Maximum of Log Data	4.673
Mean	17.65	Mean of log Data	2.216
Median	6.95	SD of log Data	1.131
SD	24.16		
Coefficient of Variation	1.369		
Skewness	2.656		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.647	Shapiro Wilk Test Statistic	0.961
Shapiro Wilk Critical Value	0.943	Shapiro Wilk Critical Value	0.943
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	23.85	95% H-UCL	26.96
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	32.41
95% Adjusted-CLT UCL (Chen-1995)	25.3	97.5% Chebyshev (MVUE) UCL	39.07
95% Modified-t UCL (Johnson-1978)	24.1	99% Chebyshev (MVUE) UCL	52.17
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.847	**Data appear Lognormal at 5% Significance Level**	
Theta Star	20.83		
MLE of Mean	17.65		
MLE of Standard Deviation	19.17		
nu star	72.88		
Approximate Chi Square Value (.05)	54.22	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0444	95% CLT UCL	23.71
Adjusted Chi Square Value	53.66	95% Jackknife UCL	23.85
		95% Standard Bootstrap UCL	23.5
Anderson-Darling Test Statistic	1.421	95% Bootstrap-t UCL	27.47
Anderson-Darling 5% Critical Value	0.783	95% Hall's Bootstrap UCL	30.47
Kolmogorov-Smirnov Test Statistic	0.177	95% Percentile Bootstrap UCL	24.13
Kolmogorov-Smirnov 5% Critical Value	0.139	95% BCA Bootstrap UCL	25.04
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	33.71
		97.5% Chebyshev(Mean, Sd) UCL	40.66
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	54.31
95% Approximate Gamma UCL	23.72		
95% Adjusted Gamma UCL	23.97		
Potential UCL to Use		Use 95% H-UCL	26.96

ProUCL computes and outputs H-statistic based UCLs for historical reasons only.
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Thallium_Veg

General Statistics

Number of Valid Data	169	Number of Detected Data	80
Number of Distinct Detected Data	58	Number of Non-Detect Data	89
		Percent Non-Detects	52.66%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.02	Minimum Detected	-3.912
Maximum Detected	16	Maximum Detected	2.773
Mean of Detected	2.175	Mean of Detected	-0.458
SD of Detected	3.251	SD of Detected	1.746
Minimum Non-Detect	0.25	Minimum Non-Detect	-1.386
Maximum Non-Detect	13	Maximum Non-Detect	2.565

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	166
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	3
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	98.22%

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Lilliefors Test Statistic	0.254	Lilliefors Test Statistic	0.174
5% Lilliefors Critical Value	0.0991	5% Lilliefors Critical Value	0.0991
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	2.309	Mean	0.177
SD	2.399	SD	1.407
95% DL/2 (t) UCL	2.614	95% H-Stat (DL/2) UCL	4.23
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	6.502	Mean in Log Scale	-0.785
SD	3.082	SD in Log Scale	1.334
95% MLE (t) UCL	6.894	Mean in Original Scale	1.255
95% MLE (Tiku) UCL	12.39	SD in Original Scale	2.405
		95% t UCL	1.561
		95% Percentile Bootstrap UCL	1.587
		95% BCA Bootstrap UCL	1.616

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.502	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	4.336		
nu star	80.25		
A-D Test Statistic	2.889	**Nonparametric Statistics**	
5% A-D Critical Value	0.818	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.818	Mean	1.455
5% K-S Critical Value	0.105	SD	2.479
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.209
		95% KM (t) UCL	1.802
Assuming Gamma Distribution		95% KM (z) UCL	1.8
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.801
Minimum	0.02	95% KM (bootstrap t) UCL	1.867
Maximum	16	95% KM (BCA) UCL	1.82
Mean	2.194	95% KM (Percentile Bootstrap) UCL	1.812
Median	1.7	95% KM (Chebyshev) UCL	2.368
SD	2.331	97.5% KM (Chebyshev) UCL	2.763
k star	0.912	99% KM (Chebyshev) UCL	3.538
Theta star	2.405		
Nu star	308.2	**Potential UCLs to Use**	
AppChi2	268.6	95% KM (Chebyshev) UCL	2.368
95% Gamma Approximate UCL	2.518		
95% Adjusted Gamma UCL	2.521		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

Thallium_Bkgd

General Statistics

Number of Valid Data	15	Number of Detected Data	7
Number of Distinct Detected Data	5	Number of Non-Detect Data	8
		Percent Non-Detects	53.33%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.91	Minimum Detected	-0.0943
Maximum Detected	4.3	Maximum Detected	1.459
Mean of Detected	1.659	Mean of Detected	0.37
SD of Detected	1.175	SD of Detected	0.499
Minimum Non-Detect	1.1	Minimum Non-Detect	0.0953
Maximum Non-Detect	6.5	Maximum Non-Detect	1.872

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	0
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	100.00%

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.578	Shapiro Wilk Test Statistic	0.704
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	1.547	Mean	0.263
SD	1.089	SD	0.57
95% DL/2 (t) UCL	2.042	95% H-Stat (DL/2) UCL	2.124
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	0.249
		SD in Log Scale	0.376
		Mean in Original Scale	1.4
		SD in Original Scale	0.823
		95% t UCL	1.774
		95% Percentile Bootstrap UCL	1.799
		95% BCA Bootstrap UCL	2.017

Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	2.288	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	0.725		
nu star	32.03		
A-D Test Statistic	1.273	**Nonparametric Statistics**	
5% A-D Critical Value	0.71	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.71	Mean	1.415
5% K-S Critical Value	0.313	SD	0.85
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.258
		95% KM (t) UCL	1.87
Assuming Gamma Distribution		95% KM (z) UCL	1.84
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.839
Minimum	0.719	95% KM (bootstrap t) UCL	2.969
Maximum	4.3	95% KM (BCA) UCL	1.955
Mean	1.647	95% KM (Percentile Bootstrap) UCL	1.886
Median	1.4	95% KM (Chebyshev) UCL	2.541
SD	0.826	97.5% KM (Chebyshev) UCL	3.029
k star	4.83	99% KM (Chebyshev) UCL	3.986
Theta star	0.341		
Nu star	144.9	**Potential UCLs to Use**	
AppChi2	118.1	95% KM (t) UCL	1.87
95% Gamma Approximate UCL	2.021	95% KM (% Bootstrap) UCL	1.886
95% Adjusted Gamma UCL	2.074		

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Thallium_Veg

Background Data: Thallium_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	169	15
Number of Distinct Observations	90	12
Minimum	0.02	0.91
Maximum	16	6.5
Mean	3.588	2.321
Median	3.1	1.6
SD	3.138	1.825
SE of Mean	0.241	0.471

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	15898
WMW Test U-Stat	1.338
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.181

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

Vanadium_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	111

Raw Statistics		**Log-transformed Statistics**	
Minimum	5.2	Minimum of Log Data	1.649
Maximum	400	Maximum of Log Data	5.991
Mean	46.76	Mean of log Data	3.642
Median	42.45	SD of log Data	0.654
SD	37.07		
Coefficient of Variation	0.793		
Skewness	5.481		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.202	Lilliefors Test Statistic	0.128
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	51.46	95% H-UCL	52.02
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	58.51
95% Adjusted-CLT UCL (Chen-1995)	52.71	97.5% Chebyshev (MVUE) UCL	63.41
95% Modified-t UCL (Johnson-1978)	51.66	99% Chebyshev (MVUE) UCL	73.02
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.579	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	18.13		
MLE of Mean	46.76		
MLE of Standard Deviation	29.12		
nu star	876.9		
Approximate Chi Square Value (.05)	809.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	51.43
Adjusted Chi Square Value	808.6	95% Jackknife UCL	51.46
		95% Standard Bootstrap UCL	51.54
Anderson-Darling Test Statistic	2.294	95% Bootstrap-t UCL	53.59
Anderson-Darling 5% Critical Value	0.762	95% Hall's Bootstrap UCL	61.07
Kolmogorov-Smirnov Test Statistic	0.107	95% Percentile Bootstrap UCL	51.82
Kolmogorov-Smirnov 5% Critical Value	0.072	95% BCA Bootstrap UCL	53.36
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	59.15
		97.5% Chebyshev(Mean, Sd) UCL	64.51
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	75.05
95% Approximate Gamma UCL	50.67		
95% Adjusted Gamma UCL	50.71		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	59.15

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Vanadium_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	12
Raw Statistics		**Log-transformed Statistics**	
Minimum	3.9	Minimum of Log Data	1.361
Maximum	59	Maximum of Log Data	4.078
Mean	28.81	Mean of log Data	3.162
Median	28	SD of log Data	0.733
SD	16.16		
Coefficient of Variation	0.561		
Skewness	0.438		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk Test Statistic	0.904
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	36.16	95% H-UCL	48.95
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	56.61
95% Adjusted-CLT UCL (Chen-1995)	36.18	97.5% Chebyshev (MVUE) UCL	68.03
95% Modified-t UCL (Johnson-1978)	36.24	99% Chebyshev (MVUE) UCL	90.45
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	2.179	**Data appear Normal at 5% Significance Level**	
Theta Star	13.22		
MLE of Mean	28.81		
MLE of Standard Deviation	19.52		
nu star	65.36		
Approximate Chi Square Value (.05)	47.76	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	35.67
Adjusted Chi Square Value	45.91	95% Jackknife UCL	36.16
		95% Standard Bootstrap UCL	35.3
Anderson-Darling Test Statistic	0.392	95% Bootstrap-t UCL	36.97
Anderson-Darling 5% Critical Value	0.745	95% Hall's Bootstrap UCL	37.16
Kolmogorov-Smirnov Test Statistic	0.207	95% Percentile Bootstrap UCL	35.66
Kolmogorov-Smirnov 5% Critical Value	0.224	95% BCA Bootstrap UCL	35.81
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	47
		97.5% Chebyshev(Mean, Sd) UCL	54.87
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	70.33
95% Approximate Gamma UCL	39.42		
95% Adjusted Gamma UCL	41.01		
Potential UCL to Use		Use 95% Student's-t UCL	36.16

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Vanadium_Veg

Background Data: Vanadium_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	111	12
Minimum	5.2	3.9
Maximum	400	59
Mean	46.76	28.81
Median	42.45	28
SD	37.07	16.16
SE of Mean	2.843	4.173

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16337
WMW Test U-Stat	2.648
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.00809

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Zinc_Veg

General Statistics

Number of Valid Observations	170	Number of Distinct Observations	114
Raw Statistics		**Log-transformed Statistics**	
Minimum	24	Minimum of Log Data	3.178
Maximum	1250	Maximum of Log Data	7.131
Mean	118.4	Mean of log Data	4.496
Median	80.5	SD of log Data	0.666
SD	132.6		
Coefficient of Variation	1.12		
Skewness	5.025		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Lilliefors Test Statistic	0.244	Lilliefors Test Statistic	0.0697
Lilliefors Critical Value	0.068	Lilliefors Critical Value	0.068
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	135.3	95% H-UCL	123.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	139.1
95% Adjusted-CLT UCL (Chen-1995)	139.4	97.5% Chebyshev (MVUE) UCL	151
95% Modified-t UCL (Johnson-1978)	135.9	99% Chebyshev (MVUE) UCL	174.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	1.919	**Data do not follow a Discernable Distribution (0.05)**	
Theta Star	61.73		
MLE of Mean	118.4		
MLE of Standard Deviation	85.5		
nu star	652.3		
Approximate Chi Square Value (.05)	594.1	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0486	95% CLT UCL	135.2
Adjusted Chi Square Value	593.6	95% Jackknife UCL	135.3
		95% Standard Bootstrap UCL	135.5
Anderson-Darling Test Statistic	5.917	95% Bootstrap-t UCL	143
Anderson-Darling 5% Critical Value	0.766	95% Hall's Bootstrap UCL	149
Kolmogorov-Smirnov Test Statistic	0.132	95% Percentile Bootstrap UCL	136.4
Kolmogorov-Smirnov 5% Critical Value	0.0724	95% BCA Bootstrap UCL	140.4
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	162.8
		97.5% Chebyshev(Mean, Sd) UCL	182
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	219.6
95% Approximate Gamma UCL	130		
95% Adjusted Gamma UCL	130.1		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	162.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zinc_Bkgd

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	13

Raw Statistics		**Log-transformed Statistics**	
Minimum	17	Minimum of Log Data	2.833
Maximum	86	Maximum of Log Data	4.454
Mean	42.77	Mean of log Data	3.649
Median	37	SD of log Data	0.476
SD	20.91		
Coefficient of Variation	0.489		
Skewness	0.922		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.898	Shapiro Wilk Test Statistic	0.97
Shapiro Wilk Critical Value	0.881	Shapiro Wilk Critical Value	0.881
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	52.28	95% H-UCL	55.83
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	66.21
95% Adjusted-CLT UCL (Chen-1995)	53.02	97.5% Chebyshev (MVUE) UCL	76.37
95% Modified-t UCL (Johnson-1978)	52.49	99% Chebyshev (MVUE) UCL	96.34
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	3.935	**Data appear Normal at 5% Significance Level**	
Theta Star	10.87		
MLE of Mean	42.77		
MLE of Standard Deviation	21.56		
nu star	118		
Approximate Chi Square Value (.05)	93.96	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	51.65
Adjusted Chi Square Value	91.31	95% Jackknife UCL	52.28
		95% Standard Bootstrap UCL	51.44
Anderson-Darling Test Statistic	0.317	95% Bootstrap-t UCL	54.37
Anderson-Darling 5% Critical Value	0.739	95% Hall's Bootstrap UCL	52.45
Kolmogorov-Smirnov Test Statistic	0.143	95% Percentile Bootstrap UCL	51.67
Kolmogorov-Smirnov 5% Critical Value	0.222	95% BCA Bootstrap UCL	52.13
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	66.3
		97.5% Chebyshev(Mean, Sd) UCL	76.49
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	96.49
95% Approximate Gamma UCL	53.73		
95% Adjusted Gamma UCL	55.29		
Potential UCL to Use		Use 95% Student's-t UCL	52.28

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

Zinc - Soil Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: Zinc_Veg

Background Data: Zinc_Bkgd

Raw Statistics

	Site	Background
Number of Valid Observations	170	15
Number of Distinct Observations	114	13
Minimum	24	17
Maximum	1250	86
Mean	118.4	42.77
Median	80.5	37
SD	132.6	20.91
SE of Mean	10.17	5.399

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	16732
WMW Test U-Stat	4.633
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	3.611E-06

Conclusion with Alpha = 0.05

Reject H0, Conclude Site <> Background

P-Value < alpha (0.05)

Zinc - Small Mammals Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	WorkSheet.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Equal to Background Mean/Median (Two Sided Alternative)
Alternative Hypothesis	Site or AOC Mean/Median Not Equal to Background Mean/Median

Area of Concern Data: ZINC_VEG

Background Data: ZINC_BKGD

Raw Statistics

	Site	Background
Number of Valid Observations	30	10
Number of Distinct Observations	12	8
Minimum	26	24
Maximum	46	36
Mean	30.63	31.25
Median	29	30.5
SD	4.319	3.995
SE of Mean	0.789	1.263

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC = Mean/Median of Background

Site Rank Sum W-Stat	587
WMW Test U-Stat	0.859
Lower Critical Value (0.025)	-1.96
Upper Critical Value (0.975)	1.96
P-Value	0.373

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Site = Background

P-Value >= alpha (0.05)

APPENDIX H

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Antimony	ELY-SS-TR-08A (0.5-12)DUP	8.1	0.5	16.2
Transition	Antimony	ELY-SS-TZ-12 (0-3)	6.1	0.5	12.2
Transition	Antimony	ELY-SS-SA-06 (0-6)	5.9	0.5	11.8
Transition	Antimony	ELY-SS-TZ-14 (4-12)	4.3	0.5	8.60
Transition	Antimony	ELY-SS-TZ-11 (0-1)	4.2	0.5	8.40
Transition	Antimony	ELY-TP-109 (0-1)	4	0.5	8.00
Transition	Antimony	ELY-SS-TZ-39 (3-8)	2.8	0.5	5.60
Transition	Antimony	ELY-SS-TR-02D (2-12) DUP	2.6	0.5	5.20
Transition	Antimony	ELY-SS-TZ-16 (4-12)	2.6	0.5	5.20
Transition	Antimony	ELY-SS-TR-08C (0-5) DUP	2.4	0.5	4.80
Transition	Antimony	ELY-SS-TR-03B (2-12)	1.9	0.5	3.80
Transition	Antimony	ELY-SS-TZ-30 (0-0.5)	1.9	0.5	3.80
Transition	Antimony	SS-21X-083109AX	1.8	0.5	3.60
Transition	Antimony	ELY-TP-104 (0-1)	1.5	0.5	3.00
Transition	Antimony	ELY-SS-TZ-15 (3.5-12)	1.3	0.5	2.60
Transition	Antimony	ELY-SS-TR-02B (4-11)	1.2	0.5	2.40
Transition	Antimony	ELY-SS-TR-02D (2-12)	1.2	0.5	2.40
Transition	Antimony	ELY-SS-TR-05D (3-12)	1.2	0.5	2.40
Transition	Antimony	ELY-SS-TR-08C (5-12) DUP	1.2	0.5	2.40
Transition	Antimony	ELY-SS-SA-01 (0-2)	1.1	0.5	2.20
Transition	Antimony	ELY-SS-TZ-35 (2-9)	1.1	0.5	2.20
Transition	Antimony	SS-01X-090209AX	1.1	0.5	2.20
Transition	Antimony	ELY-SS-TR-02D(0-2) DUP	1	0.5	2.00
Transition	Antimony	ELY-SS-TR-08C (5-12)	0.96	0.5	1.92
Transition	Antimony	ELY-SS-TR-02C (0-3)	0.92	0.5	1.84
Transition	Antimony	ELY-SS-TR-02C (3-12)	0.7	0.5	1.40
Transition	Antimony	ELY-SS-TR-05D (0-3)	0.7	0.5	1.40
Transition	Antimony	SS-22X-082709AX	0.64	0.5	1.28
Transition	Antimony	SS-13X-082809AX	0.6	0.5	1.20
Transition	Antimony	SS-14X-083109AX	0.51	0.5	1.02
Transition	Antimony	SS-15X-083109AX	0.42	0.5	0.840
Transition	Antimony	ELY-SS-TR-02A (0-1.5)	0.39	0.5	0.780
Transition	Antimony	SS-27X-082609AX	0.38	0.5	0.760
Transition	Antimony	SS-24X-083109AX	0.36	0.5	0.720
Transition	Antimony	SS-25X-082709AX	0.36	0.5	0.720
Transition	Antimony	ELY-SS-TR-05C (1-12)	0.33	0.5	0.660
Transition	Antimony	SS-18X-082709AX	0.32	0.5	0.640
Transition	Antimony	SS-19X-082709AX	0.32	0.5	0.640
Transition	Antimony	SS-17X-083109AX	0.31	0.5	0.620
Transition	Antimony	SS-20X-083109AX	0.31	0.5	0.620
Transition	Antimony	SS-29X-083109AX	0.3	0.5	0.600
Transition	Antimony	ELY-SS-TR-02A (1.5-11)	0.28	0.5	0.560
Transition	Antimony	SS-26X-083109AX	0.28	0.5	0.560
Transition	Antimony	SS-23X-082709AX	0.26	0.5	0.520
Transition	Antimony	TA-14X-082409AX	0.23	0.5	0.460
Transition	Antimony	SS-10X-090309AX	0.2	0.5	0.400
Transition	Antimony	SS-11X-090309AX	0.2	0.5	0.400
Transition	Antimony	TL-04X-082509AX	0.19	0.5	0.380
Transition	Antimony	SS-28X-083109AX	0.17	0.5	0.340
Transition	Antimony	SS-09X-090209AX	0.14	0.5	0.280
Transition	Antimony	SS-16X-090309AX	0.14	0.5	0.280
Transition	Antimony	TA-04X-082409AX	0.13	0.5	0.260
Transition	Antimony	TN-02X-082509AD	0.13	0.5	0.260
Transition	Antimony	SS-02X-090209AX	0.12	0.5	0.240
Transition	Antimony	TG-02X-082409AX	0.11	0.5	0.220
Transition	Antimony	TN-02X-082509AX	0.11	0.5	0.220
Transition	Antimony	TI-03X-082509AX	0.098	0.5	0.196
Transition	Antimony	SS-06X-090209AX	0.079	0.5	0.158
Transition	Antimony	TP-10X-082709AX	0.079	0.5	0.158
Transition	Antimony	TC-03X-082609AX	0.068	0.5	0.136
Transition	Antimony	TK-01X-082509AX	0.062	0.5	0.124
Transition	Antimony	SS-05X-090209AX	0.06	0.5	0.120
Transition	Antimony	SS-07X-090209AX	0.058	0.5	0.116
Transition	Antimony	TO-05X-082709AX	0.058	0.5	0.116
Transition	Antimony	TQ-16X-082609AX	0.056	0.5	0.112

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Antimony	TQ-06X-082609AX	0.048	0.5	0.0960
Transition	Arsenic	ELY-SS-TZ-12 (3-8)	22	18	1.22
Transition	Arsenic	ELY-SS-TR-02D(0-2) DUP	15	18	0.833
Transition	Arsenic	ELY-SS-TR-02B (4-11)	14	18	0.778
Transition	Arsenic	ELY-SS-TZ-27 (0-2.5)	13	18	0.722
Transition	Arsenic	SS-13X-082809AX	9.4	18	0.522
Transition	Arsenic	ELY-SS-TR-02C (3-12)	9.1	18	0.506
Transition	Arsenic	ELY-SS-TR-02D (0-2)	8.3	18	0.461
Transition	Arsenic	ELY-SS-TR-06C (0-3)	7.9	18	0.439
Transition	Arsenic	ELY-SS-TR-02C (0-3)	6.8	18	0.378
Transition	Arsenic	SS-11X-090309AX	6.5	18	0.361
Transition	Arsenic	ELY-SS-TZ-21 (0-5)	6.4	18	0.356
Transition	Arsenic	ELY-SS-NF-09 (0-1.5)	4.8	18	0.267
Transition	Arsenic	ELY-SS-TR-05D (0-3)	4.7	18	0.261
Transition	Arsenic	ELY-SS-TZ-31 (0-3)	4.3	18	0.239
Transition	Arsenic	ELY-SS-NF-11 (0-3)	4.2	18	0.233
Transition	Arsenic	SS-17X-083109AX	4.2	18	0.233
Transition	Arsenic	ELY-SS-TZ-11 (1-5.5)	3.8	18	0.211
Transition	Arsenic	ELY-SS-TR-04C (0-3)	3.7	18	0.206
Transition	Arsenic	ELY-SS-TZ-39 (0-3)	3.7	18	0.206
Transition	Arsenic	SS-02X-090209AX	3.7	18	0.206
Transition	Arsenic	ELY-SS-TR-02D (2-12)	3.6	18	0.200
Transition	Arsenic	ELY-SS-TZ-42 (0-2)	3.5	18	0.194
Transition	Arsenic	SS-14X-083109AX	3.5	18	0.194
Transition	Arsenic	SS-25X-082709AX	3.5	18	0.194
Transition	Arsenic	SS-26X-083109AX	3.5	18	0.194
Transition	Arsenic	ELY-SS-SA-04 (0-6)	3.3	18	0.183
Transition	Arsenic	ELY-SS-TZ-06 (0-1)	3.3	18	0.183
Transition	Arsenic	ELY-SS-NF-05 (0-3)	3.2	18	0.178
Transition	Arsenic	ELY-SS-TZ-11 (0-1)	3.2	18	0.178
Transition	Arsenic	ELY-SS-TZ-12 (0-3)	3.2	18	0.178
Transition	Arsenic	SS-22X-082709AX	3.2	18	0.178
Transition	Arsenic	SS-23X-082709AX	3.2	18	0.178
Transition	Arsenic	ELY-SS-TR-02A (1.5-11)	3.1	18	0.172
Transition	Arsenic	SS-01X-090209AX	3.1	18	0.172
Transition	Arsenic	ELY-SS-NF-12 (0-2)	3	18	0.167
Transition	Arsenic	ELY-SS-TR-02D (2-12) DUP	3	18	0.167
Transition	Arsenic	ELY-SS-TZ-43 (0-2.5)	2.9	18	0.161
Transition	Arsenic	ELY-SS-NF-15 (0-2)	2.8	18	0.156
Transition	Arsenic	ELY-SS-TZ-15 (0-3.5)	2.8	18	0.156
Transition	Arsenic	SS-09X-090209AX	2.8	18	0.156
Transition	Arsenic	ELY-SS-NF-03 (4-12)	2.7	18	0.150
Transition	Arsenic	ELY-SS-NF-14 (0-3)	2.7	18	0.150
Transition	Arsenic	ELY-SS-SA-01 (0-2)	2.7	18	0.150
Transition	Arsenic	ELY-SS-TR-06B (3-7)	2.7	18	0.150
Transition	Arsenic	ELY-SS-TZ-14 (0-4)	2.7	18	0.150
Transition	Arsenic	ELY-SS-TZ-16 (4-12)	2.7	18	0.150
Transition	Arsenic	ELY-SS-NF-08 (2-11)	2.6	18	0.144
Transition	Arsenic	ELY-SS-TR-07B (2-8)	2.6	18	0.144
Transition	Arsenic	SS-10X-090309AX	2.6	18	0.144
Transition	Arsenic	SS-15X-083109AX	2.6	18	0.144
Transition	Arsenic	ELY-SS-NF-07 (0-2)	2.5	18	0.139
Transition	Arsenic	ELY-SS-SA-06 (0-6)	2.5	18	0.139
Transition	Arsenic	ELY-SS-TR-07C (0-2)	2.5	18	0.139
Transition	Arsenic	ELY-SS-TZ-35 (0-2)	2.5	18	0.139
Transition	Arsenic	ELY-SS-NF-02 (0-8)	2.4	18	0.133
Transition	Arsenic	ELY-SS-NF-05 (3-11)	2.4	18	0.133
Transition	Arsenic	ELY-SS-TR-02B (0-4)	2.4	18	0.133
Transition	Arsenic	ELY-SS-TR-04C (3-6)	2.4	18	0.133
Transition	Arsenic	ELY-SS-TR-06C (3-12)	2.4	18	0.133
Transition	Arsenic	ELY-SS-TR-07D (0-2)	2.4	18	0.133
Transition	Arsenic	SS-24X-083109AX	2.4	18	0.133
Transition	Arsenic	SS-28X-083109AX	2.4	18	0.133
Transition	Arsenic	ELY-SS-TR-02A (0-1.5)	2.3	18	0.128
Transition	Arsenic	ELY-SS-TR-08D (0-2) DUP	2.3	18	0.128

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Arsenic	ELY-SS-TZ-06 (1-12)	2.3	18	0.128
Transition	Arsenic	ELY-SS-TZ-15 (3.5-12)	2.3	18	0.128
Transition	Arsenic	ELY-SS-TZ-21 (5-12)	2.3	18	0.128
Transition	Arsenic	SS-16X-090309AX	2.3	18	0.128
Transition	Arsenic	SS-20X-083109AX	2.3	18	0.128
Transition	Arsenic	ELY-SS-TZ-16 (0-4)	2.2	18	0.122
Transition	Arsenic	ELY-SS-TZ-27 (2.5-8)	2.2	18	0.122
Transition	Arsenic	ELY-SS-TZ-31 (3-9)	2.2	18	0.122
Transition	Arsenic	ELY-SS-TZ-37 (0-2)	2.2	18	0.122
Transition	Arsenic	ELY-SS-TZ-40 (0-2)	2.2	18	0.122
Transition	Arsenic	SS-27X-082609AX	2.2	18	0.122
Transition	Arsenic	ELY-SS-NF-04 (0-4) DUP	2.1	18	0.117
Transition	Arsenic	ELY-SS-NF-06 (3-12)	2.1	18	0.117
Transition	Arsenic	ELY-SS-NF-10 (0-4)	2.1	18	0.117
Transition	Arsenic	ELY-SS-NF-13 (0-2.5)	2.1	18	0.117
Transition	Arsenic	SS-06X-090209AX	2.1	18	0.117
Transition	Arsenic	TN-02X-082509AD	2	18	0.111
Transition	Arsenic	ELY-SS-NF-06 (0-3)	1.9	18	0.106
Transition	Arsenic	ELY-SS-NF-11 (3-9)	1.9	18	0.106
Transition	Arsenic	ELY-SS-TZ-23 (0-2.5)	1.9	18	0.106
Transition	Arsenic	SS-03X-090209AX	1.9	18	0.106
Transition	Arsenic	SS-19X-082709AX	1.9	18	0.106
Transition	Arsenic	TL-04X-082509AX	1.9	18	0.106
Transition	Arsenic	ELY-SS-NF-10 (4-12)	1.8	18	0.100
Transition	Arsenic	ELY-SS-TR-09B (2-5)	1.8	18	0.100
Transition	Arsenic	ELY-SS-TZ-30 (0-0.5)	1.8	18	0.100
Transition	Arsenic	ELY-SS-TR-03B (2-12)	1.7	18	0.0944
Transition	Arsenic	ELY-SS-TR-09B (0-2)	1.7	18	0.0944
Transition	Arsenic	ELY-SS-TR-09D (0-3)	1.7	18	0.0944
Transition	Arsenic	ELY-SS-TZ-40 (2-10)	1.7	18	0.0944
Transition	Arsenic	ELY-SS-NF-04 (4-10)	1.6	18	0.0889
Transition	Arsenic	ELY-SS-TR-07B (0-2)	1.6	18	0.0889
Transition	Arsenic	ELY-SS-TR-08D (0-2)	1.6	18	0.0889
Transition	Arsenic	SS-18X-082709AX	1.6	18	0.0889
Transition	Arsenic	SS-29X-083109AX	1.6	18	0.0889
Transition	Arsenic	ELY-SS-TR-07C (2-12)	1.5	18	0.0833
Transition	Arsenic	ELY-SS-TZ-34 (0-2.5)	1.5	18	0.0833
Transition	Arsenic	SS-07X-090209AX	1.5	18	0.0833
Transition	Arsenic	ELY-SS-NF-17 (0-4)	1.4	18	0.0778
Transition	Arsenic	ELY-SS-TR-03C (3-12)	1.4	18	0.0778
Transition	Arsenic	ELY-SS-TR-08A (0.5-12)	1.4	18	0.0778
Transition	Arsenic	ELY-SS-TZ-18 (0-.5)	1.4	18	0.0778
Transition	Arsenic	ELY-SS-TZ-30 (0.5-12)	1.4	18	0.0778
Transition	Arsenic	SS-21X-083109AX	1.4	18	0.0778
Transition	Arsenic	TN-02X-082509AX	1.4	18	0.0778
Transition	Arsenic	ELY-SS-NF-03 (0-4)	1.3	18	0.0722
Transition	Arsenic	ELY-SS-SA-09 (0-4)	1.3	18	0.0722
Transition	Arsenic	ELY-SS-TR-03C (0-3)	1.3	18	0.0722
Transition	Arsenic	ELY-SS-TR-06B (0-3)	1.3	18	0.0722
Transition	Arsenic	ELY-SS-TR-08C (0-5)	1.3	18	0.0722
Transition	Arsenic	TA-04X-082409AX	1.3	18	0.0722
Transition	Arsenic	ELY-SS-NF-08 (0-2)	1.2	18	0.0667
Transition	Arsenic	ELY-SS-NF-16 (0-1)	1.2	18	0.0667
Transition	Arsenic	ELY-SS-TZ-34 (2.5-8)	1.1	18	0.0611
Transition	Arsenic	SS-05X-090209AX	1.1	18	0.0611
Transition	Arsenic	SS-08X-090209AX	1.1	18	0.0611
Transition	Arsenic	TA-14X-082409AX	1.1	18	0.0611
Transition	Arsenic	ELY-SS-NF-14 (3-12)	1	18	0.0556
Transition	Arsenic	ELY-SS-TR-04B (1.5-12)	1	18	0.0556
Transition	Arsenic	TI-03X-082509AX	1	18	0.0556
Transition	Arsenic	ELY-SS-TR-08D (2-12)	0.98	18	0.0544
Transition	Arsenic	TK-01X-082509AX	0.97	18	0.0539
Transition	Arsenic	ELY-SS-TR-08D (2-12) DUP	0.96	18	0.0533
Transition	Arsenic	ELY-SS-TZ-35 (2-9)	0.92	18	0.0511
Transition	Arsenic	ELY-SS-TR-04B (0-1.5)	0.9	18	0.0500

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Arsenic	ELY-SS-TZ-36 (0-1.5)	0.84	18	0.0467
Transition	Arsenic	ELY-SS-NF-09 (1.5-12)	0.77	18	0.0428
Transition	Arsenic	ELY-SS-TZ-36 (1.5-9)	0.76	18	0.0422
Transition	Arsenic	SS-12X-090309AX	0.76	18	0.0422
Transition	Arsenic	ELY-SS-TZ-23 (2.5-12)	0.73	18	0.0406
Transition	Arsenic	ELY-SS-TZ-18 (.5-12)	0.7	18	0.0389
Transition	Arsenic	SS-04X-090209AX	0.64	18	0.0356
Transition	Arsenic	TG-02X-082409AX	0.62	18	0.0344
Transition	Arsenic	TQ-16X-082609AX	0.62	18	0.0344
Transition	Arsenic	ELY-SS-NF-01 (2-7)	0.59	18	0.0328
Transition	Arsenic	TC-03X-082609AX	0.48	18	0.0267
Transition	Cadmium	SS-13X-082809AX	7.2	32	0.225
Transition	Cadmium	SS-27X-082609AX	4.8	32	0.150
Transition	Cadmium	ELY-SS-NF-03 (4-12)	3.6	32	0.113
Transition	Cadmium	SS-29X-083109AX	3.5	32	0.109
Transition	Cadmium	ELY-SS-TR-02A (1.5-11)	3.2	32	0.100
Transition	Cadmium	ELY-SS-TZ-21 (0-5)	3.2	32	0.100
Transition	Cadmium	ELY-SS-TZ-14 (0-4)	3	32	0.0938
Transition	Cadmium	SS-18X-082709AX	2.9	32	0.0906
Transition	Cadmium	SS-26X-083109AX	2.9	32	0.0906
Transition	Cadmium	ELY-SS-TR-02C (3-12)	2.8	32	0.0875
Transition	Cadmium	ELY-SS-NF-06 (0-3)	2.5	32	0.0781
Transition	Cadmium	ELY-SS-TZ-16 (0-4)	2.5	32	0.0781
Transition	Cadmium	SS-25X-082709AX	2.5	32	0.0781
Transition	Cadmium	SS-10X-090309AX	2.4	32	0.0750
Transition	Cadmium	ELY-SS-TR-03C (0-3)	2.3	32	0.0719
Transition	Cadmium	ELY-SS-TZ-40 (0-2)	2.3	32	0.0719
Transition	Cadmium	ELY-SS-NF-03 (0-4)	2.2	32	0.0688
Transition	Cadmium	ELY-SS-NF-15 (0-2)	2.2	32	0.0688
Transition	Cadmium	ELY-SS-TZ-42 (0-2)	2.2	32	0.0688
Transition	Cadmium	SS-24X-083109AX	2.2	32	0.0688
Transition	Cadmium	ELY-SS-TR-03B (0-2)	2	32	0.0625
Transition	Cadmium	ELY-SS-TR-03B (2-12)	2	32	0.0625
Transition	Cadmium	ELY-SS-NF-06 (3-12)	1.9	32	0.0594
Transition	Cadmium	ELY-SS-TZ-27 (0-2.5)	1.6	32	0.0500
Transition	Cadmium	ELY-SS-TR-08D (0-2)	1.5	32	0.0469
Transition	Cadmium	SS-15X-083109AX	1.5	32	0.0469
Transition	Cadmium	ELY-SS-TR-04C (0-3)	1.4	32	0.0438
Transition	Cadmium	ELY-SS-TR-05D (0-3)	1.4	32	0.0438
Transition	Cadmium	ELY-SS-TR-05D (3-12)	1.4	32	0.0438
Transition	Cadmium	SS-11X-090309AX	1.4	32	0.0438
Transition	Cadmium	SS-19X-082709AX	1.4	32	0.0438
Transition	Cadmium	ELY-SS-NF-04 (0-4)	1.3	32	0.0406
Transition	Cadmium	ELY-SS-NF-17 (0-4)	1.3	32	0.0406
Transition	Cadmium	ELY-SS-TZ-06 (1-12)	1.3	32	0.0406
Transition	Cadmium	ELY-SS-NF-08 (2-11)	1.2	32	0.0375
Transition	Cadmium	ELY-SS-NF-11 (0-3)	1.1	32	0.0344
Transition	Cadmium	ELY-SS-TR-02C (0-3)	1.1	32	0.0344
Transition	Cadmium	TA-04X-082409AX	1.1	32	0.0344
Transition	Cadmium	ELY-SS-NF-05 (0-3)	1	32	0.0313
Transition	Cadmium	ELY-SS-NF-05 (3-11)	1	32	0.0313
Transition	Cadmium	ELY-SS-SA-01 (0-2)	1	32	0.0313
Transition	Cadmium	ELY-SS-TR-02B (0-4)	1	32	0.0313
Transition	Cadmium	ELY-SS-TR-08D (0-2) DUP	1	32	0.0313
Transition	Cadmium	ELY-SS-TZ-12 (0-3)	1	32	0.0313
Transition	Cadmium	TA-14X-082409AX	1	32	0.0313
Transition	Cadmium	ELY-SS-TR-05C (1-12)	0.96	32	0.0300
Transition	Cadmium	ELY-SS-TZ-12 (3-8)	0.93	32	0.0291
Transition	Cadmium	ELY-SS-TZ-15 (0-3.5)	0.93	32	0.0291
Transition	Cadmium	SS-01X-090209AX	0.92	32	0.0288
Transition	Cadmium	SS-17X-083109AX	0.92	32	0.0288
Transition	Cadmium	ELY-SS-NF-02 (0-8)	0.88	32	0.0275
Transition	Cadmium	SS-09X-090209AX	0.88	32	0.0275
Transition	Cadmium	ELY-SS-TZ-06 (0-1)	0.87	32	0.0272
Transition	Cadmium	SS-23X-082709AX	0.87	32	0.0272

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cadmium	ELY-SS-TR-09D (0-3)	0.84	32	0.0263
Transition	Cadmium	ELY-SS-TZ-38 (0-0.5)	0.84	32	0.0263
Transition	Cadmium	ELY-SS-TZ-21 (5-12)	0.83	32	0.0259
Transition	Cadmium	ELY-SS-NF-10 (0-4)	0.82	32	0.0256
Transition	Cadmium	ELY-SS-TZ-14 (4-12)	0.8	32	0.0250
Transition	Cadmium	ELY-SS-TZ-29 (1-9)	0.8	32	0.0250
Transition	Cadmium	SS-14X-083109AX	0.79	32	0.0247
Transition	Cadmium	ELY-SS-NF-04 (0-4) DUP	0.74	32	0.0231
Transition	Cadmium	ELY-SS-NF-04 (4-10)	0.72	32	0.0225
Transition	Cadmium	ELY-SS-TR-04C (3-6)	0.72	32	0.0225
Transition	Cadmium	ELY-SS-TR-05C (0-1)	0.69	32	0.0216
Transition	Cadmium	ELY-SS-TR-08C (5-12)	0.62	32	0.0194
Transition	Cadmium	SS-22X-082709AX	0.62	32	0.0194
Transition	Cadmium	ELY-SS-NF-04 (4-10) DUP	0.54	32	0.0169
Transition	Cadmium	ELY-SS-TR-02A (0-1.5)	0.54	32	0.0169
Transition	Cadmium	SS-08X-090209AX	0.54	32	0.0169
Transition	Cadmium	ELY-SS-TZ-29 (0-1)	0.53	32	0.0166
Transition	Cadmium	ELY-SS-TR-07C (0-2)	0.52	32	0.0163
Transition	Cadmium	ELY-SS-NF-10 (4-12)	0.51	32	0.0159
Transition	Cadmium	ELY-SS-NF-09 (0-1.5)	0.5	32	0.0156
Transition	Cadmium	ELY-SS-TZ-16 (4-12)	0.5	32	0.0156
Transition	Cadmium	ELY-SS-NF-07 (0-2)	0.47	32	0.0147
Transition	Cadmium	ELY-SS-TR-08C (5-12) DUP	0.47	32	0.0147
Transition	Cadmium	ELY-SS-TZ-42 (2-12)	0.46	32	0.0144
Transition	Cadmium	ELY-SS-NF-11 (3-9)	0.45	32	0.0141
Transition	Cadmium	ELY-SS-NF-13 (0-2.5)	0.45	32	0.0141
Transition	Cadmium	ELY-SS-TR-06A (1-12)	0.45	32	0.0141
Transition	Cadmium	ELY-SS-TR-06A (0-1)	0.44	32	0.0138
Transition	Cadmium	ELY-SS-TZ-27 (2.5-8)	0.44	32	0.0138
Transition	Cadmium	ELY-SS-TZ-43 (0-2.5)	0.44	32	0.0138
Transition	Cadmium	ELY-SS-TR-06C (0-3)	0.43	32	0.0134
Transition	Cadmium	ELY-SS-TR-08C (0-5) DUP	0.43	32	0.0134
Transition	Cadmium	ELY-SS-NF-14 (0-3)	0.4	32	0.0125
Transition	Cadmium	SS-21X-083109AX	0.4	32	0.0125
Transition	Cadmium	ELY-SS-NF-12 (0-2)	0.39	32	0.0122
Transition	Cadmium	ELY-SS-SA-23 (0-6)	0.39	32	0.0122
Transition	Cadmium	ELY-SS-TR-09B (0-2)	0.39	32	0.0122
Transition	Cadmium	ELY-SS-TZ-11 (1-5.5)	0.39	32	0.0122
Transition	Cadmium	ELY-SS-TZ-43 (2.5-11)	0.39	32	0.0122
Transition	Cadmium	SS-16X-090309AX	0.39	32	0.0122
Transition	Cadmium	ELY-SS-NF-13 (2.5-12)	0.38	32	0.0119
Transition	Cadmium	ELY-SS-NF-16 (0-1)	0.38	32	0.0119
Transition	Cadmium	SS-12X-090309AX	0.37	32	0.0116
Transition	Cadmium	ELY-SS-NF-08 (0-2)	0.36	32	0.0113
Transition	Cadmium	ELY-SS-TR-06B (0-3)	0.36	32	0.0113
Transition	Cadmium	ELY-SS-TZ-34 (0-2.5)	0.36	32	0.0113
Transition	Cadmium	ELY-SS-NF-09 (1.5-12)	0.35	32	0.0109
Transition	Cadmium	SS-02X-090209AX	0.35	32	0.0109
Transition	Cadmium	ELY-SS-TZ-30 (0.5-12)	0.34	32	0.0106
Transition	Cadmium	TK-01X-082509AX	0.33	32	0.0103
Transition	Cadmium	ELY-SS-TR-04B (1.5-12)	0.31	32	0.00969
Transition	Cadmium	ELY-SS-TR-07B (0-2)	0.31	32	0.00969
Transition	Cadmium	ELY-SS-TZ-34 (2.5-8)	0.3	32	0.00938
Transition	Cadmium	ELY-SS-TR-07B (2-8)	0.29	32	0.00906
Transition	Cadmium	ELY-SS-TZ-11 (0-1)	0.29	32	0.00906
Transition	Cadmium	ELY-SS-TZ-23 (0-2.5)	0.29	32	0.00906
Transition	Cadmium	SS-05X-090209AX	0.28	32	0.00875
Transition	Cadmium	ELY-SS-TR-06C (3-12)	0.27	32	0.00844
Transition	Cadmium	ELY-SS-TR-08C (0-5)	0.27	32	0.00844
Transition	Cadmium	ELY-SS-NF-01 (2-7)	0.26	32	0.00813
Transition	Cadmium	ELY-SS-NF-07 (2-8)	0.26	32	0.00813
Transition	Cadmium	ELY-SS-TZ-30 (0-0.5)	0.26	32	0.00813
Transition	Cadmium	SS-20X-083109AX	0.26	32	0.00813
Transition	Cadmium	SS-28X-083109AX	0.26	32	0.00813
Transition	Cadmium	ELY-SS-NF-12 (2-9)	0.25	32	0.00781

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cadmium	ELY-SS-TR-04B (0-1.5)	0.25	32	0.00781
Transition	Cadmium	ELY-SS-TR-08D (2-12)	0.25	32	0.00781
Transition	Cadmium	ELY-SS-TZ-23 (2.5-12)	0.25	32	0.00781
Transition	Cadmium	ELY-SS-NF-15 (2-5)	0.24	32	0.00750
Transition	Cadmium	ELY-SS-TR-07D (0-2)	0.24	32	0.00750
Transition	Cadmium	SS-06X-090209AX	0.23	32	0.00719
Transition	Cadmium	ELY-SS-TR-07C (2-12)	0.22	32	0.00688
Transition	Cadmium	ELY-SS-TR-08D (2-12) DUP	0.22	32	0.00688
Transition	Cadmium	SS-07X-090209AX	0.21	32	0.00656
Transition	Cadmium	SS-03X-090209AX	0.2	32	0.00625
Transition	Cadmium	TL-04X-082509AX	0.2	32	0.00625
Transition	Cadmium	ELY-SS-TR-07D (2-9)	0.19	32	0.00594
Transition	Cadmium	TP-10X-082709AX	0.18	32	0.00563
Transition	Cadmium	SS-04X-090209AX	0.15	32	0.00469
Transition	Cadmium	TN-02X-082509AD	0.15	32	0.00469
Transition	Cadmium	TQ-16X-082609AX	0.14	32	0.00438
Transition	Cadmium	ELY-SS-TZ-31 (0-3)	0.13	32	0.00406
Transition	Cadmium	TC-03X-082609AX	0.13	32	0.00406
Transition	Cadmium	TG-02X-082409AX	0.13	32	0.00406
Transition	Cadmium	TO-05X-082709AX	0.13	32	0.00406
Transition	Cadmium	TI-03X-082509AX	0.12	32	0.00375
Transition	Cadmium	TN-02X-082509AX	0.12	32	0.00375
Transition	Cadmium	TQ-06X-082609AX	0.017	32	<0.001
Transition	Chromium	ELY-SS-NF-03 (4-12)	440	0.018	24444
Transition	Chromium	ELY-SS-TR-05C (1-12)	150	0.018	8333
Transition	Chromium	SS-11X-090309AX	111	0.018	6167
Transition	Chromium	ELY-SS-SA-23 (0-6)	92	0.018	5111
Transition	Chromium	ELY-SS-TR-08C (0-5) DUP	90	0.018	5000
Transition	Chromium	ELY-SS-NF-04 (0-4)	88	0.018	4889
Transition	Chromium	ELY-SS-TR-05D (3-12)	82	0.018	4556
Transition	Chromium	ELY-SS-TZ-21 (5-12)	82	0.018	4556
Transition	Chromium	ELY-SS-TZ-29 (1-9)	82	0.018	4556
Transition	Chromium	ELY-SS-TR-03B (2-12)	77	0.018	4278
Transition	Chromium	ELY-SS-TR-08C (5-12) DUP	74	0.018	4111
Transition	Chromium	ELY-SS-TZ-16 (4-12)	74	0.018	4111
Transition	Chromium	ELY-SS-TR-02D(0-2) DUP	72	0.018	4000
Transition	Chromium	ELY-SS-TR-05C (0-1)	72	0.018	4000
Transition	Chromium	ELY-SS-TR-08C (5-12)	72	0.018	4000
Transition	Chromium	ELY-SS-TZ-34 (2.5-8)	68	0.018	3778
Transition	Chromium	ELY-SS-TR-04C (3-6)	64	0.018	3556
Transition	Chromium	ELY-SS-NF-10 (4-12)	61	0.018	3389
Transition	Chromium	ELY-SS-TR-05D (0-3)	60	0.018	3333
Transition	Chromium	ELY-SS-TZ-14 (4-12)	59	0.018	3278
Transition	Chromium	ELY-SS-NF-17 (4-10)	58	0.018	3222
Transition	Chromium	ELY-SS-NF-09 (1.5-12)	57	0.018	3167
Transition	Chromium	ELY-SS-TZ-35 (2-9)	57	0.018	3167
Transition	Chromium	TQ-16X-082609AX	55.9	0.018	3106
Transition	Chromium	ELY-SS-TZ-18 (.5-12)	55	0.018	3056
Transition	Chromium	ELY-SS-TZ-23 (2.5-12)	54	0.018	3000
Transition	Chromium	ELY-SS-TZ-36 (1.5-9)	54	0.018	3000
Transition	Chromium	SS-09X-090209AX	53.2	0.018	2956
Transition	Chromium	ELY-SS-NF-11 (0-3)	53	0.018	2944
Transition	Chromium	TQ-06X-082609AX	52.1	0.018	2894
Transition	Chromium	ELY-SS-TZ-27 (2.5-8)	52	0.018	2889
Transition	Chromium	ELY-SS-TZ-30 (0.5-12)	52	0.018	2889
Transition	Chromium	TL-04X-082509AX	51.3	0.018	2850
Transition	Chromium	ELY-SS-NF-11 (3-9)	51	0.018	2833
Transition	Chromium	ELY-SS-NF-15 (2-5)	50	0.018	2778
Transition	Chromium	ELY-SS-TR-04B (1.5-12)	50	0.018	2778
Transition	Chromium	ELY-SS-TZ-29 (0-1)	50	0.018	2778
Transition	Chromium	TN-02X-082509AD	49.4	0.018	2744
Transition	Chromium	SS-29X-083109AX	48.9	0.018	2717
Transition	Chromium	TP-10X-082709AX	48.6	0.018	2700
Transition	Chromium	ELY-SS-NF-08 (0-2)	48	0.018	2667
Transition	Chromium	ELY-SS-NF-13 (2.5-12)	48	0.018	2667

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Chromium	ELY-SS-TR-06A (0-1)	48	0.018	2667
Transition	Chromium	ELY-SS-TR-06C (0-3)	48	0.018	2667
Transition	Chromium	TI-03X-082509AX	47.3	0.018	2628
Transition	Chromium	ELY-SS-NF-04 (4-10)	47	0.018	2611
Transition	Chromium	ELY-SS-NF-12 (2-9)	47	0.018	2611
Transition	Chromium	ELY-SS-TR-07B (2-8)	47	0.018	2611
Transition	Chromium	ELY-SS-TR-09B (2-5)	47	0.018	2611
Transition	Chromium	SS-01X-090209AX	46.2	0.018	2567
Transition	Chromium	SS-03X-090209AX	46.2	0.018	2567
Transition	Chromium	ELY-SS-TR-08C (0-5)	46	0.018	2556
Transition	Chromium	ELY-SS-NF-10 (0-4)	45	0.018	2500
Transition	Chromium	SS-02X-090209AX	44.8	0.018	2489
Transition	Chromium	ELY-SS-NF-13 (0-2.5)	44	0.018	2444
Transition	Chromium	TO-05X-082709AX	43.6	0.018	2422
Transition	Chromium	ELY-SS-TZ-06 (1-12)	43	0.018	2389
Transition	Chromium	ELY-SS-TZ-15 (3.5-12)	43	0.018	2389
Transition	Chromium	TP-15X-073009AD	42.5	0.018	2361
Transition	Chromium	TP-15X-073009AX	42.3	0.018	2350
Transition	Chromium	ELY-SS-NF-04 (4-10) DUP	42	0.018	2333
Transition	Chromium	ELY-SS-TR-06B (3-7)	42	0.018	2333
Transition	Chromium	ELY-SS-TR-06C (3-12)	42	0.018	2333
Transition	Chromium	SS-06X-090209AX	42	0.018	2333
Transition	Chromium	ELY-SS-NF-16 (1-12)	41	0.018	2278
Transition	Chromium	SS-16X-090309AX	40.4	0.018	2244
Transition	Chromium	ELY-SS-TR-07B (0-2)	40	0.018	2222
Transition	Chromium	SS-07X-090209AX	39.4	0.018	2189
Transition	Chromium	TN-02X-082509AX	39.1	0.018	2172
Transition	Chromium	ELY-SS-TR-07C (2-12)	39	0.018	2167
Transition	Chromium	ELY-SS-TR-07D (2-9)	39	0.018	2167
Transition	Chromium	ELY-SS-TR-08A (0.5-12)	39	0.018	2167
Transition	Chromium	ELY-SS-TR-08D (2-12) DUP	39	0.018	2167
Transition	Chromium	TF-13X-090909BX	39	0.018	2167
Transition	Chromium	SS-28X-083109AX	38.9	0.018	2161
Transition	Chromium	ELY-SS-TZ-27 (0-2.5)	38	0.018	2111
Transition	Chromium	ELY-SS-TZ-43 (2.5-11)	38	0.018	2111
Transition	Chromium	ELY-SS-TR-06A (1-12)	37	0.018	2056
Transition	Chromium	ELY-SS-TR-08D (2-12)	37	0.018	2056
Transition	Chromium	ELY-SS-TZ-31 (3-9)	37	0.018	2056
Transition	Chromium	ELY-SS-NF-01 (2-7)	36	0.018	2000
Transition	Chromium	ELY-SS-NF-02 (0-8)	36	0.018	2000
Transition	Chromium	ELY-SS-TR-08A (0-0.5) DUP	36	0.018	2000
Transition	Chromium	SS-17X-083109AX	35.2	0.018	1956
Transition	Chromium	TK-01X-082509AX	35.2	0.018	1956
Transition	Chromium	ELY-SS-NF-08 (2-11)	35	0.018	1944
Transition	Chromium	ELY-SS-TR-03C (3-12)	35	0.018	1944
Transition	Chromium	SS-05X-090209AX	34.8	0.018	1933
Transition	Chromium	TG-02X-082409AX	34.6	0.018	1922
Transition	Chromium	ELY-SS-SA-09 (0-4)	34	0.018	1889
Transition	Chromium	ELY-SS-TR-08A (0.5-12)DUP	34	0.018	1889
Transition	Chromium	ELY-SS-TR-08A (0-0.5)	34	0.018	1889
Transition	Chromium	ELY-SS-TZ-39 (3-8)	34	0.018	1889
Transition	Chromium	SS-04X-090209AX	34	0.018	1889
Transition	Chromium	ELY-SS-NF-06 (3-12)	33	0.018	1833
Transition	Chromium	ELY-SS-NF-14 (3-12)	33	0.018	1833
Transition	Chromium	ELY-SS-TR-02D (0-2)	33	0.018	1833
Transition	Chromium	ELY-SS-TZ-06 (0-1)	33	0.018	1833
Transition	Chromium	ELY-SS-TZ-30 (0-0.5)	33	0.018	1833
Transition	Chromium	SS-26X-083109AX	32.4	0.018	1800
Transition	Chromium	TC-03X-082609AX	32.2	0.018	1789
Transition	Chromium	ELY-SS-NF-06 (0-3)	32	0.018	1778
Transition	Chromium	ELY-SS-TZ-14 (0-4)	32	0.018	1778
Transition	Chromium	ELY-SS-TZ-37 (2-12)	32	0.018	1778
Transition	Chromium	ELY-SS-TZ-38 (0.5-7)	32	0.018	1778
Transition	Chromium	ELY-SS-TR-06B (0-3)	31	0.018	1722
Transition	Chromium	TA-14X-082409AX	30.9	0.018	1717

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Chromium	SS-23X-082709AX	30.1	0.018	1672
Transition	Chromium	ELY-SS-NF-09 (0-1.5)	30	0.018	1667
Transition	Chromium	ELY-SS-TZ-11 (1-5.5)	30	0.018	1667
Transition	Chromium	ELY-SS-TZ-42 (2-12)	30	0.018	1667
Transition	Chromium	ELY-SS-NF-05 (0-3)	29	0.018	1611
Transition	Chromium	ELY-TP-109 (0-1)	29	0.018	1611
Transition	Chromium	SS-08X-090209AX	28.4	0.018	1578
Transition	Chromium	ELY-SS-NF-12 (0-2)	28	0.018	1556
Transition	Chromium	ELY-SS-TR-09C (1.5-8)	28	0.018	1556
Transition	Chromium	ELY-SS-TR-09D (3-12)	28	0.018	1556
Transition	Chromium	ELY-SS-TZ-12 (3-8)	28	0.018	1556
Transition	Chromium	ELY-SS-TZ-31 (0-3)	28	0.018	1556
Transition	Chromium	ELY-SS-TZ-40 (2-10)	28	0.018	1556
Transition	Chromium	ELY-SS-TR-02D (2-12)	27	0.018	1500
Transition	Chromium	ELY-SS-TR-02D (2-12) DUP	27	0.018	1500
Transition	Chromium	TA-04X-082409AX	26.8	0.018	1489
Transition	Chromium	SS-22X-082709AX	26.1	0.018	1450
Transition	Chromium	ELY-SS-TR-08D (0-2) DUP	24	0.018	1333
Transition	Chromium	ELY-SS-TZ-21 (0-5)	24	0.018	1333
Transition	Chromium	SS-20X-083109AX	23.1	0.018	1283
Transition	Chromium	ELY-SS-TZ-11 (0-1)	23	0.018	1278
Transition	Chromium	ELY-SS-TZ-36 (0-1.5)	23	0.018	1278
Transition	Chromium	ELY-SS-TZ-43 (0-2.5)	23	0.018	1278
Transition	Chromium	ELY-TP-104 (0-1)	23	0.018	1278
Transition	Chromium	ELY-SS-NF-05 (3-11)	22	0.018	1222
Transition	Chromium	ELY-SS-TR-07D (0-2)	22	0.018	1222
Transition	Chromium	ELY-SS-TZ-18 (0-.5)	22	0.018	1222
Transition	Chromium	SS-10X-090309AX	21.9	0.018	1217
Transition	Chromium	SS-14X-083109AX	21.2	0.018	1178
Transition	Chromium	ELY-SS-NF-14 (0-3)	21	0.018	1167
Transition	Chromium	ELY-SS-TR-04C (0-3)	21	0.018	1167
Transition	Chromium	ELY-SS-TR-09C (0-1.5)	21	0.018	1167
Transition	Chromium	ELY-SS-TZ-42 (0-2)	21	0.018	1167
Transition	Chromium	SS-12X-090309AX	20.6	0.018	1144
Transition	Chromium	ELY-SS-NF-15 (0-2)	20	0.018	1111
Transition	Chromium	ELY-SS-SA-04 (0-6)	20	0.018	1111
Transition	Chromium	SS-13X-082809AX	20	0.018	1111
Transition	Chromium	ELY-SS-SA-06 (0-6)	18	0.018	1000
Transition	Chromium	ELY-SS-TR-08D (0-2)	17	0.018	944
Transition	Chromium	ELY-SS-TR-02B (4-11)	16	0.018	889
Transition	Chromium	ELY-SS-TZ-15 (0-3.5)	15	0.018	833
Transition	Chromium	SS-24X-083109AX	14.8	0.018	822
Transition	Chromium	ELY-SS-TR-02C (0-3)	14	0.018	778
Transition	Chromium	ELY-SS-TZ-38 (0-0.5)	14	0.018	778
Transition	Chromium	SS-25X-082709AX	14	0.018	778
Transition	Chromium	SS-21X-083109AX	13.5	0.018	750
Transition	Chromium	ELY-SS-TR-02A (1.5-11)	13	0.018	722
Transition	Chromium	SS-27X-082609AX	12.1	0.018	672
Transition	Chromium	ELY-SS-SA-01 (0-2)	12	0.018	667
Transition	Chromium	ELY-SS-TZ-35 (0-2)	12	0.018	667
Transition	Chromium	ELY-SS-TZ-37 (0-2)	12	0.018	667
Transition	Chromium	ELY-SS-TZ-39 (0-3)	12	0.018	667
Transition	Chromium	ELY-SS-TZ-40 (0-2)	12	0.018	667
Transition	Chromium	ELY-SS-TR-09B (0-2)	11	0.018	611
Transition	Chromium	SS-18X-082709AX	10.7	0.018	594
Transition	Chromium	ELY-SS-TZ-34 (0-2.5)	10	0.018	556
Transition	Chromium	ELY-SS-NF-16 (0-1)	9.1	0.018	506
Transition	Chromium	ELY-SS-NF-07 (0-2)	9	0.018	500
Transition	Chromium	ELY-SS-TR-02C (3-12)	9	0.018	500
Transition	Chromium	ELY-SS-TZ-23 (0-2.5)	8.1	0.018	450
Transition	Chromium	SS-19X-082709AX	7.8	0.018	433
Transition	Chromium	ELY-SS-TR-03B (0-2)	7.4	0.018	411
Transition	Chromium	ELY-SS-NF-07 (2-8)	7.3	0.018	406
Transition	Chromium	ELY-SS-TR-02A (0-1.5)	6	0.018	333
Transition	Chromium	ELY-SS-TR-07C (0-2)	5.5	0.018	306

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Chromium	SS-15X-083109AX	5.3	0.018	294
Transition	Chromium	ELY-SS-NF-17 (0-4)	5.2	0.018	289
Transition	Chromium	ELY-SS-TR-04B (0-1.5)	5.1	0.018	283
Transition	Chromium	ELY-SS-TR-02B (0-4)	4.2	0.018	233
Transition	Chromium	ELY-SS-TZ-12 (0-3)	3.9	0.018	217
Transition	Chromium	ELY-SS-NF-03 (0-4)	3.7	0.018	206
Transition	Chromium	ELY-SS-NF-04 (0-4) DUP	3.2	0.018	178
Transition	Chromium	ELY-SS-TZ-16 (0-4)	3.1	0.018	172
Transition	Chromium	ELY-SS-TR-03C (0-3)	2.6	0.018	144
Transition	Chromium	ELY-SS-TR-09D (0-3)	2.5	0.018	139
Transition	Cobalt	ELY-SS-SA-09 (0-4)	120	13	9.23
Transition	Cobalt	ELY-SS-TR-02D (2-12) DUP	110	13	8.46
Transition	Cobalt	ELY-SS-NF-03 (4-12)	87	13	6.69
Transition	Cobalt	ELY-SS-TR-02D (2-12)	82	13	6.31
Transition	Cobalt	ELY-SS-SA-04 (0-6)	73	13	5.62
Transition	Cobalt	ELY-SS-TZ-06 (0-1)	71	13	5.46
Transition	Cobalt	ELY-SS-TZ-11 (1-5.5)	70	13	5.38
Transition	Cobalt	TF-13X-090909BX	66.5	13	5.12
Transition	Cobalt	ELY-SS-TZ-21 (0-5)	60	13	4.62
Transition	Cobalt	ELY-SS-SA-01 (0-2)	51	13	3.92
Transition	Cobalt	ELY-TP-104 (0-1)	51	13	3.92
Transition	Cobalt	ELY-SS-NF-05 (3-11)	50	13	3.85
Transition	Cobalt	ELY-SS-TR-02A (1.5-11)	47	13	3.62
Transition	Cobalt	ELY-SS-TZ-06 (1-12)	44	13	3.38
Transition	Cobalt	ELY-SS-NF-05 (0-3)	42	13	3.23
Transition	Cobalt	ELY-SS-SA-06 (0-6)	35	13	2.69
Transition	Cobalt	ELY-SS-TR-03B (2-12)	35	13	2.69
Transition	Cobalt	ELY-SS-TR-02B (4-11)	33	13	2.54
Transition	Cobalt	ELY-SS-TR-02D(0-2) DUP	32	13	2.46
Transition	Cobalt	SS-08X-090209AX	31.6	13	2.43
Transition	Cobalt	SS-13X-082809AX	28.9	13	2.22
Transition	Cobalt	ELY-SS-TZ-11 (0-1)	28	13	2.15
Transition	Cobalt	ELY-SS-SA-23 (0-6)	27	13	2.08
Transition	Cobalt	ELY-SS-TR-05C (1-12)	27	13	2.08
Transition	Cobalt	ELY-SS-TZ-16 (0-4)	25	13	1.92
Transition	Cobalt	ELY-SS-NF-04 (0-4)	24	13	1.85
Transition	Cobalt	ELY-SS-TZ-12 (3-8)	23	13	1.77
Transition	Cobalt	ELY-SS-TR-02D (0-2)	22	13	1.69
Transition	Cobalt	ELY-SS-TZ-14 (0-4)	21	13	1.62
Transition	Cobalt	ELY-SS-TZ-21 (5-12)	21	13	1.62
Transition	Cobalt	ELY-SS-TR-06A (1-12)	20	13	1.54
Transition	Cobalt	ELY-SS-TR-09D (3-12)	20	13	1.54
Transition	Cobalt	SS-11X-090309AX	18.1	13	1.39
Transition	Cobalt	SS-23X-082709AX	18	13	1.38
Transition	Cobalt	TO-05X-082709AX	18	13	1.38
Transition	Cobalt	SS-09X-090209AX	17.1	13	1.32
Transition	Cobalt	ELY-SS-TR-07B (0-2)	17	13	1.31
Transition	Cobalt	ELY-SS-TZ-16 (4-12)	17	13	1.31
Transition	Cobalt	ELY-SS-TZ-29 (1-9)	17	13	1.31
Transition	Cobalt	ELY-SS-TZ-34 (2.5-8)	17	13	1.31
Transition	Cobalt	ELY-SS-TZ-37 (2-12)	17	13	1.31
Transition	Cobalt	ELY-SS-TZ-39 (3-8)	17	13	1.31
Transition	Cobalt	ELY-TP-109 (0-1)	17	13	1.31
Transition	Cobalt	ELY-SS-NF-01 (2-7)	16	13	1.23
Transition	Cobalt	ELY-SS-NF-06 (0-3)	16	13	1.23
Transition	Cobalt	ELY-SS-NF-11 (0-3)	16	13	1.23
Transition	Cobalt	ELY-SS-NF-12 (2-9)	16	13	1.23
Transition	Cobalt	ELY-SS-TZ-27 (0-2.5)	16	13	1.23
Transition	Cobalt	SS-02X-090209AX	16	13	1.23
Transition	Cobalt	TA-14X-082409AX	15.2	13	1.17
Transition	Cobalt	ELY-SS-NF-02 (0-8)	15	13	1.15
Transition	Cobalt	ELY-SS-NF-09 (0-1.5)	15	13	1.15
Transition	Cobalt	ELY-SS-TR-05C (0-1)	15	13	1.15
Transition	Cobalt	SS-01X-090209AX	14.9	13	1.15
Transition	Cobalt	ELY-SS-NF-06 (3-12)	14	13	1.08

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cobalt	ELY-SS-NF-09 (1.5-12)	14	13	1.08
Transition	Cobalt	ELY-SS-NF-10 (4-12)	14	13	1.08
Transition	Cobalt	ELY-SS-TR-02C (0-3)	14	13	1.08
Transition	Cobalt	ELY-SS-TR-04C (3-6)	14	13	1.08
Transition	Cobalt	ELY-SS-TR-05D (0-3)	14	13	1.08
Transition	Cobalt	ELY-SS-TR-06C (0-3)	14	13	1.08
Transition	Cobalt	ELY-SS-TR-07B (2-8)	14	13	1.08
Transition	Cobalt	ELY-SS-TR-08C (5-12)	14	13	1.08
Transition	Cobalt	ELY-SS-TZ-27 (2.5-8)	14	13	1.08
Transition	Cobalt	ELY-SS-TZ-36 (1.5-9)	14	13	1.08
Transition	Cobalt	SS-26X-083109AX	13.9	13	1.07
Transition	Cobalt	SS-16X-090309AX	13.7	13	1.05
Transition	Cobalt	ELY-SS-NF-11 (3-9)	13	13	1.00
Transition	Cobalt	ELY-SS-TR-08C (0-5) DUP	13	13	1.00
Transition	Cobalt	ELY-SS-TR-08C (5-12) DUP	13	13	1.00
Transition	Cobalt	TI-03X-082509AX	12.6	13	0.969
Transition	Cobalt	SS-29X-083109AX	12.2	13	0.938
Transition	Cobalt	SS-28X-083109AX	12.1	13	0.931
Transition	Cobalt	ELY-SS-NF-08 (0-2)	12	13	0.923
Transition	Cobalt	ELY-SS-NF-10 (0-4)	12	13	0.923
Transition	Cobalt	ELY-SS-NF-13 (0-2.5)	12	13	0.923
Transition	Cobalt	ELY-SS-NF-13 (2.5-12)	12	13	0.923
Transition	Cobalt	ELY-SS-NF-15 (2-5)	12	13	0.923
Transition	Cobalt	ELY-SS-TR-02B (0-4)	12	13	0.923
Transition	Cobalt	ELY-SS-TR-07C (2-12)	12	13	0.923
Transition	Cobalt	ELY-SS-TR-08A (0.5-12)DUP	12	13	0.923
Transition	Cobalt	ELY-SS-TR-08D (2-12) DUP	12	13	0.923
Transition	Cobalt	ELY-SS-TZ-29 (0-1)	12	13	0.923
Transition	Cobalt	ELY-SS-TZ-35 (2-9)	12	13	0.923
Transition	Cobalt	ELY-SS-TZ-42 (2-12)	12	13	0.923
Transition	Cobalt	SS-03X-090209AX	11.4	13	0.877
Transition	Cobalt	SS-18X-082709AX	11.3	13	0.869
Transition	Cobalt	ELY-SS-NF-04 (4-10)	11	13	0.846
Transition	Cobalt	ELY-SS-NF-08 (2-11)	11	13	0.846
Transition	Cobalt	ELY-SS-TR-04B (1.5-12)	11	13	0.846
Transition	Cobalt	ELY-SS-TR-05D (3-12)	11	13	0.846
Transition	Cobalt	ELY-SS-TR-08D (2-12)	11	13	0.846
Transition	Cobalt	ELY-SS-TZ-23 (2.5-12)	11	13	0.846
Transition	Cobalt	ELY-SS-TZ-38 (0.5-7)	11	13	0.846
Transition	Cobalt	ELY-SS-TZ-42 (0-2)	11	13	0.846
Transition	Cobalt	SS-10X-090309AX	10.6	13	0.815
Transition	Cobalt	TL-04X-082509AX	10.2	13	0.785
Transition	Cobalt	TQ-16X-082609AX	10.2	13	0.785
Transition	Cobalt	TG-02X-082409AX	10.1	13	0.777
Transition	Cobalt	ELY-SS-NF-16 (1-12)	10	13	0.769
Transition	Cobalt	ELY-SS-NF-17 (4-10)	10	13	0.769
Transition	Cobalt	ELY-SS-TR-06B (3-7)	10	13	0.769
Transition	Cobalt	ELY-SS-TZ-14 (4-12)	10	13	0.769
Transition	Cobalt	ELY-SS-TZ-30 (0.5-12)	10	13	0.769
Transition	Cobalt	ELY-SS-TZ-40 (2-10)	10	13	0.769
Transition	Cobalt	ELY-SS-TZ-40 (0-2)	9.9	13	0.762
Transition	Cobalt	ELY-SS-TR-06A (0-1)	9.8	13	0.754
Transition	Cobalt	ELY-SS-TZ-43 (2.5-11)	9.8	13	0.754
Transition	Cobalt	TA-04X-082409AX	9.8	13	0.754
Transition	Cobalt	TP-10X-082709AX	9.7	13	0.746
Transition	Cobalt	ELY-SS-TR-06C (3-12)	9.6	13	0.738
Transition	Cobalt	ELY-SS-TR-07D (2-9)	9.6	13	0.738
Transition	Cobalt	ELY-SS-TR-09B (2-5)	9.6	13	0.738
Transition	Cobalt	ELY-SS-TR-08A (0.5-12)	9.5	13	0.731
Transition	Cobalt	ELY-SS-TR-08A (0-0.5) DUP	9.5	13	0.731
Transition	Cobalt	ELY-SS-NF-07 (2-8)	9.4	13	0.723
Transition	Cobalt	ELY-SS-NF-14 (3-12)	9.4	13	0.723
Transition	Cobalt	ELY-SS-NF-04 (4-10) DUP	9.3	13	0.715
Transition	Cobalt	ELY-SS-TR-08D (0-2) DUP	9.2	13	0.708
Transition	Cobalt	ELY-SS-TR-09C (1.5-8)	9.2	13	0.708

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cobalt	SS-17X-083109AX	9.2	13	0.708
Transition	Cobalt	TN-02X-082509AD	9.2	13	0.708
Transition	Cobalt	TP-15X-073009AX	9.2	13	0.708
Transition	Cobalt	ELY-SS-TZ-39 (0-3)	9.1	13	0.700
Transition	Cobalt	ELY-SS-TZ-15 (3.5-12)	8.7	13	0.669
Transition	Cobalt	ELY-SS-TR-08A (0-0.5)	8.6	13	0.662
Transition	Cobalt	ELY-SS-TZ-31 (3-9)	8.6	13	0.662
Transition	Cobalt	ELY-SS-TR-02C (3-12)	8.5	13	0.654
Transition	Cobalt	ELY-SS-TZ-30 (0-0.5)	8.5	13	0.654
Transition	Cobalt	TP-15X-073009AD	8.4	13	0.646
Transition	Cobalt	TK-01X-082509AX	8.3	13	0.638
Transition	Cobalt	TN-02X-082509AX	8.3	13	0.638
Transition	Cobalt	ELY-SS-NF-07 (0-2)	8	13	0.615
Transition	Cobalt	ELY-SS-TR-08C (0-5)	8	13	0.615
Transition	Cobalt	SS-06X-090209AX	7.9	13	0.608
Transition	Cobalt	ELY-SS-TR-03C (0-3)	7.8	13	0.600
Transition	Cobalt	ELY-SS-TZ-18 (.5-12)	7.8	13	0.600
Transition	Cobalt	ELY-SS-TZ-38 (0-0.5)	7.5	13	0.577
Transition	Cobalt	SS-27X-082609AX	7.5	13	0.577
Transition	Cobalt	ELY-SS-TR-04C (0-3)	7.4	13	0.569
Transition	Cobalt	ELY-SS-TR-07C (0-2)	7.4	13	0.569
Transition	Cobalt	ELY-SS-TR-08D (0-2)	7.4	13	0.569
Transition	Cobalt	SS-24X-083109AX	7.3	13	0.562
Transition	Cobalt	ELY-SS-NF-12 (0-2)	7.1	13	0.546
Transition	Cobalt	ELY-SS-TR-09D (0-3)	7.1	13	0.546
Transition	Cobalt	SS-07X-090209AX	7.1	13	0.546
Transition	Cobalt	ELY-SS-TR-02A (0-1.5)	7	13	0.538
Transition	Cobalt	ELY-SS-NF-14 (0-3)	6.8	13	0.523
Transition	Cobalt	ELY-SS-NF-15 (0-2)	6.8	13	0.523
Transition	Cobalt	ELY-SS-TZ-31 (0-3)	6.8	13	0.523
Transition	Cobalt	SS-14X-083109AX	6.8	13	0.523
Transition	Cobalt	SS-04X-090209AX	6.6	13	0.508
Transition	Cobalt	ELY-SS-TR-03B (0-2)	6.4	13	0.492
Transition	Cobalt	ELY-SS-TR-06B (0-3)	6.3	13	0.485
Transition	Cobalt	ELY-SS-TZ-37 (0-2)	6.2	13	0.477
Transition	Cobalt	SS-22X-082709AX	6.1	13	0.469
Transition	Cobalt	ELY-SS-TR-09C (0-1.5)	6	13	0.462
Transition	Cobalt	ELY-SS-TZ-43 (0-2.5)	6	13	0.462
Transition	Cobalt	ELY-SS-TR-09B (0-2)	5.9	13	0.454
Transition	Cobalt	ELY-SS-TZ-36 (0-1.5)	5.9	13	0.454
Transition	Cobalt	ELY-SS-TR-07D (0-2)	5.8	13	0.446
Transition	Cobalt	SS-12X-090309AX	5.8	13	0.446
Transition	Cobalt	ELY-SS-TR-03C (3-12)	5.4	13	0.415
Transition	Cobalt	ELY-SS-TZ-18 (0-.5)	5.4	13	0.415
Transition	Cobalt	ELY-SS-TZ-15 (0-3.5)	5.1	13	0.392
Transition	Cobalt	SS-25X-082709AX	4.9	13	0.377
Transition	Cobalt	TC-03X-082609AX	4.7	13	0.362
Transition	Cobalt	SS-05X-090209AX	4.6	13	0.354
Transition	Cobalt	SS-21X-083109AX	4.5	13	0.346
Transition	Cobalt	SS-20X-083109AX	4.4	13	0.338
Transition	Cobalt	SS-15X-083109AX	4.3	13	0.331
Transition	Cobalt	ELY-SS-TZ-12 (0-3)	4.2	13	0.323
Transition	Cobalt	TQ-06X-082609AX	4.1	13	0.315
Transition	Cobalt	ELY-SS-TZ-34 (0-2.5)	4	13	0.308
Transition	Cobalt	ELY-SS-NF-17 (0-4)	3.9	13	0.300
Transition	Cobalt	ELY-SS-TZ-35 (0-2)	3.9	13	0.300
Transition	Cobalt	SS-19X-082709AX	3.9	13	0.300
Transition	Cobalt	ELY-SS-NF-04 (0-4) DUP	3.1	13	0.238
Transition	Cobalt	ELY-SS-NF-03 (0-4)	2.9	13	0.223
Transition	Cobalt	ELY-SS-NF-16 (0-1)	2.8	13	0.215
Transition	Cobalt	ELY-SS-TZ-23 (0-2.5)	2.4	13	0.185
Transition	Cobalt	ELY-SS-TR-04B (0-1.5)	1.8	13	0.138
Transition	Copper	TF-13X-090909BX	7850	70	112
Transition	Copper	ELY-SS-TR-08A (0.5-12)	4000	70	57.1
Transition	Copper	ELY-SS-SA-04 (0-6)	3800	70	54.3

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Copper	ELY-SS-TZ-38 (0-0.5)	3700	70	52.9
Transition	Copper	ELY-SS-TR-03B (2-12)	2900	70	41.4
Transition	Copper	ELY-SS-TR-02D (2-12) DUP	2800	70	40.0
Transition	Copper	ELY-SS-TR-02D (2-12)	2100	70	30.0
Transition	Copper	ELY-SS-NF-03 (4-12)	2000	70	28.6
Transition	Copper	ELY-SS-TZ-06 (0-1)	2000	70	28.6
Transition	Copper	ELY-SS-TR-02B (4-11)	1900	70	27.1
Transition	Copper	ELY-SS-TZ-16 (4-12)	1800	70	25.7
Transition	Copper	ELY-SS-SA-01 (0-2)	1700	70	24.3
Transition	Copper	ELY-SS-SA-06 (0-6)	1700	70	24.3
Transition	Copper	ELY-SS-SA-09 (0-4)	1600	70	22.9
Transition	Copper	ELY-SS-TR-03B (0-2)	1600	70	22.9
Transition	Copper	ELY-SS-TR-08C (0-5)	1600	70	22.9
Transition	Copper	ELY-TP-104 (0-1)	1600	70	22.9
Transition	Copper	ELY-SS-NF-05 (0-3)	1500	70	21.4
Transition	Copper	ELY-SS-TR-02A (1.5-11)	1500	70	21.4
Transition	Copper	ELY-SS-TZ-06 (1-12)	1500	70	21.4
Transition	Copper	ELY-SS-TZ-39 (3-8)	1500	70	21.4
Transition	Copper	ELY-TP-109 (0-1)	1500	70	21.4
Transition	Copper	ELY-SS-NF-05 (3-11)	1400	70	20.0
Transition	Copper	ELY-SS-TR-08A (0.5-12)DUP	1400	70	20.0
Transition	Copper	ELY-SS-TZ-11 (1-5.5)	1400	70	20.0
Transition	Copper	ELY-SS-TZ-38 (0.5-7)	1400	70	20.0
Transition	Copper	SS-27X-082609AX	1370	70	19.6
Transition	Copper	ELY-SS-TR-04C (3-6)	1300	70	18.6
Transition	Copper	ELY-SS-TR-05D (3-12)	1300	70	18.6
Transition	Copper	ELY-SS-TZ-30 (0.5-12)	1300	70	18.6
Transition	Copper	SS-18X-082709AX	1280	70	18.3
Transition	Copper	ELY-SS-TR-02D(0-2) DUP	1200	70	17.1
Transition	Copper	ELY-SS-TR-06B (3-7)	1200	70	17.1
Transition	Copper	ELY-SS-TZ-14 (4-12)	1200	70	17.1
Transition	Copper	ELY-SS-TZ-16 (0-4)	1200	70	17.1
Transition	Copper	ELY-SS-TR-06C (0-3)	1100	70	15.7
Transition	Copper	ELY-SS-TZ-30 (0-0.5)	1100	70	15.7
Transition	Copper	TO-05X-082709AX	1100	70	15.7
Transition	Copper	ELY-SS-TR-09B (0-2)	1000	70	14.3
Transition	Copper	SS-13X-082809AX	995	70	14.2
Transition	Copper	ELY-SS-TZ-14 (0-4)	980	70	14.0
Transition	Copper	ELY-SS-TZ-21 (0-5)	960	70	13.7
Transition	Copper	ELY-SS-TR-08A (0-0.5)	950	70	13.6
Transition	Copper	ELY-SS-TR-05D (0-3)	940	70	13.4
Transition	Copper	ELY-SS-TZ-35 (2-9)	940	70	13.4
Transition	Copper	ELY-SS-TR-08C (0-5) DUP	930	70	13.3
Transition	Copper	ELY-SS-TR-09C (1.5-8)	920	70	13.1
Transition	Copper	SS-11X-090309AX	897	70	12.8
Transition	Copper	ELY-SS-TR-08A (0-0.5) DUP	880	70	12.6
Transition	Copper	SS-08X-090209AX	848	70	12.1
Transition	Copper	ELY-SS-TZ-35 (0-2)	840	70	12.0
Transition	Copper	ELY-SS-TR-09C (0-1.5)	820	70	11.7
Transition	Copper	ELY-SS-TR-09D (3-12)	810	70	11.6
Transition	Copper	ELY-SS-TZ-29 (1-9)	740	70	10.6
Transition	Copper	ELY-SS-TR-06C (3-12)	730	70	10.4
Transition	Copper	SS-09X-090209AX	699	70	9.99
Transition	Copper	ELY-SS-TR-02D (0-2)	690	70	9.86
Transition	Copper	ELY-SS-TZ-36 (0-1.5)	690	70	9.86
Transition	Copper	ELY-SS-TZ-27 (0-2.5)	680	70	9.71
Transition	Copper	ELY-SS-SA-23 (0-6)	670	70	9.57
Transition	Copper	ELY-SS-TR-02B (0-4)	670	70	9.57
Transition	Copper	ELY-SS-TR-06A (0-1)	650	70	9.29
Transition	Copper	ELY-SS-TR-08D (2-12) DUP	650	70	9.29
Transition	Copper	ELY-SS-TZ-12 (3-8)	640	70	9.14
Transition	Copper	TA-14X-082409AX	632	70	9.03
Transition	Copper	ELY-SS-TR-07B (0-2)	630	70	9.00
Transition	Copper	ELY-SS-TZ-29 (0-1)	620	70	8.86
Transition	Copper	ELY-SS-TZ-27 (2.5-8)	610	70	8.71

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Copper	SS-10X-090309AX	605	70	8.64
Transition	Copper	ELY-SS-TZ-21 (5-12)	590	70	8.43
Transition	Copper	TP-15X-073009AX	584	70	8.34
Transition	Copper	ELY-SS-TR-06A (1-12)	580	70	8.29
Transition	Copper	ELY-SS-NF-13 (2.5-12)	570	70	8.14
Transition	Copper	ELY-SS-TR-07B (2-8)	560	70	8.00
Transition	Copper	ELY-SS-TR-05C (0-1)	550	70	7.86
Transition	Copper	ELY-SS-NF-09 (0-1.5)	530	70	7.57
Transition	Copper	ELY-SS-TZ-18 (.5-12)	530	70	7.57
Transition	Copper	ELY-SS-TZ-39 (0-3)	530	70	7.57
Transition	Copper	ELY-SS-NF-13 (0-2.5)	520	70	7.43
Transition	Copper	ELY-SS-TR-09B (2-5)	520	70	7.43
Transition	Copper	ELY-SS-TR-08C (5-12)	500	70	7.14
Transition	Copper	SS-02X-090209AX	494	70	7.06
Transition	Copper	ELY-SS-TZ-37 (2-12)	490	70	7.00
Transition	Copper	ELY-SS-TR-07C (2-12)	480	70	6.86
Transition	Copper	ELY-SS-TZ-34 (2.5-8)	470	70	6.71
Transition	Copper	TP-15X-073009AD	462	70	6.60
Transition	Copper	ELY-SS-TZ-15 (3.5-12)	460	70	6.57
Transition	Copper	ELY-SS-TZ-37 (0-2)	460	70	6.57
Transition	Copper	ELY-SS-TR-08C (5-12) DUP	450	70	6.43
Transition	Copper	ELY-SS-TR-05C (1-12)	430	70	6.14
Transition	Copper	ELY-SS-TR-02C (0-3)	420	70	6.00
Transition	Copper	ELY-SS-TZ-11 (0-1)	420	70	6.00
Transition	Copper	ELY-SS-TR-06B (0-3)	410	70	5.86
Transition	Copper	ELY-SS-NF-04 (0-4)	400	70	5.71
Transition	Copper	TA-04X-082409AX	365	70	5.21
Transition	Copper	SS-01X-090209AX	362	70	5.17
Transition	Copper	ELY-SS-TR-02C (3-12)	360	70	5.14
Transition	Copper	ELY-SS-TR-07C (0-2)	340	70	4.86
Transition	Copper	ELY-SS-NF-04 (4-10)	320	70	4.57
Transition	Copper	ELY-SS-NF-09 (1.5-12)	320	70	4.57
Transition	Copper	ELY-SS-NF-06 (0-3)	300	70	4.29
Transition	Copper	ELY-SS-TZ-31 (0-3)	300	70	4.29
Transition	Copper	ELY-SS-NF-06 (3-12)	290	70	4.14
Transition	Copper	TQ-06X-082609AX	288	70	4.11
Transition	Copper	ELY-SS-TR-02A (0-1.5)	280	70	4.00
Transition	Copper	ELY-SS-TZ-18 (0-.5)	280	70	4.00
Transition	Copper	ELY-SS-NF-02 (0-8)	270	70	3.86
Transition	Copper	ELY-SS-TR-03C (3-12)	270	70	3.86
Transition	Copper	ELY-SS-TZ-36 (1.5-9)	270	70	3.86
Transition	Copper	SS-17X-083109AX	265	70	3.79
Transition	Copper	ELY-SS-TZ-23 (2.5-12)	260	70	3.71
Transition	Copper	ELY-SS-TZ-40 (2-10)	260	70	3.71
Transition	Copper	ELY-SS-NF-04 (4-10) DUP	250	70	3.57
Transition	Copper	ELY-SS-TR-04B (1.5-12)	240	70	3.43
Transition	Copper	ELY-SS-TR-04C (0-3)	240	70	3.43
Transition	Copper	ELY-SS-TZ-31 (3-9)	240	70	3.43
Transition	Copper	SS-25X-082709AX	231	70	3.30
Transition	Copper	ELY-SS-TZ-15 (0-3.5)	230	70	3.29
Transition	Copper	ELY-SS-NF-01 (2-7)	220	70	3.14
Transition	Copper	ELY-SS-TR-03C (0-3)	190	70	2.71
Transition	Copper	SS-03X-090209AX	188	70	2.69
Transition	Copper	TG-02X-082409AX	182	70	2.60
Transition	Copper	ELY-SS-TR-09D (0-3)	170	70	2.43
Transition	Copper	ELY-SS-TZ-42 (2-12)	150	70	2.14
Transition	Copper	SS-12X-090309AX	149	70	2.13
Transition	Copper	SS-22X-082709AX	149	70	2.13
Transition	Copper	SS-14X-083109AX	142	70	2.03
Transition	Copper	TP-10X-082709AX	135	70	1.93
Transition	Copper	ELY-SS-NF-16 (1-12)	130	70	1.86
Transition	Copper	SS-04X-090209AX	122	70	1.74
Transition	Copper	ELY-SS-TZ-12 (0-3)	120	70	1.71
Transition	Copper	ELY-SS-NF-11 (3-9)	110	70	1.57
Transition	Copper	ELY-SS-TR-08D (2-12)	110	70	1.57

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Copper	ELY-SS-TZ-40 (0-2)	110	70	1.57
Transition	Copper	TK-01X-082509AX	110	70	1.57
Transition	Copper	TQ-16X-082609AX	109	70	1.56
Transition	Copper	SS-23X-082709AX	103	70	1.47
Transition	Copper	SS-28X-083109AX	95.4	70	1.36
Transition	Copper	ELY-SS-NF-11 (0-3)	94	70	1.34
Transition	Copper	SS-20X-083109AX	85.9	70	1.23
Transition	Copper	ELY-SS-NF-10 (0-4)	85	70	1.21
Transition	Copper	SS-16X-090309AX	80.1	70	1.14
Transition	Copper	TN-02X-082509AD	78.3	70	1.12
Transition	Copper	SS-19X-082709AX	74	70	1.06
Transition	Copper	TL-04X-082509AX	68.6	70	0.980
Transition	Copper	ELY-SS-NF-10 (4-12)	66	70	0.943
Transition	Copper	ELY-SS-TZ-42 (0-2)	66	70	0.943
Transition	Copper	SS-29X-083109AX	65.6	70	0.937
Transition	Copper	ELY-SS-TZ-34 (0-2.5)	64	70	0.914
Transition	Copper	SS-26X-083109AX	64	70	0.914
Transition	Copper	TI-03X-082509AX	61.8	70	0.883
Transition	Copper	ELY-SS-TR-07D (0-2)	61	70	0.871
Transition	Copper	TN-02X-082509AX	61	70	0.871
Transition	Copper	ELY-SS-NF-07 (2-8)	56	70	0.800
Transition	Copper	ELY-SS-NF-08 (0-2)	56	70	0.800
Transition	Copper	ELY-SS-TZ-23 (0-2.5)	56	70	0.800
Transition	Copper	ELY-SS-NF-14 (3-12)	54	70	0.771
Transition	Copper	ELY-SS-NF-17 (4-10)	53	70	0.757
Transition	Copper	ELY-SS-NF-04 (0-4) DUP	51	70	0.729
Transition	Copper	SS-21X-083109AX	50.8	70	0.726
Transition	Copper	ELY-SS-TR-08D (0-2) DUP	49	70	0.700
Transition	Copper	ELY-SS-NF-07 (0-2)	48	70	0.686
Transition	Copper	ELY-SS-NF-12 (2-9)	48	70	0.686
Transition	Copper	ELY-SS-NF-08 (2-11)	47	70	0.671
Transition	Copper	SS-24X-083109AX	45.8	70	0.654
Transition	Copper	SS-06X-090209AX	44.7	70	0.639
Transition	Copper	ELY-SS-TR-07D (2-9)	44	70	0.629
Transition	Copper	ELY-SS-TR-04B (0-1.5)	42	70	0.600
Transition	Copper	ELY-SS-TZ-43 (2.5-11)	41	70	0.586
Transition	Copper	ELY-SS-NF-14 (0-3)	37	70	0.529
Transition	Copper	ELY-SS-TR-08D (0-2)	36	70	0.514
Transition	Copper	ELY-SS-NF-15 (2-5)	35	70	0.500
Transition	Copper	ELY-SS-NF-03 (0-4)	34	70	0.486
Transition	Copper	SS-05X-090209AX	31.8	70	0.454
Transition	Copper	SS-15X-083109AX	31.4	70	0.449
Transition	Copper	SS-07X-090209AX	26.4	70	0.377
Transition	Copper	ELY-SS-NF-15 (0-2)	24	70	0.343
Transition	Copper	ELY-SS-NF-12 (0-2)	23	70	0.329
Transition	Copper	ELY-SS-TZ-43 (0-2.5)	22	70	0.314
Transition	Copper	ELY-SS-NF-16 (0-1)	21	70	0.300
Transition	Copper	TC-03X-082609AX	19.3	70	0.276
Transition	Copper	ELY-SS-NF-17 (0-4)	16	70	0.229
Transition	Lead	ELY-SS-TZ-12 (0-3)	1700	120	14.2
Transition	Lead	SS-01X-090209AX	295	120	2.46
Transition	Lead	ELY-SS-TR-02C (0-3)	200	120	1.67
Transition	Lead	ELY-SS-TR-02C (3-12)	200	120	1.67
Transition	Lead	ELY-SS-TZ-27 (0-2.5)	200	120	1.67
Transition	Lead	ELY-SS-SA-06 (0-6)	180	120	1.50
Transition	Lead	ELY-SS-TR-03B (0-2)	180	120	1.50
Transition	Lead	SS-13X-082809AX	118	120	0.983
Transition	Lead	SS-25X-082709AX	116	120	0.967
Transition	Lead	TA-14X-082409AX	116	120	0.967
Transition	Lead	SS-26X-083109AX	109	120	0.908
Transition	Lead	SS-24X-083109AX	107	120	0.892
Transition	Lead	ELY-SS-NF-11 (0-3)	94	120	0.783
Transition	Lead	SS-10X-090309AX	93.9	120	0.783
Transition	Lead	SS-14X-083109AX	93.9	120	0.783
Transition	Lead	ELY-SS-TZ-39 (3-8)	93	120	0.775

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Lead	SS-29X-083109AX	92.8	120	0.773
Transition	Lead	ELY-SS-TZ-39 (0-3)	90	120	0.750
Transition	Lead	ELY-SS-TR-06A (1-12)	83	120	0.692
Transition	Lead	SS-27X-082609AX	82	120	0.683
Transition	Lead	SS-22X-082709AX	78.3	120	0.653
Transition	Lead	ELY-SS-NF-05 (0-3)	75	120	0.625
Transition	Lead	SS-11X-090309AX	74.9	120	0.624
Transition	Lead	ELY-SS-NF-09 (0-1.5)	74	120	0.617
Transition	Lead	ELY-SS-TR-07C (0-2)	74	120	0.617
Transition	Lead	SS-23X-082709AX	71.2	120	0.593
Transition	Lead	ELY-SS-TR-02B (4-11)	68	120	0.567
Transition	Lead	ELY-SS-TZ-35 (0-2)	68	120	0.567
Transition	Lead	ELY-SS-NF-04 (0-4) DUP	65	120	0.542
Transition	Lead	SS-15X-083109AX	63.9	120	0.533
Transition	Lead	ELY-SS-TZ-27 (2.5-8)	63	120	0.525
Transition	Lead	ELY-SS-TR-03B (2-12)	62	120	0.517
Transition	Lead	ELY-SS-TR-08A (0-0.5)	62	120	0.517
Transition	Lead	ELY-SS-TZ-31 (0-3)	60	120	0.500
Transition	Lead	SS-17X-083109AX	59.8	120	0.498
Transition	Lead	ELY-SS-TR-08A (0-0.5) DUP	58	120	0.483
Transition	Lead	ELY-SS-TZ-21 (0-5)	58	120	0.483
Transition	Lead	ELY-SS-TZ-15 (0-3.5)	56	120	0.467
Transition	Lead	SS-28X-083109AX	55.6	120	0.463
Transition	Lead	ELY-SS-TR-02D (0-2)	54	120	0.450
Transition	Lead	ELY-SS-TZ-11 (1-5.5)	54	120	0.450
Transition	Lead	ELY-SS-TR-02D (2-12)	51	120	0.425
Transition	Lead	ELY-SS-TZ-14 (0-4)	48	120	0.400
Transition	Lead	SS-20X-083109AX	47	120	0.392
Transition	Lead	ELY-SS-TR-08A (0.5-12)	46	120	0.383
Transition	Lead	ELY-SS-TR-08D (0-2) DUP	46	120	0.383
Transition	Lead	ELY-SS-TZ-14 (4-12)	46	120	0.383
Transition	Lead	ELY-SS-NF-12 (0-2)	44	120	0.367
Transition	Lead	ELY-SS-TR-02D(0-2) DUP	44	120	0.367
Transition	Lead	ELY-SS-TZ-42 (0-2)	44	120	0.367
Transition	Lead	ELY-SS-TR-07B (0-2)	43	120	0.358
Transition	Lead	ELY-SS-TR-07D (0-2)	43	120	0.358
Transition	Lead	ELY-SS-TZ-11 (0-1)	43	120	0.358
Transition	Lead	ELY-SS-SA-04 (0-6)	41	120	0.342
Transition	Lead	ELY-SS-TR-04C (3-6)	40	120	0.333
Transition	Lead	ELY-SS-TR-05D (0-3)	40	120	0.333
Transition	Lead	SS-18X-082709AX	39.2	120	0.327
Transition	Lead	ELY-SS-TR-02B (0-4)	39	120	0.325
Transition	Lead	ELY-SS-TR-06B (0-3)	38	120	0.317
Transition	Lead	ELY-SS-TR-06B (3-7)	38	120	0.317
Transition	Lead	ELY-SS-TR-09D (0-3)	38	120	0.317
Transition	Lead	ELY-SS-TZ-40 (0-2)	38	120	0.317
Transition	Lead	SS-06X-090209AX	37.1	120	0.309
Transition	Lead	ELY-SS-TR-08A (0.5-12)DUP	37	120	0.308
Transition	Lead	ELY-SS-NF-10 (0-4)	36	120	0.300
Transition	Lead	ELY-SS-TZ-12 (3-8)	36	120	0.300
Transition	Lead	ELY-SS-NF-02 (0-8)	35	120	0.292
Transition	Lead	ELY-SS-NF-15 (0-2)	35	120	0.292
Transition	Lead	SS-07X-090209AX	34.9	120	0.291
Transition	Lead	SS-19X-082709AX	34.7	120	0.289
Transition	Lead	ELY-SS-NF-05 (3-11)	34	120	0.283
Transition	Lead	ELY-SS-TZ-16 (0-4)	34	120	0.283
Transition	Lead	ELY-SS-TZ-37 (2-12)	34	120	0.283
Transition	Lead	ELY-SS-TR-02A (0-1.5)	33	120	0.275
Transition	Lead	ELY-SS-TZ-30 (0.5-12)	33	120	0.275
Transition	Lead	ELY-SS-NF-14 (0-3)	32	120	0.267
Transition	Lead	ELY-SS-TZ-34 (0-2.5)	32	120	0.267
Transition	Lead	ELY-TP-109 (0-1)	32	120	0.267
Transition	Lead	ELY-SS-TZ-21 (5-12)	31	120	0.258
Transition	Lead	SS-02X-090209AX	29.7	120	0.248
Transition	Lead	TP-15X-073009AX	29.3	120	0.244

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Lead	ELY-SS-TZ-30 (0-0.5)	29	120	0.242
Transition	Lead	ELY-SS-NF-17 (0-4)	28	120	0.233
Transition	Lead	ELY-SS-TZ-29 (0-1)	28	120	0.233
Transition	Lead	ELY-SS-TZ-40 (2-10)	28	120	0.233
Transition	Lead	TA-04X-082409AX	27.6	120	0.230
Transition	Lead	ELY-SS-NF-08 (2-11)	27	120	0.225
Transition	Lead	ELY-SS-SA-23 (0-6)	27	120	0.225
Transition	Lead	ELY-SS-TZ-16 (4-12)	27	120	0.225
Transition	Lead	TK-01X-082509AX	26.8	120	0.223
Transition	Lead	ELY-SS-TR-02D (2-12) DUP	26	120	0.217
Transition	Lead	ELY-SS-TZ-43 (0-2.5)	26	120	0.217
Transition	Lead	SS-21X-083109AX	26	120	0.217
Transition	Lead	ELY-SS-NF-06 (0-3)	24	120	0.200
Transition	Lead	ELY-SS-TR-06A (0-1)	24	120	0.200
Transition	Lead	ELY-SS-TR-08C (0-5) DUP	24	120	0.200
Transition	Lead	ELY-SS-TR-03C (3-12)	23	120	0.192
Transition	Lead	ELY-SS-TR-08D (0-2)	23	120	0.192
Transition	Lead	ELY-SS-TZ-06 (0-1)	23	120	0.192
Transition	Lead	SS-09X-090209AX	22.9	120	0.191
Transition	Lead	TI-03X-082509AX	22.7	120	0.189
Transition	Lead	ELY-SS-NF-06 (3-12)	22	120	0.183
Transition	Lead	ELY-SS-NF-07 (0-2)	22	120	0.183
Transition	Lead	ELY-SS-TR-03C (0-3)	22	120	0.183
Transition	Lead	ELY-SS-SA-01 (0-2)	21	120	0.175
Transition	Lead	ELY-SS-TR-05C (0-1)	21	120	0.175
Transition	Lead	ELY-SS-TR-06C (0-3)	21	120	0.175
Transition	Lead	ELY-SS-TR-06C (3-12)	21	120	0.175
Transition	Lead	ELY-SS-NF-03 (4-12)	20	120	0.167
Transition	Lead	ELY-SS-TZ-31 (3-9)	20	120	0.167
Transition	Lead	ELY-SS-TZ-38 (0-0.5)	20	120	0.167
Transition	Lead	SS-12X-090309AX	19.5	120	0.163
Transition	Lead	ELY-SS-NF-16 (0-1)	19	120	0.158
Transition	Lead	ELY-SS-TZ-06 (1-12)	19	120	0.158
Transition	Lead	ELY-SS-TZ-15 (3.5-12)	19	120	0.158
Transition	Lead	ELY-SS-TZ-29 (1-9)	19	120	0.158
Transition	Lead	ELY-SS-TZ-35 (2-9)	19	120	0.158
Transition	Lead	ELY-SS-TZ-38 (0.5-7)	19	120	0.158
Transition	Lead	SS-16X-090309AX	18.7	120	0.156
Transition	Lead	ELY-SS-NF-11 (3-9)	18	120	0.150
Transition	Lead	ELY-SS-TR-08C (5-12)	18	120	0.150
Transition	Lead	ELY-SS-TR-08C (5-12) DUP	18	120	0.150
Transition	Lead	SS-03X-090209AX	17.9	120	0.149
Transition	Lead	TO-05X-082709AX	17.9	120	0.149
Transition	Lead	SS-05X-090209AX	17.8	120	0.148
Transition	Lead	ELY-SS-TR-04B (0-1.5)	17	120	0.142
Transition	Lead	TC-03X-082609AX	16.7	120	0.139
Transition	Lead	ELY-SS-NF-10 (4-12)	16	120	0.133
Transition	Lead	ELY-SS-NF-13 (0-2.5)	16	120	0.133
Transition	Lead	ELY-SS-SA-09 (0-4)	16	120	0.133
Transition	Lead	ELY-SS-TR-07B (2-8)	16	120	0.133
Transition	Lead	ELY-SS-TR-09B (2-5)	16	120	0.133
Transition	Lead	ELY-SS-TR-09D (3-12)	16	120	0.133
Transition	Lead	ELY-SS-TZ-23 (0-2.5)	16	120	0.133
Transition	Lead	ELY-SS-TZ-37 (0-2)	16	120	0.133
Transition	Lead	TP-10X-082709AX	15.9	120	0.133
Transition	Lead	SS-04X-090209AX	15.3	120	0.128
Transition	Lead	ELY-SS-TR-04B (1.5-12)	15	120	0.125
Transition	Lead	ELY-SS-TR-04C (0-3)	15	120	0.125
Transition	Lead	ELY-SS-TZ-34 (2.5-8)	15	120	0.125
Transition	Lead	TL-04X-082509AX	15	120	0.125
Transition	Lead	TN-02X-082509AD	14.6	120	0.122
Transition	Lead	TP-15X-073009AD	14.5	120	0.121
Transition	Lead	ELY-SS-NF-04 (0-4)	14	120	0.117
Transition	Lead	ELY-SS-NF-15 (2-5)	13	120	0.108
Transition	Lead	ELY-SS-TR-09C (1.5-8)	13	120	0.108

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Lead	TN-02X-082509AX	12.1	120	0.101
Transition	Lead	ELY-SS-NF-03 (0-4)	12	120	0.100
Transition	Lead	ELY-SS-TR-08C (0-5)	12	120	0.100
Transition	Lead	ELY-TP-104 (0-1)	12	120	0.100
Transition	Lead	ELY-SS-TR-02A (1.5-11)	11	120	0.0917
Transition	Lead	ELY-SS-TR-07C (2-12)	11	120	0.0917
Transition	Lead	ELY-SS-TR-09B (0-2)	11	120	0.0917
Transition	Lead	ELY-SS-TZ-36 (1.5-9)	11	120	0.0917
Transition	Lead	ELY-SS-TR-09C (0-1.5)	10	120	0.0833
Transition	Lead	ELY-SS-TZ-36 (0-1.5)	10	120	0.0833
Transition	Lead	ELY-SS-NF-13 (2.5-12)	9.6	120	0.0800
Transition	Lead	ELY-SS-NF-04 (4-10) DUP	9.3	120	0.0775
Transition	Lead	SS-08X-090209AX	8.8	120	0.0733
Transition	Lead	ELY-SS-NF-04 (4-10)	8.6	120	0.0717
Transition	Lead	ELY-SS-TR-07D (2-9)	8.6	120	0.0717
Transition	Lead	TQ-16X-082609AX	8.5	120	0.0708
Transition	Lead	ELY-SS-NF-12 (2-9)	7.8	120	0.0650
Transition	Lead	ELY-SS-TR-05D (3-12)	7.8	120	0.0650
Transition	Lead	TG-02X-082409AX	7.7	120	0.0642
Transition	Lead	ELY-SS-NF-16 (1-12)	7.5	120	0.0625
Transition	Lead	ELY-SS-TZ-18 (0-.5)	7.1	120	0.0592
Transition	Lead	ELY-SS-NF-08 (0-2)	6.7	120	0.0558
Transition	Lead	ELY-SS-NF-17 (4-10)	6.6	120	0.0550
Transition	Lead	ELY-SS-TZ-42 (2-12)	6.6	120	0.0550
Transition	Lead	ELY-SS-TR-08D (2-12) DUP	6.4	120	0.0533
Transition	Lead	ELY-SS-NF-14 (3-12)	6.3	120	0.0525
Transition	Lead	TQ-06X-082609AX	6.1	120	0.0508
Transition	Lead	ELY-SS-TZ-43 (2.5-11)	6	120	0.0500
Transition	Lead	ELY-SS-NF-09 (1.5-12)	5.7	120	0.0475
Transition	Lead	ELY-SS-TZ-23 (2.5-12)	5.6	120	0.0467
Transition	Lead	ELY-SS-TR-08D (2-12)	5.5	120	0.0458
Transition	Lead	ELY-SS-TZ-18 (.5-12)	5	120	0.0417
Transition	Lead	TF-13X-090909BX	4.8	120	0.0400
Transition	Lead	ELY-SS-NF-01 (2-7)	4.7	120	0.0392
Transition	Lead	ELY-SS-NF-07 (2-8)	1.1	120	0.00917
Transition	Lead	ELY-SS-TR-05C (1-12)	0.72	120	0.00600
Transition	Manganese	SS-13X-082809AX	8380	220	38.1
Transition	Manganese	SS-26X-083109AX	2170	220	9.86
Transition	Manganese	ELY-SS-NF-11 (0-3)	1700	220	7.73
Transition	Manganese	ELY-SS-TZ-21 (0-5)	1600	220	7.27
Transition	Manganese	ELY-SS-TZ-40 (0-2)	1600	220	7.27
Transition	Manganese	ELY-SS-NF-06 (0-3)	1200	220	5.45
Transition	Manganese	SS-24X-083109AX	1160	220	5.27
Transition	Manganese	SS-16X-090309AX	1070	220	4.86
Transition	Manganese	ELY-SS-NF-06 (3-12)	1000	220	4.55
Transition	Manganese	ELY-SS-NF-17 (0-4)	1000	220	4.55
Transition	Manganese	SS-25X-082709AX	991	220	4.50
Transition	Manganese	ELY-SS-TR-08D (0-2)	950	220	4.32
Transition	Manganese	ELY-SS-NF-15 (0-2)	900	220	4.09
Transition	Manganese	SS-27X-082609AX	893	220	4.06
Transition	Manganese	ELY-SS-TR-02D(0-2) DUP	880	220	4.00
Transition	Manganese	SS-29X-083109AX	813	220	3.70
Transition	Manganese	ELY-SS-TZ-42 (0-2)	810	220	3.68
Transition	Manganese	ELY-SS-TR-08D (0-2) DUP	790	220	3.59
Transition	Manganese	ELY-SS-NF-02 (0-8)	720	220	3.27
Transition	Manganese	TA-14X-082409AX	717	220	3.26
Transition	Manganese	ELY-SS-NF-03 (4-12)	660	220	3.00
Transition	Manganese	ELY-SS-NF-08 (2-11)	660	220	3.00
Transition	Manganese	ELY-SS-NF-11 (3-9)	660	220	3.00
Transition	Manganese	ELY-SS-TR-04C (0-3)	540	220	2.45
Transition	Manganese	TA-04X-082409AX	527	220	2.40
Transition	Manganese	ELY-SS-NF-10 (0-4)	500	220	2.27
Transition	Manganese	ELY-SS-NF-14 (0-3)	500	220	2.27
Transition	Manganese	ELY-SS-TR-02A (1.5-11)	500	220	2.27
Transition	Manganese	ELY-SS-TZ-11 (1-5.5)	480	220	2.18

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Manganese	TK-01X-082509AX	467	220	2.12
Transition	Manganese	ELY-SS-NF-17 (4-10)	460	220	2.09
Transition	Manganese	SS-19X-082709AX	452	220	2.05
Transition	Manganese	SS-23X-082709AX	450	220	2.05
Transition	Manganese	SS-28X-083109AX	450	220	2.05
Transition	Manganese	SS-08X-090209AX	441	220	2.00
Transition	Manganese	ELY-SS-TR-02D (0-2)	440	220	2.00
Transition	Manganese	ELY-SS-TZ-40 (2-10)	420	220	1.91
Transition	Manganese	ELY-SS-NF-05 (3-11)	410	220	1.86
Transition	Manganese	ELY-SS-NF-10 (4-12)	410	220	1.86
Transition	Manganese	ELY-SS-TZ-11 (0-1)	410	220	1.86
Transition	Manganese	ELY-SS-NF-07 (0-2)	400	220	1.82
Transition	Manganese	ELY-SS-TR-02D (2-12) DUP	390	220	1.77
Transition	Manganese	TO-05X-082709AX	383	220	1.74
Transition	Manganese	ELY-SS-TR-07C (2-12)	360	220	1.64
Transition	Manganese	SS-10X-090309AX	360	220	1.64
Transition	Manganese	ELY-SS-TR-02D (2-12)	350	220	1.59
Transition	Manganese	ELY-SS-TR-08D (2-12) DUP	350	220	1.59
Transition	Manganese	TL-04X-082509AX	338	220	1.54
Transition	Manganese	ELY-SS-TR-08D (2-12)	330	220	1.50
Transition	Manganese	TI-03X-082509AX	322	220	1.46
Transition	Manganese	ELY-SS-NF-16 (0-1)	320	220	1.45
Transition	Manganese	ELY-SS-TZ-12 (3-8)	320	220	1.45
Transition	Manganese	ELY-SS-TZ-42 (2-12)	320	220	1.45
Transition	Manganese	TN-02X-082509AX	315	220	1.43
Transition	Manganese	ELY-SS-TZ-14 (0-4)	310	220	1.41
Transition	Manganese	ELY-SS-TZ-27 (0-2.5)	310	220	1.41
Transition	Manganese	SS-11X-090309AX	306	220	1.39
Transition	Manganese	ELY-SS-NF-05 (0-3)	300	220	1.36
Transition	Manganese	ELY-SS-TR-07B (0-2)	300	220	1.36
Transition	Manganese	ELY-SS-TR-07B (2-8)	290	220	1.32
Transition	Manganese	TN-02X-082509AD	289	220	1.31
Transition	Manganese	ELY-SS-TZ-21 (5-12)	280	220	1.27
Transition	Manganese	ELY-TP-104 (0-1)	280	220	1.27
Transition	Manganese	ELY-SS-NF-04 (0-4)	270	220	1.23
Transition	Manganese	TP-10X-082709AX	263	220	1.20
Transition	Manganese	ELY-SS-NF-03 (0-4)	260	220	1.18
Transition	Manganese	ELY-SS-TR-04C (3-6)	260	220	1.18
Transition	Manganese	ELY-SS-TR-07D (2-9)	260	220	1.18
Transition	Manganese	ELY-SS-TZ-16 (4-12)	260	220	1.18
Transition	Manganese	ELY-SS-TZ-27 (2.5-8)	260	220	1.18
Transition	Manganese	ELY-SS-TZ-34 (2.5-8)	260	220	1.18
Transition	Manganese	SS-09X-090209AX	256	220	1.16
Transition	Manganese	ELY-SS-TZ-36 (1.5-9)	250	220	1.14
Transition	Manganese	ELY-SS-NF-08 (0-2)	240	220	1.09
Transition	Manganese	ELY-SS-NF-16 (1-12)	240	220	1.09
Transition	Manganese	ELY-SS-TR-02C (0-3)	240	220	1.09
Transition	Manganese	ELY-SS-TR-02C (3-12)	240	220	1.09
Transition	Manganese	ELY-SS-TZ-15 (3.5-12)	240	220	1.09
Transition	Manganese	ELY-SS-NF-13 (0-2.5)	230	220	1.05
Transition	Manganese	ELY-SS-TZ-06 (1-12)	230	220	1.05
Transition	Manganese	TQ-16X-082609AX	228	220	1.04
Transition	Manganese	SS-03X-090209AX	222	220	1.01
Transition	Manganese	ELY-SS-TZ-38 (0-0.5)	220	220	1.00
Transition	Manganese	SS-14X-083109AX	217	220	0.986
Transition	Manganese	SS-17X-083109AX	214	220	0.973
Transition	Manganese	ELY-SS-NF-14 (3-12)	210	220	0.955
Transition	Manganese	ELY-SS-SA-09 (0-4)	200	220	0.909
Transition	Manganese	SS-01X-090209AX	200	220	0.909
Transition	Manganese	SS-06X-090209AX	199	220	0.905
Transition	Manganese	TG-02X-082409AX	187	220	0.850
Transition	Manganese	ELY-SS-NF-01 (2-7)	180	220	0.818
Transition	Manganese	ELY-SS-NF-09 (1.5-12)	180	220	0.818
Transition	Manganese	ELY-SS-SA-04 (0-6)	180	220	0.818
Transition	Manganese	ELY-SS-TR-02B (0-4)	180	220	0.818

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Manganese	ELY-SS-TR-04B (1.5-12)	180	220	0.818
Transition	Manganese	ELY-SS-TR-08C (0-5) DUP	180	220	0.818
Transition	Manganese	ELY-SS-NF-04 (4-10) DUP	170	220	0.773
Transition	Manganese	ELY-SS-TR-06C (0-3)	170	220	0.773
Transition	Manganese	ELY-SS-TZ-35 (2-9)	170	220	0.773
Transition	Manganese	TP-15X-073009AD	167	220	0.759
Transition	Manganese	TC-03X-082609AX	166	220	0.755
Transition	Manganese	ELY-SS-NF-04 (4-10)	160	220	0.727
Transition	Manganese	ELY-SS-SA-01 (0-2)	160	220	0.727
Transition	Manganese	ELY-SS-TR-03B (2-12)	160	220	0.727
Transition	Manganese	ELY-SS-TZ-18 (0-.5)	160	220	0.727
Transition	Manganese	ELY-SS-TZ-29 (1-9)	160	220	0.727
Transition	Manganese	ELY-SS-NF-13 (2.5-12)	150	220	0.682
Transition	Manganese	ELY-SS-SA-23 (0-6)	150	220	0.682
Transition	Manganese	ELY-SS-TR-02A (0-1.5)	150	220	0.682
Transition	Manganese	ELY-SS-TR-02B (4-11)	150	220	0.682
Transition	Manganese	ELY-SS-TZ-12 (0-3)	150	220	0.682
Transition	Manganese	ELY-SS-NF-12 (0-2)	140	220	0.636
Transition	Manganese	ELY-SS-NF-12 (2-9)	140	220	0.636
Transition	Manganese	ELY-SS-TR-06C (3-12)	140	220	0.636
Transition	Manganese	ELY-SS-TR-08C (5-12)	140	220	0.636
Transition	Manganese	ELY-SS-TZ-16 (0-4)	140	220	0.636
Transition	Manganese	ELY-SS-TZ-23 (2.5-12)	140	220	0.636
Transition	Manganese	SS-12X-090309AX	139	220	0.632
Transition	Manganese	ELY-SS-TR-06A (1-12)	130	220	0.591
Transition	Manganese	ELY-SS-TR-08C (5-12) DUP	130	220	0.591
Transition	Manganese	ELY-SS-TR-09B (2-5)	130	220	0.591
Transition	Manganese	ELY-SS-TZ-29 (0-1)	130	220	0.591
Transition	Manganese	ELY-SS-TR-05C (1-12)	120	220	0.545
Transition	Manganese	ELY-SS-TZ-06 (0-1)	120	220	0.545
Transition	Manganese	ELY-SS-TZ-30 (0.5-12)	120	220	0.545
Transition	Manganese	ELY-SS-TZ-43 (0-2.5)	120	220	0.545
Transition	Manganese	SS-07X-090209AX	120	220	0.545
Transition	Manganese	SS-04X-090209AX	118	220	0.536
Transition	Manganese	SS-02X-090209AX	116	220	0.527
Transition	Manganese	SS-05X-090209AX	116	220	0.527
Transition	Manganese	ELY-SS-NF-09 (0-1.5)	110	220	0.500
Transition	Manganese	ELY-SS-TR-07D (0-2)	110	220	0.500
Transition	Manganese	ELY-SS-TZ-14 (4-12)	110	220	0.500
Transition	Manganese	ELY-SS-TZ-30 (0-0.5)	110	220	0.500
Transition	Manganese	ELY-SS-TZ-34 (0-2.5)	110	220	0.500
Transition	Manganese	ELY-SS-TZ-38 (0.5-7)	110	220	0.500
Transition	Manganese	ELY-SS-TZ-39 (3-8)	110	220	0.500
Transition	Manganese	ELY-SS-TZ-43 (2.5-11)	110	220	0.500
Transition	Manganese	ELY-TP-109 (0-1)	110	220	0.500
Transition	Manganese	TF-13X-090909BX	109	220	0.495
Transition	Manganese	ELY-SS-SA-06 (0-6)	100	220	0.455
Transition	Manganese	ELY-SS-TR-06A (0-1)	100	220	0.455
Transition	Manganese	ELY-SS-TZ-31 (3-9)	100	220	0.455
Transition	Manganese	ELY-SS-TZ-37 (2-12)	99	220	0.450
Transition	Manganese	ELY-SS-TZ-36 (0-1.5)	97	220	0.441
Transition	Manganese	ELY-SS-TR-06B (3-7)	95	220	0.432
Transition	Manganese	ELY-SS-TR-09D (3-12)	95	220	0.432
Transition	Manganese	ELY-SS-NF-15 (2-5)	94	220	0.427
Transition	Manganese	ELY-SS-TR-03C (3-12)	92	220	0.418
Transition	Manganese	TP-15X-073009AX	90	220	0.409
Transition	Manganese	ELY-SS-TZ-18 (.5-12)	89	220	0.405
Transition	Manganese	ELY-SS-TR-09C (0-1.5)	87	220	0.395
Transition	Manganese	ELY-SS-TR-08C (0-5)	84	220	0.382
Transition	Manganese	SS-18X-082709AX	83.2	220	0.378
Transition	Manganese	ELY-SS-TR-05D (0-3)	83	220	0.377
Transition	Manganese	ELY-SS-TR-08A (0-0.5)	83	220	0.377
Transition	Manganese	ELY-SS-TZ-15 (0-3.5)	83	220	0.377
Transition	Manganese	ELY-SS-TR-05D (3-12)	82	220	0.373
Transition	Manganese	ELY-SS-TR-04B (0-1.5)	81	220	0.368

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Manganese	ELY-SS-TR-08A (0-0.5) DUP	81	220	0.368
Transition	Manganese	ELY-SS-TZ-31 (0-3)	81	220	0.368
Transition	Manganese	TQ-06X-082609AX	78.1	220	0.355
Transition	Manganese	ELY-SS-TZ-37 (0-2)	78	220	0.355
Transition	Manganese	ELY-SS-NF-07 (2-8)	77	220	0.350
Transition	Manganese	ELY-SS-NF-04 (0-4) DUP	74	220	0.336
Transition	Manganese	ELY-SS-TR-09C (1.5-8)	71	220	0.323
Transition	Manganese	SS-21X-083109AX	70	220	0.318
Transition	Manganese	ELY-SS-TR-08A (0.5-12)	69	220	0.314
Transition	Manganese	ELY-SS-TR-08A (0.5-12)DUP	68	220	0.309
Transition	Manganese	ELY-SS-TR-05C (0-1)	66	220	0.300
Transition	Manganese	ELY-SS-TR-06B (0-3)	66	220	0.300
Transition	Manganese	SS-20X-083109AX	62.7	220	0.285
Transition	Manganese	SS-22X-082709AX	62.3	220	0.283
Transition	Manganese	ELY-SS-TR-07C (0-2)	56	220	0.255
Transition	Manganese	ELY-SS-TZ-39 (0-3)	54	220	0.245
Transition	Manganese	ELY-SS-TZ-23 (0-2.5)	51	220	0.232
Transition	Manganese	SS-15X-083109AX	50.3	220	0.229
Transition	Manganese	ELY-SS-TR-03B (0-2)	40	220	0.182
Transition	Manganese	ELY-SS-TZ-35 (0-2)	38	220	0.173
Transition	Manganese	ELY-SS-TR-09D (0-3)	36	220	0.164
Transition	Manganese	ELY-SS-TR-03C (0-3)	33	220	0.150
Transition	Manganese	ELY-SS-TR-09B (0-2)	29	220	0.132
Transition	Mercury	ELY-SS-TZ-39 (3-8)	2.8	0.349	8.02
Transition	Mercury	ELY-SS-TZ-27 (0-2.5)	0.58	0.349	1.66
Transition	Mercury	ELY-SS-TZ-39 (0-3)	0.57	0.349	1.63
Transition	Mercury	ELY-SS-TR-08A (0.5-12)DUP	0.55	0.349	1.58
Transition	Mercury	ELY-SS-TR-08A (0.5-12)	0.49	0.349	1.40
Transition	Mercury	ELY-SS-SA-06 (0-6)	0.44	0.349	1.26
Transition	Mercury	ELY-SS-SA-01 (0-2)	0.42	0.349	1.20
Transition	Mercury	ELY-SS-TZ-21 (5-12)	0.38	0.349	1.09
Transition	Mercury	TA-14X-082409AX	0.36	0.349	1.03
Transition	Mercury	ELY-SS-TZ-35 (0-2)	0.35	0.349	1.00
Transition	Mercury	ELY-SS-TZ-12 (0-3)	0.34	0.349	0.974
Transition	Mercury	ELY-SS-TR-04B (1.5-12)	0.33	0.349	0.946
Transition	Mercury	ELY-SS-TZ-27 (2.5-8)	0.32	0.349	0.917
Transition	Mercury	SS-13X-082809AX	0.3	0.349	0.860
Transition	Mercury	ELY-SS-TR-04B (0-1.5)	0.27	0.349	0.774
Transition	Mercury	ELY-SS-TR-06B (0-3)	0.27	0.349	0.774
Transition	Mercury	ELY-SS-NF-04 (0-4) DUP	0.26	0.349	0.745
Transition	Mercury	ELY-SS-NF-09 (0-1.5)	0.26	0.349	0.745
Transition	Mercury	ELY-SS-TR-07C (0-2)	0.26	0.349	0.745
Transition	Mercury	ELY-SS-TZ-14 (0-4)	0.26	0.349	0.745
Transition	Mercury	ELY-SS-TZ-15 (0-3.5)	0.26	0.349	0.745
Transition	Mercury	SS-11X-090309AX	0.26	0.349	0.745
Transition	Mercury	SS-27X-082609AX	0.25	0.349	0.716
Transition	Mercury	ELY-SS-TR-08D (0-2) DUP	0.24	0.349	0.688
Transition	Mercury	SS-15X-083109AX	0.24	0.349	0.688
Transition	Mercury	ELY-SS-TR-06B (3-7)	0.23	0.349	0.659
Transition	Mercury	SS-29X-083109AX	0.23	0.349	0.659
Transition	Mercury	ELY-SS-NF-03 (0-4)	0.22	0.349	0.630
Transition	Mercury	ELY-SS-SA-04 (0-6)	0.22	0.349	0.630
Transition	Mercury	ELY-SS-TR-09D (0-3)	0.22	0.349	0.630
Transition	Mercury	ELY-SS-TZ-29 (0-1)	0.22	0.349	0.630
Transition	Mercury	ELY-SS-SA-09 (0-4)	0.21	0.349	0.602
Transition	Mercury	ELY-SS-TZ-21 (0-5)	0.21	0.349	0.602
Transition	Mercury	SS-26X-083109AX	0.21	0.349	0.602
Transition	Mercury	ELY-SS-NF-15 (0-2)	0.2	0.349	0.573
Transition	Mercury	ELY-SS-TZ-34 (0-2.5)	0.2	0.349	0.573
Transition	Mercury	ELY-SS-NF-02 (0-8)	0.19	0.349	0.544
Transition	Mercury	ELY-SS-NF-17 (0-4)	0.19	0.349	0.544
Transition	Mercury	ELY-SS-TR-03C (0-3)	0.19	0.349	0.544
Transition	Mercury	SS-14X-083109AX	0.19	0.349	0.544
Transition	Mercury	ELY-SS-NF-04 (0-4)	0.18	0.349	0.516
Transition	Mercury	ELY-SS-TZ-23 (0-2.5)	0.18	0.349	0.516

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Mercury	ELY-SS-TZ-42 (0-2)	0.18	0.349	0.516
Transition	Mercury	SS-17X-083109AX	0.17	0.349	0.487
Transition	Mercury	SS-25X-082709AX	0.17	0.349	0.487
Transition	Mercury	ELY-SS-TR-08A (0-0.5)	0.16	0.349	0.458
Transition	Mercury	ELY-SS-TZ-38 (0-0.5)	0.16	0.349	0.458
Transition	Mercury	ELY-SS-TZ-40 (0-2)	0.16	0.349	0.458
Transition	Mercury	ELY-SS-TR-02B (0-4)	0.15	0.349	0.430
Transition	Mercury	SS-19X-082709AX	0.15	0.349	0.430
Transition	Mercury	ELY-SS-TR-02D(0-2) DUP	0.14	0.349	0.401
Transition	Mercury	ELY-SS-TR-03B (0-2)	0.14	0.349	0.401
Transition	Mercury	ELY-SS-TR-04C (3-6)	0.14	0.349	0.401
Transition	Mercury	ELY-SS-TR-08A (0-0.5) DUP	0.14	0.349	0.401
Transition	Mercury	ELY-SS-TZ-16 (0-4)	0.14	0.349	0.401
Transition	Mercury	SS-18X-082709AX	0.14	0.349	0.401
Transition	Mercury	ELY-SS-TR-02D (0-2)	0.13	0.349	0.372
Transition	Mercury	ELY-SS-TR-04C (0-3)	0.13	0.349	0.372
Transition	Mercury	ELY-SS-TR-05D (0-3)	0.13	0.349	0.372
Transition	Mercury	SS-22X-082709AX	0.13	0.349	0.372
Transition	Mercury	SS-24X-083109AX	0.13	0.349	0.372
Transition	Mercury	ELY-SS-NF-05 (0-3)	0.12	0.349	0.344
Transition	Mercury	ELY-SS-NF-06 (3-12)	0.12	0.349	0.344
Transition	Mercury	ELY-SS-NF-11 (0-3)	0.12	0.349	0.344
Transition	Mercury	ELY-SS-TR-09B (0-2)	0.12	0.349	0.344
Transition	Mercury	ELY-SS-TZ-37 (0-2)	0.12	0.349	0.344
Transition	Mercury	ELY-SS-TZ-43 (0-2.5)	0.12	0.349	0.344
Transition	Mercury	SS-10X-090309AX	0.12	0.349	0.344
Transition	Mercury	TA-04X-082409AX	0.12	0.349	0.344
Transition	Mercury	ELY-SS-NF-06 (0-3)	0.11	0.349	0.315
Transition	Mercury	ELY-SS-NF-08 (2-11)	0.11	0.349	0.315
Transition	Mercury	SS-07X-090209AX	0.11	0.349	0.315
Transition	Mercury	ELY-SS-NF-14 (0-3)	0.1	0.349	0.287
Transition	Mercury	ELY-SS-NF-16 (0-1)	0.1	0.349	0.287
Transition	Mercury	ELY-SS-TR-07D (0-2)	0.1	0.349	0.287
Transition	Mercury	ELY-SS-TR-08D (0-2)	0.1	0.349	0.287
Transition	Mercury	ELY-SS-TZ-14 (4-12)	0.1	0.349	0.287
Transition	Mercury	SS-06X-090209AX	0.1	0.349	0.287
Transition	Mercury	ELY-SS-TR-07B (0-2)	0.094	0.349	0.269
Transition	Mercury	ELY-SS-TR-09C (0-1.5)	0.094	0.349	0.269
Transition	Mercury	ELY-SS-NF-13 (0-2.5)	0.092	0.349	0.264
Transition	Mercury	ELY-SS-TZ-29 (1-9)	0.091	0.349	0.261
Transition	Mercury	ELY-SS-TR-02B (4-11)	0.09	0.349	0.258
Transition	Mercury	SS-01X-090209AX	0.088	0.349	0.252
Transition	Mercury	ELY-SS-TR-06C (0-3)	0.087	0.349	0.249
Transition	Mercury	ELY-SS-TR-05D (3-12)	0.085	0.349	0.244
Transition	Mercury	SS-20X-083109AX	0.081	0.349	0.232
Transition	Mercury	SS-23X-082709AX	0.081	0.349	0.232
Transition	Mercury	ELY-SS-NF-05 (3-11)	0.079	0.349	0.226
Transition	Mercury	SS-05X-090209AX	0.079	0.349	0.226
Transition	Mercury	ELY-SS-NF-15 (2-5)	0.078	0.349	0.223
Transition	Mercury	SS-12X-090309AX	0.078	0.349	0.223
Transition	Mercury	SS-28X-083109AX	0.078	0.349	0.223
Transition	Mercury	ELY-SS-TZ-36 (1.5-9)	0.077	0.349	0.221
Transition	Mercury	ELY-SS-TZ-06 (0-1)	0.076	0.349	0.218
Transition	Mercury	TN-02X-082509AD	0.075	0.349	0.215
Transition	Mercury	ELY-SS-TR-02C (0-3)	0.074	0.349	0.212
Transition	Mercury	ELY-SS-TR-03B (2-12)	0.074	0.349	0.212
Transition	Mercury	ELY-SS-TZ-18 (0-.5)	0.074	0.349	0.212
Transition	Mercury	SS-02X-090209AX	0.074	0.349	0.212
Transition	Mercury	ELY-SS-TZ-15 (3.5-12)	0.073	0.349	0.209
Transition	Mercury	ELY-SS-TZ-16 (4-12)	0.073	0.349	0.209
Transition	Mercury	ELY-TP-109 (0-1)	0.072	0.349	0.206
Transition	Mercury	TI-03X-082509AX	0.071	0.349	0.203
Transition	Mercury	ELY-SS-TZ-30 (0.5-12)	0.07	0.349	0.201
Transition	Mercury	TK-01X-082509AX	0.07	0.349	0.201
Transition	Mercury	ELY-SS-TZ-30 (0-0.5)	0.069	0.349	0.198

TABLE H-1

**SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT**

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Mercury	ELY-SS-NF-12 (0-2)	0.068	0.349	0.195
Transition	Mercury	ELY-SS-TR-08C (0-5)	0.065	0.349	0.186
Transition	Mercury	ELY-SS-TZ-12 (3-8)	0.065	0.349	0.186
Transition	Mercury	ELY-SS-TZ-36 (0-1.5)	0.065	0.349	0.186
Transition	Mercury	ELY-SS-NF-08 (0-2)	0.064	0.349	0.183
Transition	Mercury	ELY-SS-TR-06C (3-12)	0.061	0.349	0.175
Transition	Mercury	ELY-SS-TZ-11 (1-5.5)	0.061	0.349	0.175
Transition	Mercury	SS-16X-090309AX	0.061	0.349	0.175
Transition	Mercury	ELY-SS-NF-10 (0-4)	0.059	0.349	0.169
Transition	Mercury	ELY-SS-NF-17 (4-10)	0.059	0.349	0.169
Transition	Mercury	TN-02X-082509AX	0.059	0.349	0.169
Transition	Mercury	ELY-SS-TR-06A (0-1)	0.058	0.349	0.166
Transition	Mercury	SS-09X-090209AX	0.058	0.349	0.166
Transition	Mercury	ELY-SS-TR-07D (2-9)	0.057	0.349	0.163
Transition	Mercury	SS-21X-083109AX	0.057	0.349	0.163
Transition	Mercury	TP-10X-082709AX	0.057	0.349	0.163
Transition	Mercury	ELY-SS-TR-02D (2-12) DUP	0.055	0.349	0.158
Transition	Mercury	ELY-SS-TR-08D (2-12)	0.055	0.349	0.158
Transition	Mercury	ELY-SS-TZ-35 (2-9)	0.055	0.349	0.158
Transition	Mercury	ELY-SS-TR-07C (2-12)	0.053	0.349	0.152
Transition	Mercury	ELY-SS-NF-07 (0-2)	0.051	0.349	0.146
Transition	Mercury	ELY-SS-TR-07B (2-8)	0.051	0.349	0.146
Transition	Mercury	ELY-SS-SA-23 (0-6)	0.05	0.349	0.143
Transition	Mercury	TC-03X-082609AX	0.049	0.349	0.140
Transition	Mercury	TL-04X-082509AX	0.048	0.349	0.138
Transition	Mercury	ELY-SS-TR-08C (5-12)	0.046	0.349	0.132
Transition	Mercury	ELY-SS-TZ-34 (2.5-8)	0.046	0.349	0.132
Transition	Mercury	ELY-SS-NF-04 (4-10)	0.045	0.349	0.129
Transition	Mercury	ELY-SS-NF-14 (3-12)	0.045	0.349	0.129
Transition	Mercury	ELY-SS-TR-06A (1-12)	0.045	0.349	0.129
Transition	Mercury	ELY-SS-TR-08C (0-5) DUP	0.045	0.349	0.129
Transition	Mercury	ELY-SS-TZ-23 (2.5-12)	0.045	0.349	0.129
Transition	Mercury	SS-04X-090209AX	0.045	0.349	0.129
Transition	Mercury	ELY-SS-NF-09 (1.5-12)	0.044	0.349	0.126
Transition	Mercury	ELY-SS-TR-02A (0-1.5)	0.044	0.349	0.126
Transition	Mercury	ELY-SS-TR-02D (2-12)	0.044	0.349	0.126
Transition	Mercury	ELY-SS-TR-03C (3-12)	0.044	0.349	0.126
Transition	Mercury	ELY-SS-NF-03 (4-12)	0.042	0.349	0.120
Transition	Mercury	ELY-SS-TR-05C (0-1)	0.042	0.349	0.120
Transition	Mercury	ELY-SS-TZ-06 (1-12)	0.042	0.349	0.120
Transition	Mercury	ELY-SS-NF-04 (4-10) DUP	0.041	0.349	0.117
Transition	Mercury	ELY-SS-NF-16 (1-12)	0.04	0.349	0.115
Transition	Mercury	SS-03X-090209AX	0.039	0.349	0.112
Transition	Mercury	ELY-SS-NF-10 (4-12)	0.037	0.349	0.106
Transition	Mercury	TQ-06X-082609AX	0.037	0.349	0.106
Transition	Mercury	ELY-SS-TZ-43 (2.5-11)	0.034	0.349	0.0974
Transition	Mercury	TG-02X-082409AX	0.034	0.349	0.0974
Transition	Mercury	TQ-16X-082609AX	0.033	0.349	0.0946
Transition	Mercury	ELY-SS-NF-11 (3-9)	0.032	0.349	0.0917
Transition	Mercury	ELY-SS-TR-08D (2-12) DUP	0.032	0.349	0.0917
Transition	Mercury	ELY-SS-TZ-31 (3-9)	0.032	0.349	0.0917
Transition	Mercury	ELY-SS-TR-05C (1-12)	0.031	0.349	0.0888
Transition	Mercury	ELY-SS-TZ-11 (0-1)	0.03	0.349	0.0860
Transition	Mercury	ELY-SS-NF-12 (2-9)	0.029	0.349	0.0831
Transition	Mercury	ELY-SS-TR-02C (3-12)	0.028	0.349	0.0802
Transition	Mercury	ELY-SS-TZ-40 (2-10)	0.028	0.349	0.0802
Transition	Mercury	ELY-SS-TZ-42 (2-12)	0.026	0.349	0.0745
Transition	Mercury	ELY-SS-NF-07 (2-8)	0.022	0.349	0.0630
Transition	Mercury	ELY-SS-TZ-38 (0.5-7)	0.022	0.349	0.0630
Transition	Mercury	ELY-SS-TR-08C (5-12) DUP	0.021	0.349	0.0602
Transition	Mercury	ELY-SS-NF-13 (2.5-12)	0.02	0.349	0.0573
Transition	Mercury	ELY-SS-TR-02A (1.5-11)	0.02	0.349	0.0573
Transition	Mercury	ELY-SS-NF-01 (2-7)	0.017	0.349	0.0487
Transition	Mercury	ELY-SS-TZ-18 (.5-12)	0.009	0.349	0.0258
Transition	Mercury	ELY-SS-TZ-31 (0-3)	0.007	0.349	0.0201

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Molybdenum	ELY-SS-SA-06 (0-6)	27	2	13.5
Transition	Molybdenum	ELY-SS-TZ-39 (3-8)	26	2	13.0
Transition	Molybdenum	ELY-SS-TZ-37 (2-12)	20	2	10.0
Transition	Molybdenum	ELY-SS-TR-06A (1-12)	18	2	9.00
Transition	Molybdenum	ELY-SS-TR-09D (3-12)	18	2	9.00
Transition	Molybdenum	ELY-SS-SA-09 (0-4)	17	2	8.50
Transition	Molybdenum	ELY-SS-TR-08A (0.5-12)DUP	17	2	8.50
Transition	Molybdenum	ELY-SS-TR-03B (2-12)	16	2	8.00
Transition	Molybdenum	ELY-SS-NF-09 (0-1.5)	15	2	7.50
Transition	Molybdenum	ELY-SS-TZ-29 (1-9)	12	2	6.00
Transition	Molybdenum	ELY-SS-TZ-06 (0-1)	11	2	5.50
Transition	Molybdenum	ELY-SS-TZ-14 (4-12)	11	2	5.50
Transition	Molybdenum	ELY-SS-TZ-29 (0-1)	11	2	5.50
Transition	Molybdenum	TP-15X-073009AX	10.2	2	5.10
Transition	Molybdenum	ELY-SS-TR-08A (0.5-12)	10	2	5.00
Transition	Molybdenum	ELY-SS-TR-08A (0-0.5) DUP	10	2	5.00
Transition	Molybdenum	ELY-SS-TR-02D (2-12) DUP	9.8	2	4.90
Transition	Molybdenum	ELY-TP-109 (0-1)	9.8	2	4.90
Transition	Molybdenum	ELY-SS-TR-08A (0-0.5)	9.4	2	4.70
Transition	Molybdenum	ELY-SS-TR-09C (1.5-8)	8.4	2	4.20
Transition	Molybdenum	ELY-SS-TR-08C (5-12) DUP	7.5	2	3.75
Transition	Molybdenum	ELY-SS-TR-02D(0-2) DUP	6.8	2	3.40
Transition	Molybdenum	TP-15X-073009AD	6.8	2	3.40
Transition	Molybdenum	ELY-SS-TZ-37 (0-2)	6.7	2	3.35
Transition	Molybdenum	ELY-SS-TR-02D (2-12)	6.6	2	3.30
Transition	Molybdenum	ELY-SS-TZ-39 (0-3)	6.5	2	3.25
Transition	Molybdenum	ELY-SS-TR-04C (3-6)	6.3	2	3.15
Transition	Molybdenum	ELY-SS-TZ-36 (0-1.5)	6.3	2	3.15
Transition	Molybdenum	ELY-SS-SA-04 (0-6)	6	2	3.00
Transition	Molybdenum	ELY-SS-TR-09C (0-1.5)	5.9	2	2.95
Transition	Molybdenum	ELY-SS-TZ-30 (0-0.5)	5.8	2	2.90
Transition	Molybdenum	ELY-SS-SA-01 (0-2)	5.6	2	2.80
Transition	Molybdenum	ELY-SS-TR-08C (5-12)	5.6	2	2.80
Transition	Molybdenum	ELY-SS-TZ-27 (0-2.5)	5.6	2	2.80
Transition	Molybdenum	ELY-SS-TZ-16 (4-12)	5.3	2	2.65
Transition	Molybdenum	ELY-SS-TR-06A (0-1)	5	2	2.50
Transition	Molybdenum	ELY-SS-TZ-14 (0-4)	4.7	2	2.35
Transition	Molybdenum	ELY-TP-104 (0-1)	4.4	2	2.20
Transition	Molybdenum	ELY-SS-TZ-38 (0.5-7)	4.3	2	2.15
Transition	Molybdenum	ELY-SS-NF-13 (2.5-12)	4.2	2	2.10
Transition	Molybdenum	ELY-SS-TR-06B (3-7)	4.2	2	2.10
Transition	Molybdenum	ELY-SS-TZ-11 (1-5.5)	4.2	2	2.10
Transition	Molybdenum	ELY-SS-TZ-38 (0-0.5)	4.2	2	2.10
Transition	Molybdenum	ELY-SS-TZ-06 (1-12)	4.1	2	2.05
Transition	Molybdenum	ELY-SS-TZ-35 (0-2)	3.9	2	1.95
Transition	Molybdenum	ELY-SS-TR-05D (0-3)	3.8	2	1.90
Transition	Molybdenum	ELY-SS-NF-03 (4-12)	3.7	2	1.85
Transition	Molybdenum	TO-05X-082709AX	3.7	2	1.85
Transition	Molybdenum	ELY-SS-TR-02B (4-11)	3.6	2	1.80
Transition	Molybdenum	ELY-SS-TR-06B (0-3)	3.6	2	1.80
Transition	Molybdenum	ELY-SS-TR-06C (3-12)	3.4	2	1.70
Transition	Molybdenum	ELY-SS-TZ-30 (0.5-12)	3.4	2	1.70
Transition	Molybdenum	ELY-SS-TR-02D (0-2)	3.2	2	1.60
Transition	Molybdenum	ELY-SS-TR-05D (3-12)	3.1	2	1.55
Transition	Molybdenum	ELY-SS-NF-05 (3-11)	3	2	1.50
Transition	Molybdenum	SS-17X-083109AX	2.9	2	1.45
Transition	Molybdenum	ELY-SS-TZ-15 (3.5-12)	2.8	2	1.40
Transition	Molybdenum	ELY-SS-NF-05 (0-3)	2.7	2	1.35
Transition	Molybdenum	SS-13X-082809AX	2.7	2	1.35
Transition	Molybdenum	ELY-SS-TR-07B (0-2)	2.6	2	1.30
Transition	Molybdenum	ELY-SS-TZ-35 (2-9)	2.5	2	1.25
Transition	Molybdenum	ELY-SS-TR-06C (0-3)	2.4	2	1.20
Transition	Molybdenum	ELY-SS-TZ-21 (0-5)	2.4	2	1.20
Transition	Molybdenum	SS-02X-090209AX	2.4	2	1.20
Transition	Molybdenum	SS-11X-090309AX	2.4	2	1.20

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Molybdenum	ELY-SS-TZ-15 (0-3.5)	2	2	1.00
Transition	Molybdenum	ELY-SS-TZ-36 (1.5-9)	2	2	1.00
Transition	Molybdenum	SS-22X-082709AX	2	2	1.00
Transition	Molybdenum	SS-01X-090209AX	1.9	2	0.950
Transition	Molybdenum	ELY-SS-NF-13 (0-2.5)	1.8	2	0.900
Transition	Molybdenum	ELY-SS-TR-04C (0-3)	1.7	2	0.850
Transition	Molybdenum	SS-14X-083109AX	1.7	2	0.850
Transition	Molybdenum	ELY-SS-TZ-31 (3-9)	1.6	2	0.800
Transition	Molybdenum	SS-09X-090209AX	1.6	2	0.800
Transition	Molybdenum	ELY-SS-TR-02C (0-3)	1.5	2	0.750
Transition	Molybdenum	ELY-SS-TZ-11 (0-1)	1.5	2	0.750
Transition	Molybdenum	ELY-SS-TZ-12 (0-3)	1.5	2	0.750
Transition	Molybdenum	SS-08X-090209AX	1.5	2	0.750
Transition	Molybdenum	SS-25X-082709AX	1.4	2	0.700
Transition	Molybdenum	ELY-SS-TZ-27 (2.5-8)	1.3	2	0.650
Transition	Molybdenum	ELY-SS-TZ-31 (0-3)	1.3	2	0.650
Transition	Molybdenum	SS-20X-083109AX	1.3	2	0.650
Transition	Molybdenum	ELY-SS-NF-06 (3-12)	1.2	2	0.600
Transition	Molybdenum	ELY-SS-TR-02C (3-12)	1.2	2	0.600
Transition	Molybdenum	ELY-SS-TR-07B (2-8)	1.2	2	0.600
Transition	Molybdenum	SS-27X-082609AX	1.2	2	0.600
Transition	Molybdenum	ELY-SS-TR-07D (2-9)	1.1	2	0.550
Transition	Molybdenum	SS-10X-090309AX	1.1	2	0.550
Transition	Molybdenum	TA-14X-082409AX	1	2	0.500
Transition	Molybdenum	ELY-SS-TR-02A (1.5-11)	0.95	2	0.475
Transition	Molybdenum	ELY-SS-TR-05C (0-1)	0.95	2	0.475
Transition	Molybdenum	TA-04X-082409AX	0.95	2	0.475
Transition	Molybdenum	SS-29X-083109AX	0.9	2	0.450
Transition	Molybdenum	ELY-SS-TR-09D (0-3)	0.87	2	0.435
Transition	Molybdenum	ELY-SS-TZ-42 (0-2)	0.87	2	0.435
Transition	Molybdenum	ELY-SS-TR-07C (0-2)	0.86	2	0.430
Transition	Molybdenum	SS-19X-082709AX	0.85	2	0.425
Transition	Molybdenum	SS-18X-082709AX	0.84	2	0.420
Transition	Molybdenum	TQ-06X-082609AX	0.84	2	0.420
Transition	Molybdenum	SS-26X-083109AX	0.81	2	0.405
Transition	Molybdenum	SS-23X-082709AX	0.79	2	0.395
Transition	Molybdenum	ELY-SS-NF-07 (0-2)	0.78	2	0.390
Transition	Molybdenum	ELY-SS-NF-07 (2-8)	0.76	2	0.380
Transition	Molybdenum	ELY-SS-TZ-16 (0-4)	0.76	2	0.380
Transition	Molybdenum	TN-02X-082509AX	0.73	2	0.365
Transition	Molybdenum	SS-28X-083109AX	0.72	2	0.360
Transition	Molybdenum	TL-04X-082509AX	0.69	2	0.345
Transition	Molybdenum	ELY-SS-TR-02B (0-4)	0.68	2	0.340
Transition	Molybdenum	ELY-SS-TR-03C (0-3)	0.66	2	0.330
Transition	Molybdenum	ELY-SS-NF-04 (0-4)	0.64	2	0.320
Transition	Molybdenum	SS-03X-090209AX	0.63	2	0.315
Transition	Molybdenum	ELY-SS-NF-14 (0-3)	0.62	2	0.310
Transition	Molybdenum	TP-10X-082709AX	0.62	2	0.310
Transition	Molybdenum	ELY-SS-TR-07D (0-2)	0.61	2	0.305
Transition	Molybdenum	SS-15X-083109AX	0.6	2	0.300
Transition	Molybdenum	SS-21X-083109AX	0.6	2	0.300
Transition	Molybdenum	TN-02X-082509AD	0.58	2	0.290
Transition	Molybdenum	ELY-SS-NF-04 (0-4) DUP	0.55	2	0.275
Transition	Molybdenum	TG-02X-082409AX	0.55	2	0.275
Transition	Molybdenum	ELY-SS-NF-04 (4-10)	0.54	2	0.270
Transition	Molybdenum	ELY-SS-TZ-40 (0-2)	0.53	2	0.265
Transition	Molybdenum	SS-24X-083109AX	0.52	2	0.260
Transition	Molybdenum	TK-01X-082509AX	0.5	2	0.250
Transition	Molybdenum	SS-16X-090309AX	0.49	2	0.245
Transition	Molybdenum	SS-05X-090209AX	0.48	2	0.240
Transition	Molybdenum	SS-06X-090209AX	0.48	2	0.240
Transition	Molybdenum	ELY-SS-TZ-34 (0-2.5)	0.45	2	0.225
Transition	Molybdenum	SS-07X-090209AX	0.45	2	0.225
Transition	Molybdenum	SS-04X-090209AX	0.44	2	0.220
Transition	Molybdenum	ELY-SS-NF-04 (4-10) DUP	0.43	2	0.215

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Molybdenum	TI-03X-082509AX	0.43	2	0.215
Transition	Molybdenum	ELY-SS-NF-02 (0-8)	0.41	2	0.205
Transition	Molybdenum	ELY-SS-TR-02A (0-1.5)	0.37	2	0.185
Transition	Molybdenum	ELY-SS-TZ-42 (2-12)	0.37	2	0.185
Transition	Molybdenum	TC-03X-082609AX	0.33	2	0.165
Transition	Molybdenum	TQ-16X-082609AX	0.33	2	0.165
Transition	Molybdenum	SS-12X-090309AX	0.32	2	0.160
Transition	Molybdenum	ELY-SS-NF-16 (0-1)	0.2	2	0.100
Transition	Nickel	ELY-SS-NF-03 (4-12)	110	38	2.89
Transition	Nickel	SS-11X-090309AX	66.3	38	1.74
Transition	Nickel	ELY-SS-NF-04 (0-4)	61	38	1.61
Transition	Nickel	SS-13X-082809AX	57.7	38	1.52
Transition	Nickel	ELY-SS-NF-12 (2-9)	53	38	1.39
Transition	Nickel	ELY-SS-TR-02D(0-2) DUP	50	38	1.32
Transition	Nickel	ELY-SS-TZ-21 (5-12)	43	38	1.13
Transition	Nickel	TI-03X-082509AX	42.6	38	1.12
Transition	Nickel	ELY-SS-TR-05C (1-12)	41	38	1.08
Transition	Nickel	SS-03X-090209AX	40.8	38	1.07
Transition	Nickel	TQ-16X-082609AX	40.1	38	1.06
Transition	Nickel	ELY-SS-NF-15 (2-5)	39	38	1.03
Transition	Nickel	ELY-SS-NF-08 (0-2)	38	38	1.00
Transition	Nickel	ELY-SS-TR-07B (2-8)	37	38	0.974
Transition	Nickel	TF-13X-090909BX	36.9	38	0.971
Transition	Nickel	SS-29X-083109AX	36.2	38	0.953
Transition	Nickel	ELY-SS-NF-09 (1.5-12)	36	38	0.947
Transition	Nickel	ELY-SS-NF-10 (4-12)	35	38	0.921
Transition	Nickel	TN-02X-082509AD	34.7	38	0.913
Transition	Nickel	SS-01X-090209AX	34.2	38	0.900
Transition	Nickel	ELY-SS-TR-04C (3-6)	34	38	0.895
Transition	Nickel	ELY-SS-TZ-23 (2.5-12)	34	38	0.895
Transition	Nickel	ELY-SS-TZ-34 (2.5-8)	34	38	0.895
Transition	Nickel	SS-26X-083109AX	33.2	38	0.874
Transition	Nickel	ELY-SS-NF-11 (0-3)	33	38	0.868
Transition	Nickel	ELY-SS-TZ-27 (2.5-8)	33	38	0.868
Transition	Nickel	SS-28X-083109AX	32.9	38	0.866
Transition	Nickel	TP-10X-082709AX	32.8	38	0.863
Transition	Nickel	ELY-SS-TR-03B (2-12)	32	38	0.842
Transition	Nickel	ELY-SS-TZ-36 (1.5-9)	32	38	0.842
Transition	Nickel	SS-16X-090309AX	32	38	0.842
Transition	Nickel	SS-02X-090209AX	31.1	38	0.818
Transition	Nickel	ELY-SS-NF-11 (3-9)	31	38	0.816
Transition	Nickel	ELY-SS-TR-04B (1.5-12)	31	38	0.816
Transition	Nickel	ELY-SS-TZ-06 (1-12)	31	38	0.816
Transition	Nickel	TK-01X-082509AX	30.3	38	0.797
Transition	Nickel	ELY-SS-NF-10 (0-4)	30	38	0.789
Transition	Nickel	ELY-SS-NF-16 (1-12)	30	38	0.789
Transition	Nickel	ELY-SS-TR-06C (0-3)	30	38	0.789
Transition	Nickel	ELY-SS-TR-07C (2-12)	30	38	0.789
Transition	Nickel	TL-04X-082509AX	29.7	38	0.782
Transition	Nickel	TG-02X-082409AX	29.6	38	0.779
Transition	Nickel	SS-09X-090209AX	29.2	38	0.768
Transition	Nickel	ELY-SS-NF-08 (2-11)	29	38	0.763
Transition	Nickel	ELY-SS-TR-08D (2-12) DUP	29	38	0.763
Transition	Nickel	SS-06X-090209AX	28.7	38	0.755
Transition	Nickel	ELY-SS-NF-13 (0-2.5)	28	38	0.737
Transition	Nickel	ELY-SS-NF-17 (4-10)	28	38	0.737
Transition	Nickel	TN-02X-082509AX	27.8	38	0.732
Transition	Nickel	SS-27X-082609AX	27.4	38	0.721
Transition	Nickel	SS-08X-090209AX	27.3	38	0.718
Transition	Nickel	ELY-SS-TR-07D (2-9)	27	38	0.711
Transition	Nickel	ELY-SS-TR-08D (2-12)	27	38	0.711
Transition	Nickel	ELY-SS-TZ-43 (2.5-11)	27	38	0.711
Transition	Nickel	ELY-SS-NF-02 (0-8)	26	38	0.684
Transition	Nickel	ELY-SS-NF-14 (3-12)	26	38	0.684
Transition	Nickel	ELY-SS-TZ-18 (.5-12)	26	38	0.684

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Nickel	SS-07X-090209AX	25.1	38	0.661
Transition	Nickel	SS-17X-083109AX	25.1	38	0.661
Transition	Nickel	ELY-SS-NF-04 (4-10)	25	38	0.658
Transition	Nickel	ELY-SS-TR-02D (0-2)	25	38	0.658
Transition	Nickel	ELY-SS-TZ-21 (0-5)	25	38	0.658
Transition	Nickel	ELY-SS-TZ-40 (2-10)	25	38	0.658
Transition	Nickel	ELY-SS-NF-06 (0-3)	24	38	0.632
Transition	Nickel	ELY-SS-NF-06 (3-12)	24	38	0.632
Transition	Nickel	ELY-SS-NF-13 (2.5-12)	24	38	0.632
Transition	Nickel	ELY-SS-TR-09B (2-5)	24	38	0.632
Transition	Nickel	ELY-SS-TZ-06 (0-1)	24	38	0.632
Transition	Nickel	ELY-SS-TZ-30 (0.5-12)	24	38	0.632
Transition	Nickel	SS-04X-090209AX	23.7	38	0.624
Transition	Nickel	TA-14X-082409AX	23.6	38	0.621
Transition	Nickel	TQ-06X-082609AX	23.3	38	0.613
Transition	Nickel	SS-23X-082709AX	23.1	38	0.608
Transition	Nickel	ELY-SS-TR-06C (3-12)	23	38	0.605
Transition	Nickel	TO-05X-082709AX	22.7	38	0.597
Transition	Nickel	ELY-SS-NF-12 (0-2)	22	38	0.579
Transition	Nickel	ELY-SS-TR-08D (0-2) DUP	22	38	0.579
Transition	Nickel	ELY-SS-TZ-31 (3-9)	22	38	0.579
Transition	Nickel	ELY-SS-TZ-35 (2-9)	22	38	0.579
Transition	Nickel	ELY-SS-NF-04 (4-10) DUP	20	38	0.526
Transition	Nickel	ELY-SS-NF-14 (0-3)	20	38	0.526
Transition	Nickel	ELY-SS-TZ-11 (0-1)	20	38	0.526
Transition	Nickel	ELY-SS-TZ-11 (1-5.5)	20	38	0.526
Transition	Nickel	ELY-SS-TZ-12 (3-8)	20	38	0.526
Transition	Nickel	ELY-SS-TZ-27 (0-2.5)	20	38	0.526
Transition	Nickel	TA-04X-082409AX	19.2	38	0.505
Transition	Nickel	ELY-SS-NF-01 (2-7)	19	38	0.500
Transition	Nickel	ELY-SS-NF-05 (0-3)	19	38	0.500
Transition	Nickel	ELY-SS-TR-05C (0-1)	19	38	0.500
Transition	Nickel	ELY-SS-TR-06A (0-1)	19	38	0.500
Transition	Nickel	ELY-SS-TR-06B (3-7)	19	38	0.500
Transition	Nickel	ELY-SS-TZ-29 (1-9)	19	38	0.500
Transition	Nickel	ELY-SS-NF-09 (0-1.5)	18	38	0.474
Transition	Nickel	ELY-SS-NF-15 (0-2)	18	38	0.474
Transition	Nickel	ELY-SS-TR-02D (2-12)	18	38	0.474
Transition	Nickel	ELY-SS-TZ-30 (0-0.5)	18	38	0.474
Transition	Nickel	SS-05X-090209AX	17.4	38	0.458
Transition	Nickel	ELY-SS-SA-04 (0-6)	17	38	0.447
Transition	Nickel	ELY-SS-TR-02D (2-12) DUP	17	38	0.447
Transition	Nickel	ELY-SS-TR-05D (0-3)	17	38	0.447
Transition	Nickel	ELY-SS-TR-08D (0-2)	17	38	0.447
Transition	Nickel	ELY-SS-TZ-31 (0-3)	17	38	0.447
Transition	Nickel	ELY-SS-TZ-42 (2-12)	17	38	0.447
Transition	Nickel	ELY-TP-104 (0-1)	17	38	0.447
Transition	Nickel	TP-15X-073009AD	17	38	0.447
Transition	Nickel	SS-10X-090309AX	16.7	38	0.439
Transition	Nickel	SS-20X-083109AX	16.1	38	0.424
Transition	Nickel	ELY-SS-NF-05 (3-11)	16	38	0.421
Transition	Nickel	ELY-SS-TR-02A (1.5-11)	16	38	0.421
Transition	Nickel	ELY-SS-TR-04C (0-3)	16	38	0.421
Transition	Nickel	ELY-SS-TZ-15 (3.5-12)	16	38	0.421
Transition	Nickel	ELY-SS-TZ-40 (0-2)	16	38	0.421
Transition	Nickel	ELY-SS-TZ-42 (0-2)	16	38	0.421
Transition	Nickel	ELY-SS-TZ-43 (0-2.5)	16	38	0.421
Transition	Nickel	SS-14X-083109AX	15.9	38	0.418
Transition	Nickel	SS-22X-082709AX	15.8	38	0.416
Transition	Nickel	SS-25X-082709AX	15.6	38	0.411
Transition	Nickel	TC-03X-082609AX	15.6	38	0.411
Transition	Nickel	TP-15X-073009AX	15.5	38	0.408
Transition	Nickel	ELY-SS-SA-23 (0-6)	15	38	0.395
Transition	Nickel	ELY-SS-TR-03C (3-12)	15	38	0.395
Transition	Nickel	ELY-SS-TR-05D (3-12)	15	38	0.395

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY ELY COPPER MINE SUPERFUND SITE VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Nickel	ELY-SS-TR-07D (0-2)	15	38	0.395
Transition	Nickel	ELY-SS-TR-02B (4-11)	14	38	0.368
Transition	Nickel	ELY-SS-TR-06B (0-3)	14	38	0.368
Transition	Nickel	SS-24X-083109AX	13.7	38	0.361
Transition	Nickel	ELY-SS-TR-02C (0-3)	13	38	0.342
Transition	Nickel	ELY-SS-TZ-14 (0-4)	13	38	0.342
Transition	Nickel	ELY-SS-TR-07B (0-2)	12	38	0.316
Transition	Nickel	ELY-SS-TZ-14 (4-12)	12	38	0.316
Transition	Nickel	ELY-SS-TZ-29 (0-1)	12	38	0.316
Transition	Nickel	ELY-SS-TZ-38 (0.5-7)	12	38	0.316
Transition	Nickel	ELY-SS-SA-01 (0-2)	11	38	0.289
Transition	Nickel	ELY-SS-TR-08A (0.5-12)	11	38	0.289
Transition	Nickel	ELY-SS-TZ-16 (0-4)	11	38	0.289
Transition	Nickel	ELY-SS-TZ-16 (4-12)	11	38	0.289
Transition	Nickel	ELY-SS-TZ-18 (0-.5)	11	38	0.289
Transition	Nickel	ELY-SS-TZ-37 (2-12)	11	38	0.289
Transition	Nickel	SS-12X-090309AX	10.6	38	0.279
Transition	Nickel	SS-18X-082709AX	10.5	38	0.276
Transition	Nickel	ELY-SS-TR-02C (3-12)	10	38	0.263
Transition	Nickel	ELY-SS-TR-07C (0-2)	10	38	0.263
Transition	Nickel	ELY-SS-TR-08A (0.5-12)DUP	10	38	0.263
Transition	Nickel	ELY-SS-TR-08A (0-0.5) DUP	10	38	0.263
Transition	Nickel	ELY-SS-TZ-39 (0-3)	10	38	0.263
Transition	Nickel	ELY-SS-TR-08C (0-5) DUP	9.6	38	0.253
Transition	Nickel	ELY-SS-TR-09D (3-12)	9.6	38	0.253
Transition	Nickel	ELY-SS-TR-08A (0-0.5)	9.1	38	0.239
Transition	Nickel	ELY-SS-TR-09C (1.5-8)	9.1	38	0.239
Transition	Nickel	ELY-TP-109 (0-1)	9.1	38	0.239
Transition	Nickel	ELY-SS-NF-07 (2-8)	9	38	0.237
Transition	Nickel	ELY-SS-SA-06 (0-6)	8.9	38	0.234
Transition	Nickel	ELY-SS-TZ-15 (0-3.5)	8.8	38	0.232
Transition	Nickel	ELY-SS-TZ-38 (0-0.5)	8.7	38	0.229
Transition	Nickel	SS-21X-083109AX	8.6	38	0.226
Transition	Nickel	ELY-SS-TZ-36 (0-1.5)	8.5	38	0.224
Transition	Nickel	ELY-SS-NF-07 (0-2)	8.1	38	0.213
Transition	Nickel	ELY-SS-TZ-39 (3-8)	8	38	0.211
Transition	Nickel	ELY-SS-NF-04 (0-4) DUP	7.9	38	0.208
Transition	Nickel	ELY-SS-SA-09 (0-4)	7.9	38	0.208
Transition	Nickel	ELY-SS-TZ-34 (0-2.5)	7.5	38	0.197
Transition	Nickel	ELY-SS-NF-16 (0-1)	7.4	38	0.195
Transition	Nickel	ELY-SS-TR-03B (0-2)	7.4	38	0.195
Transition	Nickel	ELY-SS-TZ-23 (0-2.5)	7.4	38	0.195
Transition	Nickel	SS-15X-083109AX	7.4	38	0.195
Transition	Nickel	ELY-SS-TR-09C (0-1.5)	7.2	38	0.189
Transition	Nickel	SS-19X-082709AX	7.2	38	0.189
Transition	Nickel	ELY-SS-TZ-12 (0-3)	6.9	38	0.182
Transition	Nickel	ELY-SS-NF-17 (0-4)	6.6	38	0.174
Transition	Nickel	ELY-SS-TR-02B (0-4)	6.4	38	0.168
Transition	Nickel	ELY-SS-TZ-35 (0-2)	6.3	38	0.166
Transition	Nickel	ELY-SS-TR-09B (0-2)	6.2	38	0.163
Transition	Nickel	ELY-SS-TR-02A (0-1.5)	6	38	0.158
Transition	Nickel	ELY-SS-TR-09D (0-3)	6	38	0.158
Transition	Nickel	ELY-SS-TZ-37 (0-2)	6	38	0.158
Transition	Nickel	ELY-SS-TR-08C (5-12) DUP	5.7	38	0.150
Transition	Nickel	ELY-SS-TR-06A (1-12)	5.2	38	0.137
Transition	Nickel	ELY-SS-TR-08C (5-12)	5.1	38	0.134
Transition	Nickel	ELY-SS-TR-03C (0-3)	4.9	38	0.129
Transition	Nickel	ELY-SS-NF-03 (0-4)	4.1	38	0.108
Transition	Nickel	ELY-SS-TR-04B (0-1.5)	3.9	38	0.103
Transition	Nickel	ELY-SS-TR-08C (0-5)	3.6	38	0.0947
Transition	Selenium	ELY-SS-TR-06A (1-12)	83	0.52	160
Transition	Selenium	ELY-SS-TZ-39 (3-8)	76	0.52	146
Transition	Selenium	ELY-SS-SA-06 (0-6)	72	0.52	138
Transition	Selenium	ELY-SS-TZ-37 (2-12)	66	0.52	127
Transition	Selenium	ELY-SS-TR-09D (3-12)	63	0.52	121

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Selenium	ELY-SS-TR-03B (2-12)	62	0.52	119
Transition	Selenium	ELY-SS-TZ-14 (4-12)	55	0.52	106
Transition	Selenium	ELY-SS-TZ-29 (1-9)	44	0.52	84.6
Transition	Selenium	ELY-SS-TR-08A (0.5-12)	42	0.52	80.8
Transition	Selenium	ELY-TP-109 (0-1)	41	0.52	78.8
Transition	Selenium	ELY-SS-TR-08C (5-12) DUP	40	0.52	76.9
Transition	Selenium	ELY-SS-TR-02B (4-11)	38	0.52	73.1
Transition	Selenium	ELY-SS-TR-08A (0.5-12)DUP	38	0.52	73.1
Transition	Selenium	ELY-SS-TR-09C (1.5-8)	36	0.52	69.2
Transition	Selenium	ELY-SS-NF-09 (0-1.5)	35	0.52	67.3
Transition	Selenium	ELY-SS-TZ-14 (0-4)	34	0.52	65.4
Transition	Selenium	ELY-SS-TR-08A (0-0.5) DUP	33	0.52	63.5
Transition	Selenium	ELY-SS-TR-08C (5-12)	33	0.52	63.5
Transition	Selenium	ELY-SS-TZ-29 (0-1)	32	0.52	61.5
Transition	Selenium	ELY-SS-TZ-16 (4-12)	31	0.52	59.6
Transition	Selenium	ELY-SS-TR-08A (0-0.5)	28	0.52	53.8
Transition	Selenium	ELY-SS-TZ-38 (0.5-7)	28	0.52	53.8
Transition	Selenium	ELY-SS-TR-09C (0-1.5)	27	0.52	51.9
Transition	Selenium	ELY-SS-SA-23 (0-6)	26	0.52	50.0
Transition	Selenium	ELY-SS-TR-04C (3-6)	25	0.52	48.1
Transition	Selenium	ELY-SS-TR-06A (0-1)	25	0.52	48.1
Transition	Selenium	ELY-SS-TZ-37 (0-2)	25	0.52	48.1
Transition	Selenium	ELY-SS-TR-08C (0-5) DUP	24	0.52	46.2
Transition	Selenium	TP-15X-073009AX	23.7	0.52	45.6
Transition	Selenium	ELY-SS-SA-09 (0-4)	22	0.52	42.3
Transition	Selenium	ELY-SS-TR-08C (0-5)	22	0.52	42.3
Transition	Selenium	ELY-SS-TZ-36 (0-1.5)	21	0.52	40.4
Transition	Selenium	ELY-SS-TZ-39 (0-3)	20	0.52	38.5
Transition	Selenium	ELY-SS-TR-03B (0-2)	19	0.52	36.5
Transition	Selenium	ELY-SS-TZ-06 (0-1)	19	0.52	36.5
Transition	Selenium	TP-15X-073009AD	18.4	0.52	35.4
Transition	Selenium	ELY-SS-TR-02D(0-2) DUP	18	0.52	34.6
Transition	Selenium	ELY-SS-TR-05D (3-12)	18	0.52	34.6
Transition	Selenium	ELY-SS-NF-13 (2.5-12)	17	0.52	32.7
Transition	Selenium	ELY-SS-TR-06B (3-7)	17	0.52	32.7
Transition	Selenium	ELY-SS-TR-05D (0-3)	16	0.52	30.8
Transition	Selenium	ELY-SS-SA-04 (0-6)	15	0.52	28.8
Transition	Selenium	ELY-SS-TR-06C (3-12)	15	0.52	28.8
Transition	Selenium	ELY-SS-TZ-35 (0-2)	15	0.52	28.8
Transition	Selenium	ELY-SS-TZ-38 (0-0.5)	15	0.52	28.8
Transition	Selenium	ELY-SS-TR-07B (0-2)	14	0.52	26.9
Transition	Selenium	ELY-SS-SA-01 (0-2)	13	0.52	25.0
Transition	Selenium	ELY-SS-TZ-27 (0-2.5)	13	0.52	25.0
Transition	Selenium	ELY-SS-TZ-30 (0.5-12)	13	0.52	25.0
Transition	Selenium	ELY-SS-TR-06B (0-3)	12	0.52	23.1
Transition	Selenium	ELY-SS-TZ-06 (1-12)	12	0.52	23.1
Transition	Selenium	ELY-SS-TZ-21 (0-5)	12	0.52	23.1
Transition	Selenium	ELY-SS-TR-02A (1.5-11)	11	0.52	21.2
Transition	Selenium	ELY-SS-TR-02D (2-12) DUP	11	0.52	21.2
Transition	Selenium	ELY-SS-TR-06C (0-3)	11	0.52	21.2
Transition	Selenium	ELY-SS-TZ-30 (0-0.5)	11	0.52	21.2
Transition	Selenium	SS-13X-082809AX	10.4	0.52	20.0
Transition	Selenium	ELY-SS-NF-03 (4-12)	9.9	0.52	19.0
Transition	Selenium	ELY-SS-TZ-35 (2-9)	9.6	0.52	18.5
Transition	Selenium	ELY-SS-TR-02D (2-12)	9.4	0.52	18.1
Transition	Selenium	ELY-SS-TR-02D (0-2)	9.3	0.52	17.9
Transition	Selenium	ELY-SS-TZ-12 (3-8)	9.1	0.52	17.5
Transition	Selenium	ELY-TP-104 (0-1)	9	0.52	17.3
Transition	Selenium	ELY-SS-NF-13 (0-2.5)	8.3	0.52	16.0
Transition	Selenium	ELY-SS-TZ-11 (1-5.5)	8.3	0.52	16.0
Transition	Selenium	ELY-SS-TZ-15 (3.5-12)	8.1	0.52	15.6
Transition	Selenium	ELY-SS-TR-04C (0-3)	7.8	0.52	15.0
Transition	Selenium	ELY-SS-TZ-16 (0-4)	7.8	0.52	15.0
Transition	Selenium	ELY-SS-TZ-36 (1.5-9)	7.7	0.52	14.8
Transition	Selenium	TO-05X-082709AX	7.7	0.52	14.8

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Selenium	ELY-SS-TZ-15 (0-3.5)	7.1	0.52	13.7
Transition	Selenium	ELY-SS-TZ-18 (0-.5)	7.1	0.52	13.7
Transition	Selenium	ELY-SS-TR-02B (0-4)	6.6	0.52	12.7
Transition	Selenium	ELY-SS-TZ-12 (0-3)	6	0.52	11.5
Transition	Selenium	SS-25X-082709AX	5.9	0.52	11.3
Transition	Selenium	ELY-SS-NF-05 (0-3)	5.6	0.52	10.8
Transition	Selenium	ELY-SS-TR-05C (0-1)	5.3	0.52	10.2
Transition	Selenium	ELY-SS-TR-09D (0-3)	5.2	0.52	10.0
Transition	Selenium	ELY-SS-TZ-42 (0-2)	4.8	0.52	9.23
Transition	Selenium	SS-22X-082709AX	4.8	0.52	9.23
Transition	Selenium	ELY-SS-TR-03C (0-3)	4.6	0.52	8.85
Transition	Selenium	ELY-SS-NF-09 (1.5-12)	4.5	0.52	8.65
Transition	Selenium	SS-17X-083109AX	4.4	0.52	8.46
Transition	Selenium	ELY-SS-NF-05 (3-11)	4.3	0.52	8.27
Transition	Selenium	SS-02X-090209AX	4.2	0.52	8.08
Transition	Selenium	ELY-SS-TR-07B (2-8)	4.1	0.52	7.88
Transition	Selenium	SS-27X-082609AX	4	0.52	7.69
Transition	Selenium	ELY-SS-TR-07C (0-2)	3.9	0.52	7.50
Transition	Selenium	ELY-SS-NF-04 (0-4)	3.7	0.52	7.12
Transition	Selenium	ELY-SS-TR-09B (2-5)	3.7	0.52	7.12
Transition	Selenium	ELY-SS-TR-03C (3-12)	3.6	0.52	6.92
Transition	Selenium	ELY-SS-TZ-21 (5-12)	3.5	0.52	6.73
Transition	Selenium	ELY-SS-NF-04 (4-10)	3.3	0.52	6.35
Transition	Selenium	SS-01X-090209AX	3.3	0.52	6.35
Transition	Selenium	SS-11X-090309AX	3.3	0.52	6.35
Transition	Selenium	SS-18X-082709AX	3.3	0.52	6.35
Transition	Selenium	ELY-SS-TZ-34 (2.5-8)	3.2	0.52	6.15
Transition	Selenium	ELY-SS-TZ-18 (.5-12)	3.1	0.52	5.96
Transition	Selenium	ELY-SS-TZ-40 (0-2)	3.1	0.52	5.96
Transition	Selenium	ELY-SS-TR-02A (0-1.5)	3	0.52	5.77
Transition	Selenium	ELY-SS-TZ-31 (0-3)	3	0.52	5.77
Transition	Selenium	ELY-SS-TZ-34 (0-2.5)	3	0.52	5.77
Transition	Selenium	SS-09X-090209AX	3	0.52	5.77
Transition	Selenium	SS-14X-083109AX	2.9	0.52	5.58
Transition	Selenium	ELY-SS-NF-01 (2-7)	2.7	0.52	5.19
Transition	Selenium	ELY-SS-TZ-11 (0-1)	2.7	0.52	5.19
Transition	Selenium	TQ-06X-082609AX	2.7	0.52	5.19
Transition	Selenium	ELY-SS-NF-04 (0-4) DUP	2.6	0.52	5.00
Transition	Selenium	ELY-SS-NF-17 (4-10)	2.6	0.52	5.00
Transition	Selenium	ELY-SS-TR-02C (0-3)	2.6	0.52	5.00
Transition	Selenium	ELY-SS-TR-02C (3-12)	2.6	0.52	5.00
Transition	Selenium	ELY-SS-TR-05C (1-12)	2.6	0.52	5.00
Transition	Selenium	ELY-SS-TZ-43 (0-2.5)	2.6	0.52	5.00
Transition	Selenium	ELY-SS-TZ-23 (0-2.5)	2.5	0.52	4.81
Transition	Selenium	ELY-SS-TZ-31 (3-9)	2.5	0.52	4.81
Transition	Selenium	ELY-SS-NF-15 (0-2)	2.4	0.52	4.62
Transition	Selenium	SS-08X-090209AX	2.4	0.52	4.62
Transition	Selenium	ELY-SS-TR-07D (0-2)	2.1	0.52	4.04
Transition	Selenium	ELY-SS-TR-08D (0-2) DUP	2.1	0.52	4.04
Transition	Selenium	ELY-SS-NF-07 (0-2)	2	0.52	3.85
Transition	Selenium	SS-10X-090309AX	2	0.52	3.85
Transition	Selenium	ELY-SS-TZ-23 (2.5-12)	1.8	0.52	3.46
Transition	Selenium	ELY-SS-NF-02 (0-8)	1.7	0.52	3.27
Transition	Selenium	ELY-SS-TR-04B (0-1.5)	1.7	0.52	3.27
Transition	Selenium	ELY-SS-TR-09B (0-2)	1.7	0.52	3.27
Transition	Selenium	ELY-SS-NF-14 (0-3)	1.6	0.52	3.08
Transition	Selenium	ELY-SS-NF-14 (3-12)	1.6	0.52	3.08
Transition	Selenium	ELY-SS-TR-04B (1.5-12)	1.6	0.52	3.08
Transition	Selenium	ELY-SS-TR-07C (2-12)	1.6	0.52	3.08
Transition	Selenium	ELY-SS-TR-07D (2-9)	1.6	0.52	3.08
Transition	Selenium	ELY-SS-TR-08D (2-12) DUP	1.6	0.52	3.08
Transition	Selenium	SS-20X-083109AX	1.6	0.52	3.08
Transition	Selenium	ELY-SS-NF-03 (0-4)	1.5	0.52	2.88
Transition	Selenium	ELY-SS-NF-12 (0-2)	1.5	0.52	2.88
Transition	Selenium	ELY-SS-TR-08D (0-2)	1.5	0.52	2.88

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Selenium	ELY-SS-TR-08D (2-12)	1.5	0.52	2.88
Transition	Selenium	SS-15X-083109AX	1.5	0.52	2.88
Transition	Selenium	ELY-SS-NF-12 (2-9)	1.4	0.52	2.69
Transition	Selenium	ELY-SS-NF-17 (0-4)	1.4	0.52	2.69
Transition	Selenium	SS-19X-082709AX	1.4	0.52	2.69
Transition	Selenium	TA-14X-082409AX	1.4	0.52	2.69
Transition	Selenium	ELY-SS-NF-16 (0-1)	1.2	0.52	2.31
Transition	Selenium	SS-23X-082709AX	1.2	0.52	2.31
Transition	Selenium	SS-29X-083109AX	1.1	0.52	2.12
Transition	Selenium	TA-04X-082409AX	1	0.52	1.92
Transition	Selenium	SS-05X-090209AX	0.97	0.52	1.87
Transition	Selenium	SS-06X-090209AX	0.94	0.52	1.81
Transition	Selenium	SS-26X-083109AX	0.9	0.52	1.73
Transition	Selenium	TG-02X-082409AX	0.85	0.52	1.63
Transition	Selenium	SS-12X-090309AX	0.8	0.52	1.54
Transition	Selenium	TP-10X-082709AX	0.76	0.52	1.46
Transition	Selenium	SS-28X-083109AX	0.7	0.52	1.35
Transition	Selenium	TL-04X-082509AX	0.69	0.52	1.33
Transition	Selenium	TN-02X-082509AD	0.68	0.52	1.31
Transition	Selenium	SS-07X-090209AX	0.66	0.52	1.27
Transition	Selenium	TC-03X-082609AX	0.63	0.52	1.21
Transition	Selenium	SS-04X-090209AX	0.62	0.52	1.19
Transition	Selenium	TN-02X-082509AX	0.62	0.52	1.19
Transition	Selenium	SS-24X-083109AX	0.6	0.52	1.15
Transition	Selenium	SS-21X-083109AX	0.59	0.52	1.13
Transition	Selenium	TI-03X-082509AX	0.58	0.52	1.12
Transition	Selenium	SS-03X-090209AX	0.57	0.52	1.10
Transition	Selenium	SS-16X-090309AX	0.47	0.52	0.904
Transition	Selenium	TQ-16X-082609AX	0.46	0.52	0.885
Transition	Selenium	TK-01X-082509AX	0.42	0.52	0.808
Transition	Silver	ELY-SS-TR-09D (0-3)	22	560	0.0393
Transition	Silver	ELY-SS-TZ-39 (0-3)	14	560	0.0250
Transition	Silver	ELY-SS-TZ-39 (3-8)	14	560	0.0250
Transition	Silver	ELY-SS-TR-06C (0-3)	13	560	0.0232
Transition	Silver	ELY-SS-SA-06 (0-6)	12	560	0.0214
Transition	Silver	ELY-SS-TZ-14 (0-4)	12	560	0.0214
Transition	Silver	ELY-SS-TR-03B (2-12)	11	560	0.0196
Transition	Silver	ELY-SS-TR-05D (0-3)	11	560	0.0196
Transition	Silver	ELY-SS-TZ-35 (0-2)	11	560	0.0196
Transition	Silver	ELY-SS-TR-03B (0-2)	10	560	0.0179
Transition	Silver	ELY-SS-TR-09B (0-2)	10	560	0.0179
Transition	Silver	ELY-SS-TR-06B (0-3)	9.9	560	0.0177
Transition	Silver	ELY-SS-TR-08C (0-5)	9.6	560	0.0171
Transition	Silver	ELY-SS-NF-09 (0-1.5)	9.3	560	0.0166
Transition	Silver	ELY-SS-TR-08A (0.5-12)	9	560	0.0161
Transition	Silver	ELY-SS-TZ-14 (4-12)	8.2	560	0.0146
Transition	Silver	ELY-SS-TZ-06 (0-1)	7.8	560	0.0139
Transition	Silver	ELY-SS-TZ-16 (0-4)	7.2	560	0.0129
Transition	Silver	ELY-SS-TR-08A (0.5-12)DUP	7	560	0.0125
Transition	Silver	ELY-SS-TR-06A (0-1)	6.4	560	0.0114
Transition	Silver	ELY-SS-TR-07C (0-2)	6.4	560	0.0114
Transition	Silver	ELY-SS-TZ-37 (0-2)	6.2	560	0.0111
Transition	Silver	ELY-SS-TZ-29 (0-1)	6	560	0.0107
Transition	Silver	ELY-SS-SA-09 (0-4)	5.9	560	0.0105
Transition	Silver	ELY-SS-TR-08A (0-0.5) DUP	5.9	560	0.0105
Transition	Silver	ELY-SS-TR-06A (1-12)	5.8	560	0.0104
Transition	Silver	ELY-SS-TR-06B (3-7)	5.7	560	0.0102
Transition	Silver	ELY-SS-TR-03C (0-3)	5.5	560	0.00982
Transition	Silver	ELY-SS-TZ-37 (2-12)	5.4	560	0.00964
Transition	Silver	ELY-SS-TR-08A (0-0.5)	4.7	560	0.00839
Transition	Silver	ELY-TP-109 (0-1)	4.6	560	0.00821
Transition	Silver	ELY-SS-TR-09D (3-12)	4.4	560	0.00786
Transition	Silver	ELY-SS-TR-02D(0-2) DUP	4.3	560	0.00768
Transition	Silver	ELY-SS-TZ-38 (0-0.5)	4.3	560	0.00768
Transition	Silver	ELY-SS-TR-07B (0-2)	4	560	0.00714

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Silver	ELY-SS-TZ-12 (0-3)	4	560	0.00714
Transition	Silver	ELY-SS-TZ-16 (4-12)	4	560	0.00714
Transition	Silver	ELY-SS-TZ-38 (0.5-7)	4	560	0.00714
Transition	Silver	SS-01X-090209AX	4	560	0.00714
Transition	Silver	SS-22X-082709AX	4	560	0.00714
Transition	Silver	ELY-SS-SA-04 (0-6)	3.9	560	0.00696
Transition	Silver	ELY-SS-TZ-15 (0-3.5)	3.8	560	0.00679
Transition	Silver	SS-18X-082709AX	3.7	560	0.00661
Transition	Silver	ELY-SS-TR-09C (0-1.5)	3.6	560	0.00643
Transition	Silver	ELY-SS-TZ-29 (1-9)	3.5	560	0.00625
Transition	Silver	ELY-SS-TZ-35 (2-9)	3.2	560	0.00571
Transition	Silver	ELY-SS-TZ-18 (0-.5)	3	560	0.00536
Transition	Silver	SS-11X-090309AX	3	560	0.00536
Transition	Silver	ELY-SS-SA-23 (0-6)	2.9	560	0.00518
Transition	Silver	ELY-SS-TR-02D (0-2)	2.9	560	0.00518
Transition	Silver	ELY-SS-TR-09B (2-5)	2.9	560	0.00518
Transition	Silver	ELY-SS-TR-04C (3-6)	2.8	560	0.00500
Transition	Silver	ELY-SS-TZ-27 (0-2.5)	2.8	560	0.00500
Transition	Silver	ELY-SS-TZ-36 (0-1.5)	2.7	560	0.00482
Transition	Silver	ELY-SS-TR-08C (5-12)	2.6	560	0.00464
Transition	Silver	ELY-SS-TZ-31 (0-3)	2.5	560	0.00446
Transition	Silver	TP-15X-073009AX	2.5	560	0.00446
Transition	Silver	ELY-SS-NF-13 (0-2.5)	2.4	560	0.00429
Transition	Silver	ELY-SS-TR-05D (3-12)	2.4	560	0.00429
Transition	Silver	ELY-SS-TR-09C (1.5-8)	2.4	560	0.00429
Transition	Silver	SS-17X-083109AX	2.4	560	0.00429
Transition	Silver	TF-13X-090909BX	2.4	560	0.00429
Transition	Silver	ELY-SS-TR-08C (0-5) DUP	2.2	560	0.00393
Transition	Silver	ELY-SS-TR-08C (5-12) DUP	2.1	560	0.00375
Transition	Silver	ELY-SS-SA-01 (0-2)	1.9	560	0.00339
Transition	Silver	ELY-SS-TZ-06 (1-12)	1.9	560	0.00339
Transition	Silver	TP-15X-073009AD	1.8	560	0.00321
Transition	Silver	ELY-SS-TR-02D (2-12) DUP	1.7	560	0.00304
Transition	Silver	ELY-SS-TR-06C (3-12)	1.7	560	0.00304
Transition	Silver	ELY-SS-TR-02B (4-11)	1.6	560	0.00286
Transition	Silver	SS-27X-082609AX	1.6	560	0.00286
Transition	Silver	ELY-SS-NF-05 (0-3)	1.5	560	0.00268
Transition	Silver	SS-02X-090209AX	1.5	560	0.00268
Transition	Silver	SS-09X-090209AX	1.5	560	0.00268
Transition	Silver	SS-14X-083109AX	1.5	560	0.00268
Transition	Silver	ELY-SS-TR-02D (2-12)	1.4	560	0.00250
Transition	Silver	ELY-SS-TZ-30 (0-0.5)	1.4	560	0.00250
Transition	Silver	ELY-SS-TZ-31 (3-9)	1.4	560	0.00250
Transition	Silver	TO-05X-082709AX	1.4	560	0.00250
Transition	Silver	TQ-06X-082609AX	1.4	560	0.00250
Transition	Silver	ELY-SS-NF-09 (1.5-12)	1.3	560	0.00232
Transition	Silver	ELY-SS-TZ-21 (0-5)	1.3	560	0.00232
Transition	Silver	ELY-SS-TZ-40 (0-2)	1.3	560	0.00232
Transition	Silver	ELY-SS-TZ-12 (3-8)	1.2	560	0.00214
Transition	Silver	ELY-SS-TZ-30 (0.5-12)	1.2	560	0.00214
Transition	Silver	SS-08X-090209AX	1.1	560	0.00196
Transition	Silver	ELY-SS-NF-03 (4-12)	1	560	0.00179
Transition	Silver	ELY-SS-NF-13 (2.5-12)	1	560	0.00179
Transition	Silver	ELY-SS-TR-02B (0-4)	1	560	0.00179
Transition	Silver	ELY-SS-TR-05C (0-1)	0.91	560	0.00163
Transition	Silver	ELY-SS-TZ-34 (0-2.5)	0.9	560	0.00161
Transition	Silver	ELY-SS-TZ-15 (3.5-12)	0.87	560	0.00155
Transition	Silver	SS-10X-090309AX	0.86	560	0.00154
Transition	Silver	ELY-SS-TR-04C (0-3)	0.83	560	0.00148
Transition	Silver	ELY-SS-TZ-36 (1.5-9)	0.83	560	0.00148
Transition	Silver	SS-25X-082709AX	0.77	560	0.00138
Transition	Silver	ELY-SS-TZ-21 (5-12)	0.73	560	0.00130
Transition	Silver	SS-29X-083109AX	0.73	560	0.00130
Transition	Silver	ELY-SS-TR-02A (1.5-11)	0.71	560	0.00127
Transition	Silver	ELY-SS-TR-08D (0-2) DUP	0.65	560	0.00116

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Silver	ELY-SS-NF-15 (0-2)	0.62	560	0.00111
Transition	Silver	ELY-SS-TR-03C (3-12)	0.55	560	<0.001
Transition	Silver	ELY-SS-TZ-23 (0-2.5)	0.55	560	<0.001
Transition	Silver	ELY-SS-TZ-42 (0-2)	0.55	560	<0.001
Transition	Silver	SS-03X-090209AX	0.54	560	<0.001
Transition	Silver	ELY-SS-TR-07B (2-8)	0.53	560	<0.001
Transition	Silver	ELY-SS-TR-08D (0-2)	0.52	560	<0.001
Transition	Silver	ELY-SS-TZ-34 (2.5-8)	0.51	560	<0.001
Transition	Silver	SS-19X-082709AX	0.51	560	<0.001
Transition	Silver	SS-24X-083109AX	0.51	560	<0.001
Transition	Silver	SS-28X-083109AX	0.5	560	<0.001
Transition	Silver	ELY-SS-TR-07D (0-2)	0.49	560	<0.001
Transition	Silver	SS-04X-090209AX	0.45	560	<0.001
Transition	Silver	SS-20X-083109AX	0.42	560	<0.001
Transition	Silver	SS-23X-082709AX	0.41	560	<0.001
Transition	Silver	SS-15X-083109AX	0.4	560	<0.001
Transition	Silver	ELY-SS-TR-02C (3-12)	0.38	560	<0.001
Transition	Silver	TP-10X-082709AX	0.38	560	<0.001
Transition	Silver	TQ-16X-082609AX	0.38	560	<0.001
Transition	Silver	SS-26X-083109AX	0.36	560	<0.001
Transition	Silver	ELY-SS-NF-17 (0-4)	0.35	560	<0.001
Transition	Silver	TA-14X-082409AX	0.35	560	<0.001
Transition	Silver	ELY-SS-NF-01 (2-7)	0.33	560	<0.001
Transition	Silver	ELY-SS-NF-02 (0-8)	0.33	560	<0.001
Transition	Silver	ELY-SS-NF-14 (0-3)	0.33	560	<0.001
Transition	Silver	ELY-SS-TZ-40 (2-10)	0.33	560	<0.001
Transition	Silver	SS-06X-090209AX	0.33	560	<0.001
Transition	Silver	SS-05X-090209AX	0.32	560	<0.001
Transition	Silver	ELY-SS-TR-04B (0-1.5)	0.31	560	<0.001
Transition	Silver	ELY-SS-NF-04 (0-4)	0.3	560	<0.001
Transition	Silver	ELY-SS-TR-07C (2-12)	0.29	560	<0.001
Transition	Silver	TA-04X-082409AX	0.29	560	<0.001
Transition	Silver	TL-04X-082509AX	0.28	560	<0.001
Transition	Silver	ELY-SS-NF-16 (0-1)	0.27	560	<0.001
Transition	Silver	TI-03X-082509AX	0.27	560	<0.001
Transition	Silver	ELY-SS-NF-04 (4-10) DUP	0.23	560	<0.001
Transition	Silver	ELY-SS-NF-04 (0-4) DUP	0.21	560	<0.001
Transition	Silver	ELY-SS-NF-15 (2-5)	0.21	560	<0.001
Transition	Silver	TG-02X-082409AX	0.18	560	<0.001
Transition	Silver	ELY-SS-NF-03 (0-4)	0.17	560	<0.001
Transition	Silver	ELY-SS-NF-07 (0-2)	0.17	560	<0.001
Transition	Silver	TN-02X-082509AD	0.17	560	<0.001
Transition	Silver	ELY-SS-NF-16 (1-12)	0.16	560	<0.001
Transition	Silver	ELY-SS-TR-07D (2-9)	0.16	560	<0.001
Transition	Silver	SS-21X-083109AX	0.16	560	<0.001
Transition	Silver	TN-02X-082509AX	0.16	560	<0.001
Transition	Silver	ELY-SS-TZ-42 (2-12)	0.13	560	<0.001
Transition	Silver	ELY-SS-TR-04B (1.5-12)	0.12	560	<0.001
Transition	Silver	ELY-SS-NF-04 (4-10)	0.11	560	<0.001
Transition	Silver	ELY-SS-TR-05C (1-12)	0.11	560	<0.001
Transition	Thallium	ELY-TP-109 (0-1)	16	0.01	1600
Transition	Thallium	ELY-SS-TR-03B (2-12)	13	0.01	1300
Transition	Thallium	ELY-SS-TZ-14 (4-12)	13	0.01	1300
Transition	Thallium	ELY-SS-TZ-16 (4-12)	11	0.01	1100
Transition	Thallium	ELY-SS-TZ-14 (0-4)	7.6	0.01	760
Transition	Thallium	ELY-SS-TR-08A (0.5-12)DUP	7.2	0.01	720
Transition	Thallium	ELY-SS-TR-08A (0.5-12)	6.9	0.01	690
Transition	Thallium	ELY-SS-TZ-39 (3-8)	6.8	0.01	680
Transition	Thallium	ELY-SS-TR-03B (0-2)	6.4	0.01	640
Transition	Thallium	ELY-SS-SA-06 (0-6)	5.9	0.01	590
Transition	Thallium	ELY-SS-SA-09 (0-4)	5.3	0.01	530
Transition	Thallium	ELY-SS-TR-08A (0-0.5) DUP	5.2	0.01	520
Transition	Thallium	ELY-SS-NF-09 (0-1.5)	5	0.01	500
Transition	Thallium	ELY-SS-TR-02D (2-12)	4.9	0.01	490
Transition	Thallium	ELY-SS-SA-04 (0-6)	4.4	0.01	440

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Thallium	ELY-SS-TR-02D(0-2) DUP	4.4	0.01	440
Transition	Thallium	ELY-SS-TR-02D (2-12) DUP	4.1	0.01	410
Transition	Thallium	ELY-SS-TZ-11 (1-5.5)	4	0.01	400
Transition	Thallium	ELY-SS-TZ-21 (5-12)	3.8	0.01	380
Transition	Thallium	ELY-SS-TR-08C (5-12) DUP	3.5	0.01	350
Transition	Thallium	SS-13X-082809AX	3.2	0.01	320
Transition	Thallium	ELY-SS-NF-04 (0-4)	3	0.01	300
Transition	Thallium	ELY-SS-TZ-38 (0.5-7)	3	0.01	300
Transition	Thallium	ELY-SS-NF-06 (3-12)	2.9	0.01	290
Transition	Thallium	ELY-SS-TR-05D (0-3)	2.8	0.01	280
Transition	Thallium	ELY-SS-TR-02D (0-2)	2.7	0.01	270
Transition	Thallium	ELY-SS-TR-07B (0-2)	2.4	0.01	240
Transition	Thallium	ELY-SS-TZ-18 (.5-12)	2.4	0.01	240
Transition	Thallium	ELY-SS-TR-05C (0-1)	2.2	0.01	220
Transition	Thallium	ELY-SS-TZ-15 (3.5-12)	2.2	0.01	220
Transition	Thallium	ELY-SS-TZ-23 (2.5-12)	2.2	0.01	220
Transition	Thallium	ELY-SS-NF-04 (4-10)	2.1	0.01	210
Transition	Thallium	ELY-SS-TR-08C (5-12)	1.9	0.01	190
Transition	Thallium	ELY-SS-TZ-15 (0-3.5)	1.7	0.01	170
Transition	Thallium	ELY-SS-TZ-43 (0-2.5)	1.5	0.01	150
Transition	Thallium	ELY-SS-TR-05C (1-12)	1.4	0.01	140
Transition	Thallium	ELY-SS-TZ-11 (0-1)	1.4	0.01	140
Transition	Thallium	ELY-SS-TZ-43 (2.5-11)	1.4	0.01	140
Transition	Thallium	ELY-SS-TZ-31 (0-3)	1.3	0.01	130
Transition	Thallium	ELY-SS-NF-07 (2-8)	1.2	0.01	120
Transition	Thallium	ELY-SS-NF-07 (0-2)	1.1	0.01	110
Transition	Thallium	ELY-SS-TR-02A (0-1.5)	1	0.01	100
Transition	Thallium	ELY-SS-TZ-42 (2-12)	1	0.01	100
Transition	Thallium	ELY-SS-NF-17 (0-4)	0.45	0.01	45.0
Transition	Thallium	SS-27X-082609AX	0.44	0.01	44.0
Transition	Thallium	SS-11X-090309AX	0.35	0.01	35.0
Transition	Thallium	TP-15X-073009AX	0.34	0.01	34.0
Transition	Thallium	SS-18X-082709AX	0.3	0.01	30.0
Transition	Thallium	TP-15X-073009AD	0.27	0.01	27.0
Transition	Thallium	SS-02X-090209AX	0.24	0.01	24.0
Transition	Thallium	SS-25X-082709AX	0.21	0.01	21.0
Transition	Thallium	SS-26X-083109AX	0.21	0.01	21.0
Transition	Thallium	SS-09X-090209AX	0.19	0.01	19.0
Transition	Thallium	SS-01X-090209AX	0.18	0.01	18.0
Transition	Thallium	SS-03X-090209AX	0.18	0.01	18.0
Transition	Thallium	SS-22X-082709AX	0.18	0.01	18.0
Transition	Thallium	TI-03X-082509AX	0.18	0.01	18.0
Transition	Thallium	TK-01X-082509AX	0.18	0.01	18.0
Transition	Thallium	TA-14X-082409AX	0.17	0.01	17.0
Transition	Thallium	TL-04X-082509AX	0.17	0.01	17.0
Transition	Thallium	TO-05X-082709AX	0.17	0.01	17.0
Transition	Thallium	SS-07X-090209AX	0.16	0.01	16.0
Transition	Thallium	SS-10X-090309AX	0.16	0.01	16.0
Transition	Thallium	SS-16X-090309AX	0.16	0.01	16.0
Transition	Thallium	TQ-16X-082609AX	0.16	0.01	16.0
Transition	Thallium	SS-29X-083109AX	0.15	0.01	15.0
Transition	Thallium	SS-06X-090209AX	0.14	0.01	14.0
Transition	Thallium	TN-02X-082509AD	0.13	0.01	13.0
Transition	Thallium	TQ-06X-082609AX	0.12	0.01	12.0
Transition	Thallium	SS-04X-090209AX	0.11	0.01	11.0
Transition	Thallium	SS-08X-090209AX	0.11	0.01	11.0
Transition	Thallium	TP-10X-082709AX	0.11	0.01	11.0
Transition	Thallium	SS-28X-083109AX	0.1	0.01	10.0
Transition	Thallium	TA-04X-082409AX	0.1	0.01	10.0
Transition	Thallium	TC-03X-082609AX	0.1	0.01	10.0
Transition	Thallium	TN-02X-082509AX	0.1	0.01	10.0
Transition	Thallium	SS-17X-083109AX	0.098	0.01	9.80
Transition	Thallium	SS-05X-090209AX	0.096	0.01	9.60
Transition	Thallium	SS-24X-083109AX	0.091	0.01	9.10
Transition	Thallium	SS-23X-082709AX	0.081	0.01	8.10

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Thallium	TG-02X-082409AX	0.078	0.01	7.80
Transition	Thallium	SS-14X-083109AX	0.07	0.01	7.00
Transition	Thallium	SS-19X-082709AX	0.069	0.01	6.90
Transition	Thallium	SS-12X-090309AX	0.043	0.01	4.30
Transition	Thallium	SS-20X-083109AX	0.024	0.01	2.40
Transition	Thallium	SS-21X-083109AX	0.02	0.01	2.00
Transition	Vanadium	ELY-SS-NF-03 (4-12)	400	2	200
Transition	Vanadium	ELY-SS-TZ-39 (3-8)	130	2	65.0
Transition	Vanadium	SS-11X-090309AX	128	2	64.0
Transition	Vanadium	ELY-SS-TR-03B (2-12)	120	2	60.0
Transition	Vanadium	ELY-SS-TR-08C (5-12)	120	2	60.0
Transition	Vanadium	ELY-SS-TR-08C (5-12) DUP	120	2	60.0
Transition	Vanadium	ELY-SS-TZ-29 (1-9)	120	2	60.0
Transition	Vanadium	ELY-SS-NF-04 (0-4)	110	2	55.0
Transition	Vanadium	ELY-SS-SA-23 (0-6)	110	2	55.0
Transition	Vanadium	ELY-SS-TR-08C (0-5) DUP	110	2	55.0
Transition	Vanadium	ELY-SS-TZ-16 (4-12)	110	2	55.0
Transition	Vanadium	ELY-SS-TR-05D (3-12)	100	2	50.0
Transition	Vanadium	ELY-SS-TZ-14 (4-12)	99	2	49.5
Transition	Vanadium	ELY-SS-TZ-29 (0-1)	86	2	43.0
Transition	Vanadium	ELY-SS-SA-06 (0-6)	85	2	42.5
Transition	Vanadium	ELY-SS-TZ-37 (2-12)	85	2	42.5
Transition	Vanadium	ELY-SS-TZ-27 (0-2.5)	84	2	42.0
Transition	Vanadium	ELY-SS-TR-02D(0-2) DUP	82	2	41.0
Transition	Vanadium	ELY-SS-TR-04C (3-6)	80	2	40.0
Transition	Vanadium	ELY-SS-TR-08C (0-5)	78	2	39.0
Transition	Vanadium	ELY-SS-TZ-21 (5-12)	76	2	38.0
Transition	Vanadium	ELY-SS-NF-09 (0-1.5)	71	2	35.5
Transition	Vanadium	ELY-SS-TR-05C (1-12)	71	2	35.5
Transition	Vanadium	ELY-SS-TR-08A (0.5-12)	68	2	34.0
Transition	Vanadium	ELY-SS-SA-09 (0-4)	67	2	33.5
Transition	Vanadium	ELY-SS-TR-08A (0.5-12)DUP	67	2	33.5
Transition	Vanadium	ELY-SS-TR-08A (0-0.5) DUP	67	2	33.5
Transition	Vanadium	ELY-SS-TR-05D (0-3)	66	2	33.0
Transition	Vanadium	TP-15X-073009AX	63.9	2	32.0
Transition	Vanadium	ELY-SS-TR-07B (0-2)	63	2	31.5
Transition	Vanadium	ELY-SS-TR-08A (0-0.5)	62	2	31.0
Transition	Vanadium	SS-09X-090209AX	61.6	2	30.8
Transition	Vanadium	ELY-SS-TZ-27 (2.5-8)	60	2	30.0
Transition	Vanadium	ELY-SS-NF-10 (4-12)	59	2	29.5
Transition	Vanadium	ELY-SS-NF-11 (0-3)	59	2	29.5
Transition	Vanadium	ELY-SS-TZ-34 (2.5-8)	59	2	29.5
Transition	Vanadium	SS-28X-083109AX	58.2	2	29.1
Transition	Vanadium	ELY-SS-TR-06A (0-1)	58	2	29.0
Transition	Vanadium	ELY-SS-TZ-35 (2-9)	57	2	28.5
Transition	Vanadium	ELY-SS-NF-04 (4-10)	56	2	28.0
Transition	Vanadium	ELY-SS-NF-13 (2.5-12)	56	2	28.0
Transition	Vanadium	TP-15X-073009AD	55.3	2	27.7
Transition	Vanadium	TO-05X-082709AX	55.2	2	27.6
Transition	Vanadium	ELY-SS-NF-15 (2-5)	55	2	27.5
Transition	Vanadium	ELY-SS-TR-06A (1-12)	55	2	27.5
Transition	Vanadium	ELY-SS-TR-09C (1.5-8)	55	2	27.5
Transition	Vanadium	ELY-SS-TR-09D (3-12)	55	2	27.5
Transition	Vanadium	ELY-SS-TZ-14 (0-4)	55	2	27.5
Transition	Vanadium	SS-16X-090309AX	54.8	2	27.4
Transition	Vanadium	SS-05X-090209AX	53.5	2	26.8
Transition	Vanadium	ELY-SS-NF-04 (4-10) DUP	53	2	26.5
Transition	Vanadium	TQ-06X-082609AX	52.8	2	26.4
Transition	Vanadium	ELY-SS-NF-07 (0-2)	52	2	26.0
Transition	Vanadium	ELY-SS-NF-17 (4-10)	52	2	26.0
Transition	Vanadium	ELY-SS-TZ-36 (1.5-9)	52	2	26.0
Transition	Vanadium	SS-03X-090209AX	51.1	2	25.6
Transition	Vanadium	ELY-SS-TR-06C (0-3)	51	2	25.5
Transition	Vanadium	ELY-SS-TZ-30 (0.5-12)	51	2	25.5
Transition	Vanadium	ELY-TP-109 (0-1)	51	2	25.5

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Vanadium	TQ-16X-082609AX	50.5	2	25.3
Transition	Vanadium	ELY-SS-NF-11 (3-9)	50	2	25.0
Transition	Vanadium	ELY-SS-TR-06C (3-12)	50	2	25.0
Transition	Vanadium	ELY-SS-NF-01 (2-7)	49	2	24.5
Transition	Vanadium	ELY-SS-TR-05C (0-1)	49	2	24.5
Transition	Vanadium	ELY-SS-TR-07B (2-8)	49	2	24.5
Transition	Vanadium	TC-03X-082609AX	48.6	2	24.3
Transition	Vanadium	TN-02X-082509AD	48.3	2	24.2
Transition	Vanadium	ELY-SS-NF-12 (2-9)	48	2	24.0
Transition	Vanadium	ELY-SS-TR-06B (3-7)	48	2	24.0
Transition	Vanadium	SS-01X-090209AX	47.6	2	23.8
Transition	Vanadium	SS-06X-090209AX	47.5	2	23.8
Transition	Vanadium	TP-10X-082709AX	47.5	2	23.8
Transition	Vanadium	ELY-SS-NF-09 (1.5-12)	47	2	23.5
Transition	Vanadium	ELY-SS-NF-13 (0-2.5)	47	2	23.5
Transition	Vanadium	ELY-SS-TR-04B (1.5-12)	47	2	23.5
Transition	Vanadium	ELY-SS-TZ-06 (1-12)	47	2	23.5
Transition	Vanadium	SS-07X-090209AX	46.3	2	23.2
Transition	Vanadium	SS-17X-083109AX	46.3	2	23.2
Transition	Vanadium	ELY-SS-TZ-15 (3.5-12)	46	2	23.0
Transition	Vanadium	TL-04X-082509AX	46	2	23.0
Transition	Vanadium	ELY-SS-TZ-42 (2-12)	45	2	22.5
Transition	Vanadium	ELY-SS-NF-10 (0-4)	44	2	22.0
Transition	Vanadium	ELY-SS-TR-06B (0-3)	44	2	22.0
Transition	Vanadium	ELY-SS-TZ-18 (.5-12)	44	2	22.0
Transition	Vanadium	ELY-SS-TZ-23 (2.5-12)	44	2	22.0
Transition	Vanadium	ELY-SS-TZ-39 (0-3)	44	2	22.0
Transition	Vanadium	SS-02X-090209AX	43.2	2	21.6
Transition	Vanadium	SS-26X-083109AX	43.2	2	21.6
Transition	Vanadium	ELY-SS-TR-02D (0-2)	43	2	21.5
Transition	Vanadium	ELY-SS-TZ-06 (0-1)	43	2	21.5
Transition	Vanadium	ELY-SS-TZ-21 (0-5)	43	2	21.5
Transition	Vanadium	SS-29X-083109AX	42.9	2	21.5
Transition	Vanadium	ELY-SS-TR-07C (2-12)	42	2	21.0
Transition	Vanadium	ELY-SS-TR-09B (2-5)	42	2	21.0
Transition	Vanadium	ELY-SS-TR-09C (0-1.5)	41	2	20.5
Transition	Vanadium	ELY-SS-TZ-31 (0-3)	41	2	20.5
Transition	Vanadium	ELY-SS-TZ-43 (2.5-11)	41	2	20.5
Transition	Vanadium	ELY-SS-TZ-36 (0-1.5)	40	2	20.0
Transition	Vanadium	TI-03X-082509AX	39.6	2	19.8
Transition	Vanadium	SS-04X-090209AX	39.2	2	19.6
Transition	Vanadium	SS-22X-082709AX	39.2	2	19.6
Transition	Vanadium	ELY-SS-NF-07 (2-8)	39	2	19.5
Transition	Vanadium	ELY-SS-NF-08 (0-2)	39	2	19.5
Transition	Vanadium	ELY-SS-TR-03C (3-12)	39	2	19.5
Transition	Vanadium	ELY-SS-TZ-30 (0-0.5)	39	2	19.5
Transition	Vanadium	SS-14X-083109AX	38.2	2	19.1
Transition	Vanadium	ELY-SS-NF-14 (3-12)	38	2	19.0
Transition	Vanadium	ELY-SS-NF-16 (1-12)	38	2	19.0
Transition	Vanadium	ELY-SS-TR-07D (2-9)	38	2	19.0
Transition	Vanadium	ELY-SS-TZ-31 (3-9)	38	2	19.0
Transition	Vanadium	TN-02X-082509AX	37.9	2	19.0
Transition	Vanadium	TG-02X-082409AX	37.6	2	18.8
Transition	Vanadium	ELY-SS-TZ-35 (0-2)	37	2	18.5
Transition	Vanadium	ELY-SS-TZ-38 (0.5-7)	37	2	18.5
Transition	Vanadium	ELY-SS-NF-05 (0-3)	36	2	18.0
Transition	Vanadium	ELY-SS-TZ-11 (1-5.5)	36	2	18.0
Transition	Vanadium	SS-23X-082709AX	36	2	18.0
Transition	Vanadium	SS-08X-090209AX	35.2	2	17.6
Transition	Vanadium	ELY-SS-TR-08D (2-12) DUP	35	2	17.5
Transition	Vanadium	ELY-SS-TZ-42 (0-2)	35	2	17.5
Transition	Vanadium	TA-14X-082409AX	34.9	2	17.5
Transition	Vanadium	ELY-SS-NF-02 (0-8)	34	2	17.0
Transition	Vanadium	ELY-SS-TR-08D (2-12)	34	2	17.0
Transition	Vanadium	TK-01X-082509AX	33.8	2	16.9

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Vanadium	TF-13X-090909BX	33.6	2	16.8
Transition	Vanadium	ELY-SS-NF-06 (3-12)	33	2	16.5
Transition	Vanadium	ELY-SS-TR-02D (2-12)	33	2	16.5
Transition	Vanadium	ELY-SS-TR-02D (2-12) DUP	33	2	16.5
Transition	Vanadium	ELY-SS-NF-06 (0-3)	32	2	16.0
Transition	Vanadium	ELY-SS-NF-08 (2-11)	32	2	16.0
Transition	Vanadium	ELY-SS-NF-12 (0-2)	32	2	16.0
Transition	Vanadium	ELY-SS-NF-14 (0-3)	32	2	16.0
Transition	Vanadium	ELY-SS-TZ-12 (3-8)	32	2	16.0
Transition	Vanadium	ELY-SS-TZ-37 (0-2)	32	2	16.0
Transition	Vanadium	SS-10X-090309AX	31.4	2	15.7
Transition	Vanadium	TA-04X-082409AX	31.3	2	15.7
Transition	Vanadium	SS-20X-083109AX	31.1	2	15.6
Transition	Vanadium	ELY-SS-TR-07D (0-2)	31	2	15.5
Transition	Vanadium	ELY-SS-TR-02C (0-3)	30	2	15.0
Transition	Vanadium	ELY-SS-TZ-43 (0-2.5)	30	2	15.0
Transition	Vanadium	ELY-SS-TZ-40 (2-10)	28	2	14.0
Transition	Vanadium	ELY-SS-SA-04 (0-6)	27	2	13.5
Transition	Vanadium	ELY-SS-NF-15 (0-2)	26	2	13.0
Transition	Vanadium	ELY-SS-TR-08D (0-2) DUP	26	2	13.0
Transition	Vanadium	ELY-SS-TZ-15 (0-3.5)	26	2	13.0
Transition	Vanadium	ELY-TP-104 (0-1)	26	2	13.0
Transition	Vanadium	SS-25X-082709AX	25.4	2	12.7
Transition	Vanadium	ELY-SS-TR-04C (0-3)	25	2	12.5
Transition	Vanadium	ELY-SS-TZ-11 (0-1)	25	2	12.5
Transition	Vanadium	ELY-SS-NF-05 (3-11)	23	2	11.5
Transition	Vanadium	ELY-SS-SA-01 (0-2)	21	2	10.5
Transition	Vanadium	ELY-SS-TR-02C (3-12)	21	2	10.5
Transition	Vanadium	SS-13X-082809AX	20.6	2	10.3
Transition	Vanadium	SS-24X-083109AX	20.5	2	10.3
Transition	Vanadium	SS-21X-083109AX	20.3	2	10.2
Transition	Vanadium	ELY-SS-TR-02B (4-11)	20	2	10.0
Transition	Vanadium	ELY-SS-TZ-18 (0-.5)	20	2	10.0
Transition	Vanadium	ELY-SS-TR-02A (1.5-11)	19	2	9.50
Transition	Vanadium	ELY-SS-TZ-38 (0-0.5)	19	2	9.50
Transition	Vanadium	SS-12X-090309AX	18.3	2	9.15
Transition	Vanadium	ELY-SS-TR-08D (0-2)	18	2	9.00
Transition	Vanadium	SS-19X-082709AX	16.1	2	8.05
Transition	Vanadium	ELY-SS-TZ-40 (0-2)	16	2	8.00
Transition	Vanadium	ELY-SS-TR-07C (0-2)	15	2	7.50
Transition	Vanadium	SS-27X-082609AX	14.4	2	7.20
Transition	Vanadium	ELY-SS-TZ-12 (0-3)	14	2	7.00
Transition	Vanadium	SS-18X-082709AX	13.5	2	6.75
Transition	Vanadium	ELY-SS-TZ-34 (0-2.5)	13	2	6.50
Transition	Vanadium	SS-15X-083109AX	12.9	2	6.45
Transition	Vanadium	ELY-SS-NF-16 (0-1)	12	2	6.00
Transition	Vanadium	ELY-SS-TZ-23 (0-2.5)	11	2	5.50
Transition	Vanadium	ELY-SS-TZ-16 (0-4)	9.7	2	4.85
Transition	Vanadium	ELY-SS-TR-02A (0-1.5)	9.6	2	4.80
Transition	Vanadium	ELY-SS-TR-09B (0-2)	9.4	2	4.70
Transition	Vanadium	ELY-SS-TR-03B (0-2)	9.3	2	4.65
Transition	Vanadium	ELY-SS-NF-17 (0-4)	8	2	4.00
Transition	Vanadium	ELY-SS-TR-09D (0-3)	7.4	2	3.70
Transition	Vanadium	ELY-SS-TR-02B (0-4)	7.3	2	3.65
Transition	Vanadium	ELY-SS-NF-03 (0-4)	7.2	2	3.60
Transition	Vanadium	ELY-SS-TR-04B (0-1.5)	7.2	2	3.60
Transition	Vanadium	ELY-SS-NF-04 (0-4) DUP	6	2	3.00
Transition	Vanadium	ELY-SS-TR-03C (0-3)	5.2	2	2.60
Transition	Zinc	ELY-SS-TR-02D (2-12) DUP	1500	160	9.38
Transition	Zinc	ELY-SS-TR-02D (2-12)	1000	160	6.25
Transition	Zinc	ELY-SS-SA-09 (0-4)	730	160	4.56
Transition	Zinc	ELY-TP-104 (0-1)	560	160	3.50
Transition	Zinc	ELY-SS-TZ-11 (1-5.5)	550	160	3.44
Transition	Zinc	ELY-SS-NF-05 (3-11)	470	160	2.94
Transition	Zinc	ELY-SS-NF-03 (4-12)	460	160	2.88

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Zinc	ELY-SS-NF-05 (0-3)	360	160	2.25
Transition	Zinc	ELY-SS-TZ-40 (0-2)	330	160	2.06
Transition	Zinc	ELY-SS-TR-03B (0-2)	320	160	2.00
Transition	Zinc	ELY-SS-SA-01 (0-2)	310	160	1.94
Transition	Zinc	ELY-SS-SA-04 (0-6)	300	160	1.88
Transition	Zinc	ELY-SS-TR-03B (2-12)	280	160	1.75
Transition	Zinc	SS-26X-083109AX	225	160	1.41
Transition	Zinc	ELY-SS-TR-02A (1.5-11)	210	160	1.31
Transition	Zinc	ELY-SS-TR-02D(0-2) DUP	200	160	1.25
Transition	Zinc	ELY-SS-TZ-11 (0-1)	200	160	1.25
Transition	Zinc	SS-29X-083109AX	195	160	1.22
Transition	Zinc	ELY-SS-SA-06 (0-6)	190	160	1.19
Transition	Zinc	ELY-SS-TR-08D (0-2)	190	160	1.19
Transition	Zinc	ELY-SS-TZ-16 (4-12)	190	160	1.19
Transition	Zinc	ELY-SS-TZ-38 (0-0.5)	190	160	1.19
Transition	Zinc	ELY-SS-TR-02B (0-4)	180	160	1.13
Transition	Zinc	ELY-SS-TZ-06 (1-12)	180	160	1.13
Transition	Zinc	ELY-SS-TZ-34 (0-2.5)	180	160	1.13
Transition	Zinc	ELY-SS-TR-02D (0-2)	170	160	1.06
Transition	Zinc	ELY-SS-TR-06A (1-12)	170	160	1.06
Transition	Zinc	ELY-SS-TZ-27 (0-2.5)	170	160	1.06
Transition	Zinc	SS-11X-090309AX	164	160	1.03
Transition	Zinc	ELY-SS-TR-04C (0-3)	160	160	1.00
Transition	Zinc	ELY-SS-TZ-14 (0-4)	160	160	1.00
Transition	Zinc	ELY-SS-TZ-29 (1-9)	160	160	1.00
Transition	Zinc	SS-19X-082709AX	160	160	1.00
Transition	Zinc	ELY-SS-NF-03 (0-4)	150	160	0.938
Transition	Zinc	ELY-SS-TR-02C (3-12)	150	160	0.938
Transition	Zinc	ELY-SS-NF-15 (0-2)	140	160	0.875
Transition	Zinc	ELY-SS-SA-23 (0-6)	140	160	0.875
Transition	Zinc	ELY-SS-TR-08C (0-5) DUP	140	160	0.875
Transition	Zinc	ELY-SS-TZ-06 (0-1)	140	160	0.875
Transition	Zinc	ELY-SS-TZ-29 (0-1)	140	160	0.875
Transition	Zinc	TA-14X-082409AX	136	160	0.850
Transition	Zinc	ELY-SS-NF-09 (0-1.5)	130	160	0.813
Transition	Zinc	ELY-SS-TR-04C (3-6)	130	160	0.813
Transition	Zinc	ELY-SS-TR-08C (5-12)	130	160	0.813
Transition	Zinc	ELY-SS-TZ-21 (5-12)	130	160	0.813
Transition	Zinc	ELY-SS-TZ-42 (0-2)	130	160	0.813
Transition	Zinc	ELY-TP-109 (0-1)	130	160	0.813
Transition	Zinc	SS-10X-090309AX	129	160	0.806
Transition	Zinc	SS-14X-083109AX	122	160	0.763
Transition	Zinc	SS-24X-083109AX	122	160	0.763
Transition	Zinc	ELY-SS-NF-08 (2-11)	120	160	0.750
Transition	Zinc	ELY-SS-NF-11 (0-3)	120	160	0.750
Transition	Zinc	ELY-SS-NF-17 (0-4)	120	160	0.750
Transition	Zinc	ELY-SS-TR-02B (4-11)	120	160	0.750
Transition	Zinc	ELY-SS-TR-02C (0-3)	120	160	0.750
Transition	Zinc	ELY-SS-TR-05C (1-12)	120	160	0.750
Transition	Zinc	ELY-SS-TR-07B (0-2)	120	160	0.750
Transition	Zinc	ELY-SS-TR-08A (0-0.5)	120	160	0.750
Transition	Zinc	ELY-SS-TR-08C (5-12) DUP	120	160	0.750
Transition	Zinc	SS-17X-083109AX	113	160	0.706
Transition	Zinc	TA-04X-082409AX	113	160	0.706
Transition	Zinc	ELY-SS-NF-06 (0-3)	110	160	0.688
Transition	Zinc	ELY-SS-NF-13 (0-2.5)	110	160	0.688
Transition	Zinc	ELY-SS-TR-08A (0-0.5) DUP	110	160	0.688
Transition	Zinc	ELY-SS-TZ-34 (2.5-8)	110	160	0.688
Transition	Zinc	SS-01X-090209AX	108	160	0.675
Transition	Zinc	TF-13X-090909BX	107	160	0.669
Transition	Zinc	SS-22X-082709AX	103	160	0.644
Transition	Zinc	ELY-SS-TR-02A (0-1.5)	100	160	0.625
Transition	Zinc	ELY-SS-TR-05D (0-3)	100	160	0.625
Transition	Zinc	ELY-SS-TR-08C (0-5)	100	160	0.625
Transition	Zinc	ELY-SS-TR-08D (0-2) DUP	100	160	0.625

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Zinc	ELY-SS-TZ-12 (3-8)	100	160	0.625
Transition	Zinc	ELY-SS-NF-04 (0-4)	99	160	0.619
Transition	Zinc	ELY-SS-TR-08A (0.5-12)DUP	99	160	0.619
Transition	Zinc	SS-27X-082609AX	99	160	0.619
Transition	Zinc	SS-09X-090209AX	97.1	160	0.607
Transition	Zinc	ELY-SS-NF-06 (3-12)	97	160	0.606
Transition	Zinc	ELY-SS-TZ-14 (4-12)	97	160	0.606
Transition	Zinc	ELY-SS-TZ-37 (0-2)	97	160	0.606
Transition	Zinc	ELY-SS-TZ-39 (0-3)	97	160	0.606
Transition	Zinc	ELY-SS-TZ-39 (3-8)	95	160	0.594
Transition	Zinc	ELY-SS-NF-02 (0-8)	94	160	0.588
Transition	Zinc	ELY-SS-TR-06C (0-3)	93	160	0.581
Transition	Zinc	ELY-SS-TR-08A (0.5-12)	93	160	0.581
Transition	Zinc	ELY-SS-TZ-38 (0.5-7)	89	160	0.556
Transition	Zinc	ELY-SS-TZ-27 (2.5-8)	88	160	0.550
Transition	Zinc	ELY-SS-NF-13 (2.5-12)	87	160	0.544
Transition	Zinc	ELY-SS-TZ-30 (0-0.5)	86	160	0.538
Transition	Zinc	TO-05X-082709AX	85.7	160	0.536
Transition	Zinc	ELY-SS-TZ-21 (0-5)	82	160	0.513
Transition	Zinc	ELY-SS-TR-06C (3-12)	81	160	0.506
Transition	Zinc	ELY-SS-TR-09D (0-3)	80	160	0.500
Transition	Zinc	ELY-SS-NF-10 (0-4)	79	160	0.494
Transition	Zinc	ELY-SS-TZ-12 (0-3)	79	160	0.494
Transition	Zinc	ELY-SS-TR-07B (2-8)	78	160	0.488
Transition	Zinc	TI-03X-082509AX	77.5	160	0.484
Transition	Zinc	ELY-SS-TR-04B (1.5-12)	77	160	0.481
Transition	Zinc	ELY-SS-TR-06B (0-3)	77	160	0.481
Transition	Zinc	TP-10X-082709AX	76.1	160	0.476
Transition	Zinc	ELY-SS-TR-06A (0-1)	76	160	0.475
Transition	Zinc	TQ-16X-082609AX	76	160	0.475
Transition	Zinc	TK-01X-082509AX	75.1	160	0.469
Transition	Zinc	ELY-SS-TZ-16 (0-4)	75	160	0.469
Transition	Zinc	ELY-SS-TR-03C (3-12)	74	160	0.463
Transition	Zinc	SS-02X-090209AX	73.5	160	0.459
Transition	Zinc	ELY-SS-NF-14 (0-3)	72	160	0.450
Transition	Zinc	ELY-SS-TR-05C (0-1)	72	160	0.450
Transition	Zinc	TN-02X-082509AD	72	160	0.450
Transition	Zinc	SS-23X-082709AX	71.7	160	0.448
Transition	Zinc	ELY-SS-NF-04 (0-4) DUP	71	160	0.444
Transition	Zinc	ELY-SS-NF-16 (0-1)	71	160	0.444
Transition	Zinc	SS-15X-083109AX	69.2	160	0.433
Transition	Zinc	ELY-SS-TZ-36 (1.5-9)	69	160	0.431
Transition	Zinc	ELY-SS-TR-06B (3-7)	68	160	0.425
Transition	Zinc	SS-16X-090309AX	67.5	160	0.422
Transition	Zinc	ELY-SS-TZ-15 (0-3.5)	67	160	0.419
Transition	Zinc	ELY-SS-TZ-35 (2-9)	66	160	0.413
Transition	Zinc	ELY-SS-NF-11 (3-9)	64	160	0.400
Transition	Zinc	ELY-SS-TZ-30 (0.5-12)	64	160	0.400
Transition	Zinc	ELY-SS-TZ-18 (0-.5)	62	160	0.388
Transition	Zinc	ELY-SS-NF-09 (1.5-12)	61	160	0.381
Transition	Zinc	SS-28X-083109AX	60.1	160	0.376
Transition	Zinc	ELY-SS-NF-10 (4-12)	60	160	0.375
Transition	Zinc	ELY-SS-NF-12 (0-2)	60	160	0.375
Transition	Zinc	SS-20X-083109AX	59.5	160	0.372
Transition	Zinc	ELY-SS-TR-08D (2-12) DUP	59	160	0.369
Transition	Zinc	TN-02X-082509AX	58.6	160	0.366
Transition	Zinc	ELY-SS-TR-07D (0-2)	58	160	0.363
Transition	Zinc	ELY-SS-TR-07D (2-9)	58	160	0.363
Transition	Zinc	ELY-SS-TZ-43 (0-2.5)	58	160	0.363
Transition	Zinc	SS-06X-090209AX	56.8	160	0.355
Transition	Zinc	ELY-SS-NF-08 (0-2)	56	160	0.350
Transition	Zinc	ELY-SS-TR-07C (2-12)	56	160	0.350
Transition	Zinc	ELY-SS-TZ-31 (3-9)	56	160	0.350
Transition	Zinc	SS-03X-090209AX	55.8	160	0.349
Transition	Zinc	SS-07X-090209AX	55.6	160	0.348

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Zinc	TL-04X-082509AX	55.2	160	0.345
Transition	Zinc	ELY-SS-TR-09D (3-12)	55	160	0.344
Transition	Zinc	SS-08X-090209AX	54.5	160	0.341
Transition	Zinc	SS-18X-082709AX	52.8	160	0.330
Transition	Zinc	ELY-SS-NF-04 (4-10)	52	160	0.325
Transition	Zinc	ELY-SS-NF-15 (2-5)	52	160	0.325
Transition	Zinc	TP-15X-073009AX	51.2	160	0.320
Transition	Zinc	ELY-SS-TR-05D (3-12)	51	160	0.319
Transition	Zinc	TP-15X-073009AD	50.7	160	0.317
Transition	Zinc	ELY-SS-TR-07C (0-2)	50	160	0.313
Transition	Zinc	ELY-SS-TZ-15 (3.5-12)	50	160	0.313
Transition	Zinc	SS-13X-082809AX	49.2	160	0.308
Transition	Zinc	ELY-SS-TZ-23 (2.5-12)	49	160	0.306
Transition	Zinc	SS-04X-090209AX	47.1	160	0.294
Transition	Zinc	ELY-SS-TR-08D (2-12)	47	160	0.294
Transition	Zinc	ELY-SS-NF-17 (4-10)	46	160	0.288
Transition	Zinc	ELY-SS-TR-09B (2-5)	46	160	0.288
Transition	Zinc	ELY-SS-TZ-40 (2-10)	46	160	0.288
Transition	Zinc	ELY-SS-NF-07 (0-2)	45	160	0.281
Transition	Zinc	ELY-SS-TZ-18 (.5-12)	45	160	0.281
Transition	Zinc	ELY-SS-TZ-37 (2-12)	45	160	0.281
Transition	Zinc	ELY-SS-TZ-42 (2-12)	45	160	0.281
Transition	Zinc	ELY-SS-NF-04 (4-10) DUP	44	160	0.275
Transition	Zinc	ELY-SS-NF-12 (2-9)	44	160	0.275
Transition	Zinc	ELY-SS-NF-14 (3-12)	44	160	0.275
Transition	Zinc	ELY-SS-TZ-31 (0-3)	44	160	0.275
Transition	Zinc	ELY-SS-TZ-35 (0-2)	44	160	0.275
Transition	Zinc	TC-03X-082609AX	43.8	160	0.274
Transition	Zinc	SS-25X-082709AX	43.2	160	0.270
Transition	Zinc	ELY-SS-TR-09C (1.5-8)	43	160	0.269
Transition	Zinc	ELY-SS-NF-16 (1-12)	42	160	0.263
Transition	Zinc	ELY-SS-TZ-36 (0-1.5)	42	160	0.263
Transition	Zinc	SS-05X-090209AX	41.6	160	0.260
Transition	Zinc	ELY-SS-NF-01 (2-7)	40	160	0.250
Transition	Zinc	ELY-SS-TZ-23 (0-2.5)	40	160	0.250
Transition	Zinc	ELY-SS-TR-09C (0-1.5)	39	160	0.244
Transition	Zinc	ELY-SS-TZ-43 (2.5-11)	38	160	0.238
Transition	Zinc	TQ-06X-082609AX	38	160	0.238
Transition	Zinc	SS-12X-090309AX	37.2	160	0.233
Transition	Zinc	ELY-SS-TR-03C (0-3)	35	160	0.219
Transition	Zinc	ELY-SS-TR-04B (0-1.5)	35	160	0.219
Transition	Zinc	TG-02X-082409AX	30.3	160	0.189
Transition	Zinc	ELY-SS-TR-09B (0-2)	30	160	0.188
Transition	Zinc	SS-21X-083109AX	28.8	160	0.180
Transition	Zinc	ELY-SS-NF-07 (2-8)	24	160	0.150
Background	Arsenic	ELY-SS-BK-07B (0-3)	4.3	18	0.239
Background	Arsenic	ELY-SS-BK-07C (0-4)	3.4	18	0.189
Background	Arsenic	ELY-SS-BK-15C (0-2.5)	2.7	18	0.150
Background	Arsenic	ELY-SS-BK-08C (0-12)	2.6	18	0.144
Background	Arsenic	ELY-SS-BK-08A (0-10)	2.3	18	0.128
Background	Arsenic	ELY-SS-BK-15B (0-0.5)	2.2	18	0.122
Background	Arsenic	ELY-SS-BK-10B (0-1)	2.1	18	0.117
Background	Arsenic	ELY-SS-BK-10A (0-6)	1.9	18	0.106
Background	Arsenic	ELY-SS-BK-15A (0-2)	1.9	18	0.106
Background	Arsenic	ELY-SS-BK-14C (0-1)	1.8	18	0.100
Background	Arsenic	ELY-SS-BK-07A (0-3)	1.5	18	0.0833
Background	Arsenic	ELY-SS-BK-08B (0-7)	1.5	18	0.0833
Background	Arsenic	ELY-SS-BK-10C (0-6) DUP	1.4	18	0.0778
Background	Arsenic	ELY-SS-BK-14A (0-1)	1.3	18	0.0722
Background	Arsenic	ELY-SS-BK-14B (0-8)	1	18	0.0556
Background	Arsenic	ELY-SS-BK-10C (0-6)	0.91	18	0.0506
Background	Cadmium	ELY-SS-BK-07C (0-4)	0.52	32	0.0163
Background	Cadmium	ELY-SS-BK-15B (0-0.5)	0.52	32	0.0163
Background	Cadmium	ELY-SS-BK-08C (0-12)	0.4	32	0.0125
Background	Cadmium	ELY-SS-BK-15C (0-2.5)	0.32	32	0.0100

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Background	Cadmium	ELY-SS-BK-15A (0-2)	0.28	32	0.00875
Background	Cadmium	ELY-SS-BK-14C (0-1)	0.25	32	0.00781
Background	Cadmium	ELY-SS-BK-08B (0-7)	0.21	32	0.00656
Background	Cadmium	ELY-SS-BK-14B (0-8)	0.2	32	0.00625
Background	Chromium	ELY-SS-BK-07A (0-3)	32	0.018	1778
Background	Chromium	ELY-SS-BK-08C (0-12)	32	0.018	1778
Background	Chromium	ELY-SS-BK-10A (0-6)	30	0.018	1667
Background	Chromium	ELY-SS-BK-10B (0-1)	30	0.018	1667
Background	Chromium	ELY-SS-BK-10C (0-6) DUP	30	0.018	1667
Background	Chromium	ELY-SS-BK-14B (0-8)	29	0.018	1611
Background	Chromium	ELY-SS-BK-10C (0-6)	28	0.018	1556
Background	Chromium	ELY-SS-BK-08A (0-10)	24	0.018	1333
Background	Chromium	ELY-SS-BK-14C (0-1)	23	0.018	1278
Background	Chromium	ELY-SS-BK-07B (0-3)	22	0.018	1222
Background	Chromium	ELY-SS-BK-07C (0-4)	18	0.018	1000
Background	Chromium	ELY-SS-BK-14A (0-1)	18	0.018	1000
Background	Chromium	ELY-SS-BK-08B (0-7)	12	0.018	667
Background	Chromium	ELY-SS-BK-15B (0-0.5)	3.4	0.018	189
Background	Chromium	ELY-SS-BK-15C (0-2.5)	2.4	0.018	133
Background	Chromium	ELY-SS-BK-15A (0-2)	1.4	0.018	77.8
Background	Cobalt	ELY-SS-BK-07A (0-3)	16	13	1.23
Background	Cobalt	ELY-SS-BK-08C (0-12)	14	13	1.08
Background	Cobalt	ELY-SS-BK-07B (0-3)	8.7	13	0.669
Background	Cobalt	ELY-SS-BK-10C (0-6) DUP	8	13	0.615
Background	Cobalt	ELY-SS-BK-10A (0-6)	7.8	13	0.600
Background	Cobalt	ELY-SS-BK-08A (0-10)	7.7	13	0.592
Background	Cobalt	ELY-SS-BK-10B (0-1)	7.6	13	0.585
Background	Cobalt	ELY-SS-BK-07C (0-4)	7.4	13	0.569
Background	Cobalt	ELY-SS-BK-10C (0-6)	6.7	13	0.515
Background	Cobalt	ELY-SS-BK-14C (0-1)	5.9	13	0.454
Background	Cobalt	ELY-SS-BK-14A (0-1)	5.6	13	0.431
Background	Cobalt	ELY-SS-BK-08B (0-7)	4.6	13	0.354
Background	Cobalt	ELY-SS-BK-14B (0-8)	3.8	13	0.292
Background	Cobalt	ELY-SS-BK-15B (0-0.5)	1.3	13	0.100
Background	Cobalt	ELY-SS-BK-15C (0-2.5)	0.92	13	0.0708
Background	Cobalt	ELY-SS-BK-15A (0-2)	0.35	13	0.0269
Background	Copper	ELY-SS-BK-07A (0-3)	45	70	0.643
Background	Copper	ELY-SS-BK-07B (0-3)	26	70	0.371
Background	Copper	ELY-SS-BK-08C (0-12)	23	70	0.329
Background	Copper	ELY-SS-BK-07C (0-4)	20	70	0.286
Background	Copper	ELY-SS-BK-08A (0-10)	14	70	0.200
Background	Copper	ELY-SS-BK-10A (0-6)	14	70	0.200
Background	Copper	ELY-SS-BK-10C (0-6) DUP	14	70	0.200
Background	Copper	ELY-SS-BK-10B (0-1)	13	70	0.186
Background	Copper	ELY-SS-BK-10C (0-6)	13	70	0.186
Background	Copper	ELY-SS-BK-14A (0-1)	12	70	0.171
Background	Copper	ELY-SS-BK-14C (0-1)	11	70	0.157
Background	Copper	ELY-SS-BK-08B (0-7)	10	70	0.143
Background	Copper	ELY-SS-BK-15B (0-0.5)	8	70	0.114
Background	Copper	ELY-SS-BK-14B (0-8)	7.9	70	0.113
Background	Copper	ELY-SS-BK-15C (0-2.5)	6.4	70	0.0914
Background	Copper	ELY-SS-BK-15A (0-2)	5.5	70	0.0786
Background	Lead	ELY-SS-BK-07B (0-3)	77	120	0.642
Background	Lead	ELY-SS-BK-15C (0-2.5)	71	120	0.592
Background	Lead	ELY-SS-BK-07C (0-4)	59	120	0.492
Background	Lead	ELY-SS-BK-15B (0-0.5)	36	120	0.300
Background	Lead	ELY-SS-BK-15A (0-2)	28	120	0.233
Background	Lead	ELY-SS-BK-10B (0-1)	25	120	0.208
Background	Lead	ELY-SS-BK-08A (0-10)	19	120	0.158
Background	Lead	ELY-SS-BK-08C (0-12)	18	120	0.150
Background	Lead	ELY-SS-BK-10A (0-6)	17	120	0.142
Background	Lead	ELY-SS-BK-14C (0-1)	13	120	0.108
Background	Lead	ELY-SS-BK-07A (0-3)	12	120	0.100
Background	Lead	ELY-SS-BK-08B (0-7)	12	120	0.100
Background	Lead	ELY-SS-BK-14B (0-8)	11	120	0.0917

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Background	Lead	ELY-SS-BK-10C (0-6) DUP	9.6	120	0.0800
Background	Lead	ELY-SS-BK-14A (0-1)	8.6	120	0.0717
Background	Lead	ELY-SS-BK-10C (0-6)	7.8	120	0.0650
Background	Manganese	ELY-SS-BK-08B (0-7)	7800	220	35.5
Background	Manganese	ELY-SS-BK-08C (0-12)	5200	220	23.6
Background	Manganese	ELY-SS-BK-07A (0-3)	1700	220	7.73
Background	Manganese	ELY-SS-BK-08A (0-10)	1700	220	7.73
Background	Manganese	ELY-SS-BK-07C (0-4)	940	220	4.27
Background	Manganese	ELY-SS-BK-10B (0-1)	930	220	4.23
Background	Manganese	ELY-SS-BK-10C (0-6) DUP	710	220	3.23
Background	Manganese	ELY-SS-BK-07B (0-3)	620	220	2.82
Background	Manganese	ELY-SS-BK-10A (0-6)	600	220	2.73
Background	Manganese	ELY-SS-BK-10C (0-6)	590	220	2.68
Background	Manganese	ELY-SS-BK-14C (0-1)	290	220	1.32
Background	Manganese	ELY-SS-BK-14B (0-8)	150	220	0.682
Background	Manganese	ELY-SS-BK-14A (0-1)	98	220	0.445
Background	Manganese	ELY-SS-BK-15A (0-2)	45	220	0.205
Background	Manganese	ELY-SS-BK-15B (0-0.5)	44	220	0.200
Background	Manganese	ELY-SS-BK-15C (0-2.5)	26	220	0.118
Background	Mercury	ELY-SS-BK-15C (0-2.5)	0.29	0.349	0.831
Background	Mercury	ELY-SS-BK-15A (0-2)	0.27	0.349	0.774
Background	Mercury	ELY-SS-BK-07C (0-4)	0.21	0.349	0.602
Background	Mercury	ELY-SS-BK-07B (0-3)	0.19	0.349	0.544
Background	Mercury	ELY-SS-BK-15B (0-0.5)	0.16	0.349	0.458
Background	Mercury	ELY-SS-BK-10B (0-1)	0.14	0.349	0.401
Background	Mercury	ELY-SS-BK-08C (0-12)	0.13	0.349	0.372
Background	Mercury	ELY-SS-BK-14A (0-1)	0.12	0.349	0.344
Background	Mercury	ELY-SS-BK-08A (0-10)	0.088	0.349	0.252
Background	Mercury	ELY-SS-BK-10A (0-6)	0.084	0.349	0.241
Background	Mercury	ELY-SS-BK-07A (0-3)	0.082	0.349	0.235
Background	Mercury	ELY-SS-BK-10C (0-6) DUP	0.064	0.349	0.183
Background	Mercury	ELY-SS-BK-08B (0-7)	0.06	0.349	0.172
Background	Mercury	ELY-SS-BK-10C (0-6)	0.052	0.349	0.149
Background	Mercury	ELY-SS-BK-14C (0-1)	0.052	0.349	0.149
Background	Mercury	ELY-SS-BK-14B (0-8)	0.02	0.349	0.0573
Background	Molybdenum	ELY-SS-BK-14C (0-1)	0.64	2	0.320
Background	Molybdenum	ELY-SS-BK-15B (0-0.5)	0.64	2	0.320
Background	Molybdenum	ELY-SS-BK-15C (0-2.5)	0.37	2	0.185
Background	Molybdenum	ELY-SS-BK-14B (0-8)	0.29	2	0.145
Background	Nickel	ELY-SS-BK-08C (0-12)	30	38	0.789
Background	Nickel	ELY-SS-BK-07A (0-3)	28	38	0.737
Background	Nickel	ELY-SS-BK-10B (0-1)	21	38	0.553
Background	Nickel	ELY-SS-BK-10C (0-6) DUP	21	38	0.553
Background	Nickel	ELY-SS-BK-10A (0-6)	20	38	0.526
Background	Nickel	ELY-SS-BK-10C (0-6)	19	38	0.500
Background	Nickel	ELY-SS-BK-07B (0-3)	18	38	0.474
Background	Nickel	ELY-SS-BK-08A (0-10)	18	38	0.474
Background	Nickel	ELY-SS-BK-07C (0-4)	15	38	0.395
Background	Nickel	ELY-SS-BK-14A (0-1)	13	38	0.342
Background	Nickel	ELY-SS-BK-14B (0-8)	12	38	0.316
Background	Nickel	ELY-SS-BK-14C (0-1)	11	38	0.289
Background	Nickel	ELY-SS-BK-08B (0-7)	9.5	38	0.250
Background	Nickel	ELY-SS-BK-15B (0-0.5)	6.8	38	0.179
Background	Nickel	ELY-SS-BK-15C (0-2.5)	4.4	38	0.116
Background	Nickel	ELY-SS-BK-15A (0-2)	3.5	38	0.0921
Background	Selenium	ELY-SS-BK-07B (0-3)	2.9	0.52	5.58
Background	Selenium	ELY-SS-BK-07C (0-4)	2.5	0.52	4.81
Background	Selenium	ELY-SS-BK-15C (0-2.5)	2.3	0.52	4.42
Background	Selenium	ELY-SS-BK-08C (0-12)	2.2	0.52	4.23
Background	Selenium	ELY-SS-BK-15B (0-0.5)	2.2	0.52	4.23
Background	Selenium	ELY-SS-BK-07A (0-3)	2.1	0.52	4.04
Background	Selenium	ELY-SS-BK-14C (0-1)	1.8	0.52	3.46
Background	Selenium	ELY-SS-BK-15A (0-2)	1.8	0.52	3.46
Background	Selenium	ELY-SS-BK-08A (0-10)	1.5	0.52	2.88
Background	Selenium	ELY-SS-BK-10B (0-1)	1.5	0.52	2.88

TABLE H-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR PHYTOTOXICITY
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Background	Selenium	ELY-SS-BK-14A (0-1)	1.4	0.52	2.69
Background	Selenium	ELY-SS-BK-10A (0-6)	1.2	0.52	2.31
Background	Selenium	ELY-SS-BK-14B (0-8)	1.2	0.52	2.31
Background	Selenium	ELY-SS-BK-10C (0-6) DUP	1	0.52	1.92
Background	Selenium	ELY-SS-BK-08B (0-7)	0.98	0.52	1.88
Background	Selenium	ELY-SS-BK-10C (0-6)	0.94	0.52	1.81
Background	Silver	ELY-SS-BK-08C (0-12)	1.4	560	0.00250
Background	Silver	ELY-SS-BK-15C (0-2.5)	0.28	560	<0.001
Background	Silver	ELY-SS-BK-14C (0-1)	0.18	560	<0.001
Background	Silver	ELY-SS-BK-15A (0-2)	0.079	560	<0.001
Background	Thallium	ELY-SS-BK-08C (0-12)	4.3	0.01	430
Background	Thallium	ELY-SS-BK-07A (0-3)	1.4	0.01	140
Background	Thallium	ELY-SS-BK-07B (0-3)	1.3	0.01	130
Background	Thallium	ELY-SS-BK-08A (0-10)	1.3	0.01	130
Background	Thallium	ELY-SS-BK-07C (0-4)	1.2	0.01	120
Background	Thallium	ELY-SS-BK-10B (0-1)	1.2	0.01	120
Background	Thallium	ELY-SS-BK-08B (0-7)	0.91	0.01	91.0
Background	Vanadium	ELY-SS-BK-07A (0-3)	59	2	29.5
Background	Vanadium	ELY-SS-BK-07B (0-3)	58	2	29.0
Background	Vanadium	ELY-SS-BK-07C (0-4)	40	2	20.0
Background	Vanadium	ELY-SS-BK-08C (0-12)	39	2	19.5
Background	Vanadium	ELY-SS-BK-10A (0-6)	32	2	16.0
Background	Vanadium	ELY-SS-BK-10B (0-1)	32	2	16.0
Background	Vanadium	ELY-SS-BK-14C (0-1)	32	2	16.0
Background	Vanadium	ELY-SS-BK-10C (0-6) DUP	30	2	15.0
Background	Vanadium	ELY-SS-BK-08A (0-10)	28	2	14.0
Background	Vanadium	ELY-SS-BK-14B (0-8)	27	2	13.5
Background	Vanadium	ELY-SS-BK-10C (0-6)	26	2	13.0
Background	Vanadium	ELY-SS-BK-14A (0-1)	18	2	9.00
Background	Vanadium	ELY-SS-BK-08B (0-7)	15	2	7.50
Background	Vanadium	ELY-SS-BK-15B (0-0.5)	11	2	5.50
Background	Vanadium	ELY-SS-BK-15C (0-2.5)	9.2	2	4.60
Background	Vanadium	ELY-SS-BK-15A (0-2)	3.9	2	1.95
Background	Zinc	ELY-SS-BK-07C (0-4)	86	160	0.538
Background	Zinc	ELY-SS-BK-08A (0-10)	74	160	0.463
Background	Zinc	ELY-SS-BK-08C (0-12)	74	160	0.463
Background	Zinc	ELY-SS-BK-07A (0-3)	56	160	0.350
Background	Zinc	ELY-SS-BK-10C (0-6) DUP	49	160	0.306
Background	Zinc	ELY-SS-BK-10C (0-6)	44	160	0.275
Background	Zinc	ELY-SS-BK-10B (0-1)	41	160	0.256
Background	Zinc	ELY-SS-BK-08B (0-7)	40	160	0.250
Background	Zinc	ELY-SS-BK-07B (0-3)	37	160	0.231
Background	Zinc	ELY-SS-BK-10A (0-6)	37	160	0.231
Background	Zinc	ELY-SS-BK-15B (0-0.5)	31	160	0.194
Background	Zinc	ELY-SS-BK-15A (0-2)	30	160	0.188
Background	Zinc	ELY-SS-BK-14C (0-1)	26	160	0.163
Background	Zinc	ELY-SS-BK-14A (0-1)	25	160	0.156
Background	Zinc	ELY-SS-BK-14B (0-8)	21	160	0.131
Background	Zinc	ELY-SS-BK-15C (0-2.5)	17	160	0.106

APPENDIX I

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Antimony	ELY-SS-TR-08A (0.5-12)DUP	8.1	78	0.104
Transition	Antimony	ELY-SS-TZ-12 (0-3)	6.1	78	0.0782
Transition	Antimony	ELY-SS-SA-06 (0-6)	5.9	78	0.0756
Transition	Antimony	ELY-SS-TZ-14 (4-12)	4.3	78	0.0551
Transition	Antimony	ELY-SS-TZ-11 (0-1)	4.2	78	0.0538
Transition	Antimony	ELY-TP-109 (0-1)	4	78	0.0513
Transition	Antimony	ELY-SS-TZ-39 (3-8)	2.8	78	0.0359
Transition	Antimony	ELY-SS-TR-02D (2-12) DUP	2.6	78	0.0333
Transition	Antimony	ELY-SS-TZ-16 (4-12)	2.6	78	0.0333
Transition	Antimony	ELY-SS-TR-08C (0-5) DUP	2.4	78	0.0308
Transition	Antimony	ELY-SS-TR-03B (2-12)	1.9	78	0.0244
Transition	Antimony	ELY-SS-TZ-30 (0-0.5)	1.9	78	0.0244
Transition	Antimony	SS-21X-083109AX	1.8	78	0.0231
Transition	Antimony	ELY-TP-104 (0-1)	1.5	78	0.0192
Transition	Antimony	ELY-SS-TZ-15 (3.5-12)	1.3	78	0.0167
Transition	Antimony	ELY-SS-TR-02B (4-11)	1.2	78	0.0154
Transition	Antimony	ELY-SS-TR-02D (2-12)	1.2	78	0.0154
Transition	Antimony	ELY-SS-TR-05D (3-12)	1.2	78	0.0154
Transition	Antimony	ELY-SS-TR-08C (5-12) DUP	1.2	78	0.0154
Transition	Antimony	ELY-SS-SA-01 (0-2)	1.1	78	0.0141
Transition	Antimony	ELY-SS-TZ-35 (2-9)	1.1	78	0.0141
Transition	Antimony	SS-01X-090209AX	1.1	78	0.0141
Transition	Antimony	ELY-SS-TR-02D(0-2) DUP	1	78	0.0128
Transition	Antimony	ELY-SS-TR-08C (5-12)	0.96	78	0.0123
Transition	Antimony	ELY-SS-TR-02C (0-3)	0.92	78	0.0118
Transition	Antimony	ELY-SS-TR-02C (3-12)	0.7	78	0.00897
Transition	Antimony	ELY-SS-TR-05D (0-3)	0.7	78	0.00897
Transition	Antimony	SS-22X-082709AX	0.64	78	0.00821
Transition	Antimony	SS-13X-082809AX	0.6	78	0.00769
Transition	Antimony	SS-14X-083109AX	0.51	78	0.00654
Transition	Antimony	SS-15X-083109AX	0.42	78	0.00538
Transition	Antimony	ELY-SS-TR-02A (0-1.5)	0.39	78	0.00500
Transition	Antimony	SS-27X-082609AX	0.38	78	0.00487
Transition	Antimony	SS-24X-083109AX	0.36	78	0.00462
Transition	Antimony	SS-25X-082709AX	0.36	78	0.00462
Transition	Antimony	ELY-SS-TR-05C (1-12)	0.33	78	0.00423
Transition	Antimony	SS-18X-082709AX	0.32	78	0.00410
Transition	Antimony	SS-19X-082709AX	0.32	78	0.00410
Transition	Antimony	SS-17X-083109AX	0.31	78	0.00397
Transition	Antimony	SS-20X-083109AX	0.31	78	0.00397
Transition	Antimony	SS-29X-083109AX	0.3	78	0.00385
Transition	Antimony	ELY-SS-TR-02A (1.5-11)	0.28	78	0.00359
Transition	Antimony	SS-26X-083109AX	0.28	78	0.00359
Transition	Antimony	SS-23X-082709AX	0.26	78	0.00333
Transition	Antimony	TA-14X-082409AX	0.23	78	0.00295
Transition	Antimony	SS-10X-090309AX	0.2	78	0.00256
Transition	Antimony	SS-11X-090309AX	0.2	78	0.00256
Transition	Antimony	TL-04X-082509AX	0.19	78	0.00244
Transition	Antimony	SS-28X-083109AX	0.17	78	0.00218
Transition	Antimony	SS-09X-090209AX	0.14	78	0.00179
Transition	Antimony	SS-16X-090309AX	0.14	78	0.00179
Transition	Antimony	TA-04X-082409AX	0.13	78	0.00167
Transition	Antimony	TN-02X-082509AD	0.13	78	0.00167
Transition	Antimony	SS-02X-090209AX	0.12	78	0.00154
Transition	Antimony	TG-02X-082409AX	0.11	78	0.00141
Transition	Antimony	TN-02X-082509AX	0.11	78	0.00141
Transition	Antimony	TI-03X-082509AX	0.098	78	0.00126
Transition	Antimony	SS-06X-090209AX	0.079	78	0.00101
Transition	Antimony	TP-10X-082709AX	0.079	78	0.00101
Transition	Antimony	TC-03X-082609AX	0.068	78	<0.001
Transition	Antimony	TK-01X-082509AX	0.062	78	<0.001
Transition	Antimony	SS-05X-090209AX	0.06	78	<0.001
Transition	Antimony	SS-07X-090209AX	0.058	78	<0.001
Transition	Antimony	TO-05X-082709AX	0.058	78	<0.001
Transition	Antimony	TQ-16X-082609AX	0.056	78	<0.001

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Antimony	TQ-06X-082609AX	0.048	78	<0.001
Transition	Arsenic	ELY-SS-TZ-12 (3-8)	22	0.25	88.0
Transition	Arsenic	ELY-SS-TR-02D(0-2) DUP	15	0.25	60.0
Transition	Arsenic	ELY-SS-TR-02B (4-11)	14	0.25	56.0
Transition	Arsenic	ELY-SS-TZ-27 (0-2.5)	13	0.25	52.0
Transition	Arsenic	SS-13X-082809AX	9.4	0.25	37.6
Transition	Arsenic	ELY-SS-TR-02C (3-12)	9.1	0.25	36.4
Transition	Arsenic	ELY-SS-TR-02D (0-2)	8.3	0.25	33.2
Transition	Arsenic	ELY-SS-TR-06C (0-3)	7.9	0.25	31.6
Transition	Arsenic	ELY-SS-TR-02C (0-3)	6.8	0.25	27.2
Transition	Arsenic	SS-11X-090309AX	6.5	0.25	26.0
Transition	Arsenic	ELY-SS-TZ-21 (0-5)	6.4	0.25	25.6
Transition	Arsenic	ELY-SS-NF-09 (0-1.5)	4.8	0.25	19.2
Transition	Arsenic	ELY-SS-TR-05D (0-3)	4.7	0.25	18.8
Transition	Arsenic	ELY-SS-TZ-31 (0-3)	4.3	0.25	17.2
Transition	Arsenic	ELY-SS-NF-11 (0-3)	4.2	0.25	16.8
Transition	Arsenic	SS-17X-083109AX	4.2	0.25	16.8
Transition	Arsenic	ELY-SS-TZ-11 (1-5.5)	3.8	0.25	15.2
Transition	Arsenic	ELY-SS-TR-04C (0-3)	3.7	0.25	14.8
Transition	Arsenic	ELY-SS-TZ-39 (0-3)	3.7	0.25	14.8
Transition	Arsenic	SS-02X-090209AX	3.7	0.25	14.8
Transition	Arsenic	ELY-SS-TR-02D (2-12)	3.6	0.25	14.4
Transition	Arsenic	ELY-SS-TZ-42 (0-2)	3.5	0.25	14.0
Transition	Arsenic	SS-14X-083109AX	3.5	0.25	14.0
Transition	Arsenic	SS-25X-082709AX	3.5	0.25	14.0
Transition	Arsenic	SS-26X-083109AX	3.5	0.25	14.0
Transition	Arsenic	ELY-SS-SA-04 (0-6)	3.3	0.25	13.2
Transition	Arsenic	ELY-SS-TZ-06 (0-1)	3.3	0.25	13.2
Transition	Arsenic	ELY-SS-NF-05 (0-3)	3.2	0.25	12.8
Transition	Arsenic	ELY-SS-TZ-11 (0-1)	3.2	0.25	12.8
Transition	Arsenic	ELY-SS-TZ-12 (0-3)	3.2	0.25	12.8
Transition	Arsenic	SS-22X-082709AX	3.2	0.25	12.8
Transition	Arsenic	SS-23X-082709AX	3.2	0.25	12.8
Transition	Arsenic	ELY-SS-TR-02A (1.5-11)	3.1	0.25	12.4
Transition	Arsenic	SS-01X-090209AX	3.1	0.25	12.4
Transition	Arsenic	ELY-SS-NF-12 (0-2)	3	0.25	12.0
Transition	Arsenic	ELY-SS-TR-02D (2-12) DUP	3	0.25	12.0
Transition	Arsenic	ELY-SS-TZ-43 (0-2.5)	2.9	0.25	11.6
Transition	Arsenic	ELY-SS-NF-15 (0-2)	2.8	0.25	11.2
Transition	Arsenic	ELY-SS-TZ-15 (0-3.5)	2.8	0.25	11.2
Transition	Arsenic	SS-09X-090209AX	2.8	0.25	11.2
Transition	Arsenic	ELY-SS-NF-03 (4-12)	2.7	0.25	10.8
Transition	Arsenic	ELY-SS-NF-14 (0-3)	2.7	0.25	10.8
Transition	Arsenic	ELY-SS-SA-01 (0-2)	2.7	0.25	10.8
Transition	Arsenic	ELY-SS-TR-06B (3-7)	2.7	0.25	10.8
Transition	Arsenic	ELY-SS-TZ-14 (0-4)	2.7	0.25	10.8
Transition	Arsenic	ELY-SS-TZ-16 (4-12)	2.7	0.25	10.8
Transition	Arsenic	ELY-SS-NF-08 (2-11)	2.6	0.25	10.4
Transition	Arsenic	ELY-SS-TR-07B (2-8)	2.6	0.25	10.4
Transition	Arsenic	SS-10X-090309AX	2.6	0.25	10.4
Transition	Arsenic	SS-15X-083109AX	2.6	0.25	10.4
Transition	Arsenic	ELY-SS-NF-07 (0-2)	2.5	0.25	10.0
Transition	Arsenic	ELY-SS-SA-06 (0-6)	2.5	0.25	10.0
Transition	Arsenic	ELY-SS-TR-07C (0-2)	2.5	0.25	10.0
Transition	Arsenic	ELY-SS-TZ-35 (0-2)	2.5	0.25	10.0
Transition	Arsenic	ELY-SS-NF-02 (0-8)	2.4	0.25	9.60
Transition	Arsenic	ELY-SS-NF-05 (3-11)	2.4	0.25	9.60
Transition	Arsenic	ELY-SS-TR-02B (0-4)	2.4	0.25	9.60
Transition	Arsenic	ELY-SS-TR-04C (3-6)	2.4	0.25	9.60
Transition	Arsenic	ELY-SS-TR-06C (3-12)	2.4	0.25	9.60
Transition	Arsenic	ELY-SS-TR-07D (0-2)	2.4	0.25	9.60
Transition	Arsenic	SS-24X-083109AX	2.4	0.25	9.60
Transition	Arsenic	SS-28X-083109AX	2.4	0.25	9.60
Transition	Arsenic	ELY-SS-TR-02A (0-1.5)	2.3	0.25	9.20
Transition	Arsenic	ELY-SS-TR-08D (0-2) DUP	2.3	0.25	9.20

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Arsenic	ELY-SS-TZ-06 (1-12)	2.3	0.25	9.20
Transition	Arsenic	ELY-SS-TZ-15 (3.5-12)	2.3	0.25	9.20
Transition	Arsenic	ELY-SS-TZ-21 (5-12)	2.3	0.25	9.20
Transition	Arsenic	SS-16X-090309AX	2.3	0.25	9.20
Transition	Arsenic	SS-20X-083109AX	2.3	0.25	9.20
Transition	Arsenic	ELY-SS-TZ-16 (0-4)	2.2	0.25	8.80
Transition	Arsenic	ELY-SS-TZ-27 (2.5-8)	2.2	0.25	8.80
Transition	Arsenic	ELY-SS-TZ-31 (3-9)	2.2	0.25	8.80
Transition	Arsenic	ELY-SS-TZ-37 (0-2)	2.2	0.25	8.80
Transition	Arsenic	ELY-SS-TZ-40 (0-2)	2.2	0.25	8.80
Transition	Arsenic	SS-27X-082609AX	2.2	0.25	8.80
Transition	Arsenic	ELY-SS-NF-04 (0-4) DUP	2.1	0.25	8.40
Transition	Arsenic	ELY-SS-NF-06 (3-12)	2.1	0.25	8.40
Transition	Arsenic	ELY-SS-NF-10 (0-4)	2.1	0.25	8.40
Transition	Arsenic	ELY-SS-NF-13 (0-2.5)	2.1	0.25	8.40
Transition	Arsenic	SS-06X-090209AX	2.1	0.25	8.40
Transition	Arsenic	TN-02X-082509AD	2	0.25	8.00
Transition	Arsenic	ELY-SS-NF-06 (0-3)	1.9	0.25	7.60
Transition	Arsenic	ELY-SS-NF-11 (3-9)	1.9	0.25	7.60
Transition	Arsenic	ELY-SS-TZ-23 (0-2.5)	1.9	0.25	7.60
Transition	Arsenic	SS-03X-090209AX	1.9	0.25	7.60
Transition	Arsenic	SS-19X-082709AX	1.9	0.25	7.60
Transition	Arsenic	TL-04X-082509AX	1.9	0.25	7.60
Transition	Arsenic	ELY-SS-NF-10 (4-12)	1.8	0.25	7.20
Transition	Arsenic	ELY-SS-TR-09B (2-5)	1.8	0.25	7.20
Transition	Arsenic	ELY-SS-TZ-30 (0-0.5)	1.8	0.25	7.20
Transition	Arsenic	ELY-SS-TR-03B (2-12)	1.7	0.25	6.80
Transition	Arsenic	ELY-SS-TR-09B (0-2)	1.7	0.25	6.80
Transition	Arsenic	ELY-SS-TR-09D (0-3)	1.7	0.25	6.80
Transition	Arsenic	ELY-SS-TZ-40 (2-10)	1.7	0.25	6.80
Transition	Arsenic	ELY-SS-NF-04 (4-10)	1.6	0.25	6.40
Transition	Arsenic	ELY-SS-TR-07B (0-2)	1.6	0.25	6.40
Transition	Arsenic	ELY-SS-TR-08D (0-2)	1.6	0.25	6.40
Transition	Arsenic	SS-18X-082709AX	1.6	0.25	6.40
Transition	Arsenic	SS-29X-083109AX	1.6	0.25	6.40
Transition	Arsenic	ELY-SS-TR-07C (2-12)	1.5	0.25	6.00
Transition	Arsenic	ELY-SS-TZ-34 (0-2.5)	1.5	0.25	6.00
Transition	Arsenic	SS-07X-090209AX	1.5	0.25	6.00
Transition	Arsenic	ELY-SS-NF-17 (0-4)	1.4	0.25	5.60
Transition	Arsenic	ELY-SS-TR-03C (3-12)	1.4	0.25	5.60
Transition	Arsenic	ELY-SS-TR-08A (0.5-12)	1.4	0.25	5.60
Transition	Arsenic	ELY-SS-TZ-18 (0-.5)	1.4	0.25	5.60
Transition	Arsenic	ELY-SS-TZ-30 (0.5-12)	1.4	0.25	5.60
Transition	Arsenic	SS-21X-083109AX	1.4	0.25	5.60
Transition	Arsenic	TN-02X-082509AX	1.4	0.25	5.60
Transition	Arsenic	ELY-SS-NF-03 (0-4)	1.3	0.25	5.20
Transition	Arsenic	ELY-SS-SA-09 (0-4)	1.3	0.25	5.20
Transition	Arsenic	ELY-SS-TR-03C (0-3)	1.3	0.25	5.20
Transition	Arsenic	ELY-SS-TR-06B (0-3)	1.3	0.25	5.20
Transition	Arsenic	ELY-SS-TR-08C (0-5)	1.3	0.25	5.20
Transition	Arsenic	TA-04X-082409AX	1.3	0.25	5.20
Transition	Arsenic	ELY-SS-NF-08 (0-2)	1.2	0.25	4.80
Transition	Arsenic	ELY-SS-NF-16 (0-1)	1.2	0.25	4.80
Transition	Arsenic	ELY-SS-TZ-34 (2.5-8)	1.1	0.25	4.40
Transition	Arsenic	SS-05X-090209AX	1.1	0.25	4.40
Transition	Arsenic	SS-08X-090209AX	1.1	0.25	4.40
Transition	Arsenic	TA-14X-082409AX	1.1	0.25	4.40
Transition	Arsenic	ELY-SS-NF-14 (3-12)	1	0.25	4.00
Transition	Arsenic	ELY-SS-TR-04B (1.5-12)	1	0.25	4.00
Transition	Arsenic	TI-03X-082509AX	1	0.25	4.00
Transition	Arsenic	ELY-SS-TR-08D (2-12)	0.98	0.25	3.92
Transition	Arsenic	TK-01X-082509AX	0.97	0.25	3.88
Transition	Arsenic	ELY-SS-TR-08D (2-12) DUP	0.96	0.25	3.84
Transition	Arsenic	ELY-SS-TZ-35 (2-9)	0.92	0.25	3.68
Transition	Arsenic	ELY-SS-TR-04B (0-1.5)	0.9	0.25	3.60

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Arsenic	ELY-SS-TZ-36 (0-1.5)	0.84	0.25	3.36
Transition	Arsenic	ELY-SS-NF-09 (1.5-12)	0.77	0.25	3.08
Transition	Arsenic	ELY-SS-TZ-36 (1.5-9)	0.76	0.25	3.04
Transition	Arsenic	SS-12X-090309AX	0.76	0.25	3.04
Transition	Arsenic	ELY-SS-TZ-23 (2.5-12)	0.73	0.25	2.92
Transition	Arsenic	ELY-SS-TZ-18 (.5-12)	0.7	0.25	2.80
Transition	Arsenic	SS-04X-090209AX	0.64	0.25	2.56
Transition	Arsenic	TG-02X-082409AX	0.62	0.25	2.48
Transition	Arsenic	TQ-16X-082609AX	0.62	0.25	2.48
Transition	Arsenic	ELY-SS-NF-01 (2-7)	0.59	0.25	2.36
Transition	Arsenic	TC-03X-082609AX	0.48	0.25	1.92
Transition	Cadmium	SS-13X-082809AX	7.2	140	0.0514
Transition	Cadmium	SS-27X-082609AX	4.8	140	0.0343
Transition	Cadmium	ELY-SS-NF-03 (4-12)	3.6	140	0.0257
Transition	Cadmium	SS-29X-083109AX	3.5	140	0.0250
Transition	Cadmium	ELY-SS-TR-02A (1.5-11)	3.2	140	0.0229
Transition	Cadmium	ELY-SS-TZ-21 (0-5)	3.2	140	0.0229
Transition	Cadmium	ELY-SS-TZ-14 (0-4)	3	140	0.0214
Transition	Cadmium	SS-18X-082709AX	2.9	140	0.0207
Transition	Cadmium	SS-26X-083109AX	2.9	140	0.0207
Transition	Cadmium	ELY-SS-TR-02C (3-12)	2.8	140	0.0200
Transition	Cadmium	ELY-SS-NF-06 (0-3)	2.5	140	0.0179
Transition	Cadmium	ELY-SS-TZ-16 (0-4)	2.5	140	0.0179
Transition	Cadmium	SS-25X-082709AX	2.5	140	0.0179
Transition	Cadmium	SS-10X-090309AX	2.4	140	0.0171
Transition	Cadmium	ELY-SS-TR-03C (0-3)	2.3	140	0.0164
Transition	Cadmium	ELY-SS-TZ-40 (0-2)	2.3	140	0.0164
Transition	Cadmium	ELY-SS-NF-03 (0-4)	2.2	140	0.0157
Transition	Cadmium	ELY-SS-NF-15 (0-2)	2.2	140	0.0157
Transition	Cadmium	ELY-SS-TZ-42 (0-2)	2.2	140	0.0157
Transition	Cadmium	SS-24X-083109AX	2.2	140	0.0157
Transition	Cadmium	ELY-SS-TR-03B (0-2)	2	140	0.0143
Transition	Cadmium	ELY-SS-TR-03B (2-12)	2	140	0.0143
Transition	Cadmium	ELY-SS-NF-06 (3-12)	1.9	140	0.0136
Transition	Cadmium	ELY-SS-TZ-27 (0-2.5)	1.6	140	0.0114
Transition	Cadmium	ELY-SS-TR-08D (0-2)	1.5	140	0.0107
Transition	Cadmium	SS-15X-083109AX	1.5	140	0.0107
Transition	Cadmium	ELY-SS-TR-04C (0-3)	1.4	140	0.0100
Transition	Cadmium	ELY-SS-TR-05D (0-3)	1.4	140	0.0100
Transition	Cadmium	ELY-SS-TR-05D (3-12)	1.4	140	0.0100
Transition	Cadmium	SS-11X-090309AX	1.4	140	0.0100
Transition	Cadmium	SS-19X-082709AX	1.4	140	0.0100
Transition	Cadmium	ELY-SS-NF-04 (0-4)	1.3	140	0.00929
Transition	Cadmium	ELY-SS-NF-17 (0-4)	1.3	140	0.00929
Transition	Cadmium	ELY-SS-TZ-06 (1-12)	1.3	140	0.00929
Transition	Cadmium	ELY-SS-NF-08 (2-11)	1.2	140	0.00857
Transition	Cadmium	ELY-SS-NF-11 (0-3)	1.1	140	0.00786
Transition	Cadmium	ELY-SS-TR-02C (0-3)	1.1	140	0.00786
Transition	Cadmium	TA-04X-082409AX	1.1	140	0.00786
Transition	Cadmium	ELY-SS-NF-05 (0-3)	1	140	0.00714
Transition	Cadmium	ELY-SS-NF-05 (3-11)	1	140	0.00714
Transition	Cadmium	ELY-SS-SA-01 (0-2)	1	140	0.00714
Transition	Cadmium	ELY-SS-TR-02B (0-4)	1	140	0.00714
Transition	Cadmium	ELY-SS-TR-08D (0-2) DUP	1	140	0.00714
Transition	Cadmium	ELY-SS-TZ-12 (0-3)	1	140	0.00714
Transition	Cadmium	TA-14X-082409AX	1	140	0.00714
Transition	Cadmium	ELY-SS-TR-05C (1-12)	0.96	140	0.00686
Transition	Cadmium	ELY-SS-TZ-12 (3-8)	0.93	140	0.00664
Transition	Cadmium	ELY-SS-TZ-15 (0-3.5)	0.93	140	0.00664
Transition	Cadmium	SS-01X-090209AX	0.92	140	0.00657
Transition	Cadmium	SS-17X-083109AX	0.92	140	0.00657
Transition	Cadmium	ELY-SS-NF-02 (0-8)	0.88	140	0.00629
Transition	Cadmium	SS-09X-090209AX	0.88	140	0.00629
Transition	Cadmium	ELY-SS-TZ-06 (0-1)	0.87	140	0.00621
Transition	Cadmium	SS-23X-082709AX	0.87	140	0.00621

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cadmium	ELY-SS-TR-09D (0-3)	0.84	140	0.00600
Transition	Cadmium	ELY-SS-TZ-38 (0-0.5)	0.84	140	0.00600
Transition	Cadmium	ELY-SS-TZ-21 (5-12)	0.83	140	0.00593
Transition	Cadmium	ELY-SS-NF-10 (0-4)	0.82	140	0.00586
Transition	Cadmium	ELY-SS-TZ-14 (4-12)	0.8	140	0.00571
Transition	Cadmium	ELY-SS-TZ-29 (1-9)	0.8	140	0.00571
Transition	Cadmium	SS-14X-083109AX	0.79	140	0.00564
Transition	Cadmium	ELY-SS-NF-04 (0-4) DUP	0.74	140	0.00529
Transition	Cadmium	ELY-SS-NF-04 (4-10)	0.72	140	0.00514
Transition	Cadmium	ELY-SS-TR-04C (3-6)	0.72	140	0.00514
Transition	Cadmium	ELY-SS-TR-05C (0-1)	0.69	140	0.00493
Transition	Cadmium	ELY-SS-TR-08C (5-12)	0.62	140	0.00443
Transition	Cadmium	SS-22X-082709AX	0.62	140	0.00443
Transition	Cadmium	ELY-SS-NF-04 (4-10) DUP	0.54	140	0.00386
Transition	Cadmium	ELY-SS-TR-02A (0-1.5)	0.54	140	0.00386
Transition	Cadmium	SS-08X-090209AX	0.54	140	0.00386
Transition	Cadmium	ELY-SS-TZ-29 (0-1)	0.53	140	0.00379
Transition	Cadmium	ELY-SS-TR-07C (0-2)	0.52	140	0.00371
Transition	Cadmium	ELY-SS-NF-10 (4-12)	0.51	140	0.00364
Transition	Cadmium	ELY-SS-NF-09 (0-1.5)	0.5	140	0.00357
Transition	Cadmium	ELY-SS-TZ-16 (4-12)	0.5	140	0.00357
Transition	Cadmium	ELY-SS-NF-07 (0-2)	0.47	140	0.00336
Transition	Cadmium	ELY-SS-TR-08C (5-12) DUP	0.47	140	0.00336
Transition	Cadmium	ELY-SS-TZ-42 (2-12)	0.46	140	0.00329
Transition	Cadmium	ELY-SS-NF-11 (3-9)	0.45	140	0.00321
Transition	Cadmium	ELY-SS-NF-13 (0-2.5)	0.45	140	0.00321
Transition	Cadmium	ELY-SS-TR-06A (1-12)	0.45	140	0.00321
Transition	Cadmium	ELY-SS-TR-06A (0-1)	0.44	140	0.00314
Transition	Cadmium	ELY-SS-TZ-27 (2.5-8)	0.44	140	0.00314
Transition	Cadmium	ELY-SS-TZ-43 (0-2.5)	0.44	140	0.00314
Transition	Cadmium	ELY-SS-TR-06C (0-3)	0.43	140	0.00307
Transition	Cadmium	ELY-SS-TR-08C (0-5) DUP	0.43	140	0.00307
Transition	Cadmium	ELY-SS-NF-14 (0-3)	0.4	140	0.00286
Transition	Cadmium	SS-21X-083109AX	0.4	140	0.00286
Transition	Cadmium	ELY-SS-NF-12 (0-2)	0.39	140	0.00279
Transition	Cadmium	ELY-SS-SA-23 (0-6)	0.39	140	0.00279
Transition	Cadmium	ELY-SS-TR-09B (0-2)	0.39	140	0.00279
Transition	Cadmium	ELY-SS-TZ-11 (1-5.5)	0.39	140	0.00279
Transition	Cadmium	ELY-SS-TZ-43 (2.5-11)	0.39	140	0.00279
Transition	Cadmium	SS-16X-090309AX	0.39	140	0.00279
Transition	Cadmium	ELY-SS-NF-13 (2.5-12)	0.38	140	0.00271
Transition	Cadmium	ELY-SS-NF-16 (0-1)	0.38	140	0.00271
Transition	Cadmium	SS-12X-090309AX	0.37	140	0.00264
Transition	Cadmium	ELY-SS-NF-08 (0-2)	0.36	140	0.00257
Transition	Cadmium	ELY-SS-TR-06B (0-3)	0.36	140	0.00257
Transition	Cadmium	ELY-SS-TZ-34 (0-2.5)	0.36	140	0.00257
Transition	Cadmium	ELY-SS-NF-09 (1.5-12)	0.35	140	0.00250
Transition	Cadmium	SS-02X-090209AX	0.35	140	0.00250
Transition	Cadmium	ELY-SS-TZ-30 (0.5-12)	0.34	140	0.00243
Transition	Cadmium	TK-01X-082509AX	0.33	140	0.00236
Transition	Cadmium	ELY-SS-TR-04B (1.5-12)	0.31	140	0.00221
Transition	Cadmium	ELY-SS-TR-07B (0-2)	0.31	140	0.00221
Transition	Cadmium	ELY-SS-TZ-34 (2.5-8)	0.3	140	0.00214
Transition	Cadmium	ELY-SS-TR-07B (2-8)	0.29	140	0.00207
Transition	Cadmium	ELY-SS-TZ-11 (0-1)	0.29	140	0.00207
Transition	Cadmium	ELY-SS-TZ-23 (0-2.5)	0.29	140	0.00207
Transition	Cadmium	SS-05X-090209AX	0.28	140	0.00200
Transition	Cadmium	ELY-SS-TR-06C (3-12)	0.27	140	0.00193
Transition	Cadmium	ELY-SS-TR-08C (0-5)	0.27	140	0.00193
Transition	Cadmium	ELY-SS-NF-01 (2-7)	0.26	140	0.00186
Transition	Cadmium	ELY-SS-NF-07 (2-8)	0.26	140	0.00186
Transition	Cadmium	ELY-SS-TZ-30 (0-0.5)	0.26	140	0.00186
Transition	Cadmium	SS-20X-083109AX	0.26	140	0.00186
Transition	Cadmium	SS-28X-083109AX	0.26	140	0.00186
Transition	Cadmium	ELY-SS-NF-12 (2-9)	0.25	140	0.00179

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cadmium	ELY-SS-TR-04B (0-1.5)	0.25	140	0.00179
Transition	Cadmium	ELY-SS-TR-08D (2-12)	0.25	140	0.00179
Transition	Cadmium	ELY-SS-TZ-23 (2.5-12)	0.25	140	0.00179
Transition	Cadmium	ELY-SS-NF-15 (2-5)	0.24	140	0.00171
Transition	Cadmium	ELY-SS-TR-07D (0-2)	0.24	140	0.00171
Transition	Cadmium	SS-06X-090209AX	0.23	140	0.00164
Transition	Cadmium	ELY-SS-TR-07C (2-12)	0.22	140	0.00157
Transition	Cadmium	ELY-SS-TR-08D (2-12) DUP	0.22	140	0.00157
Transition	Cadmium	SS-07X-090209AX	0.21	140	0.00150
Transition	Cadmium	SS-03X-090209AX	0.2	140	0.00143
Transition	Cadmium	TL-04X-082509AX	0.2	140	0.00143
Transition	Cadmium	ELY-SS-TR-07D (2-9)	0.19	140	0.00136
Transition	Cadmium	TP-10X-082709AX	0.18	140	0.00129
Transition	Cadmium	SS-04X-090209AX	0.15	140	0.00107
Transition	Cadmium	TN-02X-082509AD	0.15	140	0.00107
Transition	Cadmium	TQ-16X-082609AX	0.14	140	0.00100
Transition	Cadmium	ELY-SS-TZ-31 (0-3)	0.13	140	<0.001
Transition	Cadmium	TC-03X-082609AX	0.13	140	<0.001
Transition	Cadmium	TG-02X-082409AX	0.13	140	<0.001
Transition	Cadmium	TO-05X-082709AX	0.13	140	<0.001
Transition	Cadmium	TI-03X-082509AX	0.12	140	<0.001
Transition	Cadmium	TN-02X-082509AX	0.12	140	<0.001
Transition	Cadmium	TQ-06X-082609AX	0.017	140	<0.001
Transition	Chromium	ELY-SS-NF-03 (4-12)	440	0.2	2200
Transition	Chromium	ELY-SS-TR-05C (1-12)	150	0.2	750
Transition	Chromium	SS-11X-090309AX	111	0.2	555
Transition	Chromium	ELY-SS-SA-23 (0-6)	92	0.2	460
Transition	Chromium	ELY-SS-TR-08C (0-5) DUP	90	0.2	450
Transition	Chromium	ELY-SS-NF-04 (0-4)	88	0.2	440
Transition	Chromium	ELY-SS-TR-05D (3-12)	82	0.2	410
Transition	Chromium	ELY-SS-TZ-21 (5-12)	82	0.2	410
Transition	Chromium	ELY-SS-TZ-29 (1-9)	82	0.2	410
Transition	Chromium	ELY-SS-TR-03B (2-12)	77	0.2	385
Transition	Chromium	ELY-SS-TR-08C (5-12) DUP	74	0.2	370
Transition	Chromium	ELY-SS-TZ-16 (4-12)	74	0.2	370
Transition	Chromium	ELY-SS-TR-02D(0-2) DUP	72	0.2	360
Transition	Chromium	ELY-SS-TR-05C (0-1)	72	0.2	360
Transition	Chromium	ELY-SS-TR-08C (5-12)	72	0.2	360
Transition	Chromium	ELY-SS-TZ-34 (2.5-8)	68	0.2	340
Transition	Chromium	ELY-SS-TR-04C (3-6)	64	0.2	320
Transition	Chromium	ELY-SS-NF-10 (4-12)	61	0.2	305
Transition	Chromium	ELY-SS-TR-05D (0-3)	60	0.2	300
Transition	Chromium	ELY-SS-TZ-14 (4-12)	59	0.2	295
Transition	Chromium	ELY-SS-NF-17 (4-10)	58	0.2	290
Transition	Chromium	ELY-SS-NF-09 (1.5-12)	57	0.2	285
Transition	Chromium	ELY-SS-TZ-35 (2-9)	57	0.2	285
Transition	Chromium	TQ-16X-082609AX	55.9	0.2	280
Transition	Chromium	ELY-SS-TZ-18 (.5-12)	55	0.2	275
Transition	Chromium	ELY-SS-TZ-23 (2.5-12)	54	0.2	270
Transition	Chromium	ELY-SS-TZ-36 (1.5-9)	54	0.2	270
Transition	Chromium	SS-09X-090209AX	53.2	0.2	266
Transition	Chromium	ELY-SS-NF-11 (0-3)	53	0.2	265
Transition	Chromium	TQ-06X-082609AX	52.1	0.2	261
Transition	Chromium	ELY-SS-TZ-27 (2.5-8)	52	0.2	260
Transition	Chromium	ELY-SS-TZ-30 (0.5-12)	52	0.2	260
Transition	Chromium	TL-04X-082509AX	51.3	0.2	257
Transition	Chromium	ELY-SS-NF-11 (3-9)	51	0.2	255
Transition	Chromium	ELY-SS-NF-15 (2-5)	50	0.2	250
Transition	Chromium	ELY-SS-TR-04B (1.5-12)	50	0.2	250
Transition	Chromium	ELY-SS-TZ-29 (0-1)	50	0.2	250
Transition	Chromium	TN-02X-082509AD	49.4	0.2	247
Transition	Chromium	SS-29X-083109AX	48.9	0.2	245
Transition	Chromium	TP-10X-082709AX	48.6	0.2	243
Transition	Chromium	ELY-SS-NF-08 (0-2)	48	0.2	240
Transition	Chromium	ELY-SS-NF-13 (2.5-12)	48	0.2	240

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Chromium	ELY-SS-TR-06A (0-1)	48	0.2	240
Transition	Chromium	ELY-SS-TR-06C (0-3)	48	0.2	240
Transition	Chromium	TI-03X-082509AX	47.3	0.2	237
Transition	Chromium	ELY-SS-NF-04 (4-10)	47	0.2	235
Transition	Chromium	ELY-SS-NF-12 (2-9)	47	0.2	235
Transition	Chromium	ELY-SS-TR-07B (2-8)	47	0.2	235
Transition	Chromium	ELY-SS-TR-09B (2-5)	47	0.2	235
Transition	Chromium	SS-01X-090209AX	46.2	0.2	231
Transition	Chromium	SS-03X-090209AX	46.2	0.2	231
Transition	Chromium	ELY-SS-TR-08C (0-5)	46	0.2	230
Transition	Chromium	ELY-SS-NF-10 (0-4)	45	0.2	225
Transition	Chromium	SS-02X-090209AX	44.8	0.2	224
Transition	Chromium	ELY-SS-NF-13 (0-2.5)	44	0.2	220
Transition	Chromium	TO-05X-082709AX	43.6	0.2	218
Transition	Chromium	ELY-SS-TZ-06 (1-12)	43	0.2	215
Transition	Chromium	ELY-SS-TZ-15 (3.5-12)	43	0.2	215
Transition	Chromium	TP-15X-073009AD	42.5	0.2	213
Transition	Chromium	TP-15X-073009AX	42.3	0.2	212
Transition	Chromium	ELY-SS-NF-04 (4-10) DUP	42	0.2	210
Transition	Chromium	ELY-SS-TR-06B (3-7)	42	0.2	210
Transition	Chromium	ELY-SS-TR-06C (3-12)	42	0.2	210
Transition	Chromium	SS-06X-090209AX	42	0.2	210
Transition	Chromium	ELY-SS-NF-16 (1-12)	41	0.2	205
Transition	Chromium	SS-16X-090309AX	40.4	0.2	202
Transition	Chromium	ELY-SS-TR-07B (0-2)	40	0.2	200
Transition	Chromium	SS-07X-090209AX	39.4	0.2	197
Transition	Chromium	TN-02X-082509AX	39.1	0.2	196
Transition	Chromium	ELY-SS-TR-07C (2-12)	39	0.2	195
Transition	Chromium	ELY-SS-TR-07D (2-9)	39	0.2	195
Transition	Chromium	ELY-SS-TR-08A (0.5-12)	39	0.2	195
Transition	Chromium	ELY-SS-TR-08D (2-12) DUP	39	0.2	195
Transition	Chromium	TF-13X-090909BX	39	0.2	195
Transition	Chromium	SS-28X-083109AX	38.9	0.2	195
Transition	Chromium	ELY-SS-TZ-27 (0-2.5)	38	0.2	190
Transition	Chromium	ELY-SS-TZ-43 (2.5-11)	38	0.2	190
Transition	Chromium	ELY-SS-TR-06A (1-12)	37	0.2	185
Transition	Chromium	ELY-SS-TR-08D (2-12)	37	0.2	185
Transition	Chromium	ELY-SS-TZ-31 (3-9)	37	0.2	185
Transition	Chromium	ELY-SS-NF-01 (2-7)	36	0.2	180
Transition	Chromium	ELY-SS-NF-02 (0-8)	36	0.2	180
Transition	Chromium	ELY-SS-TR-08A (0-0.5) DUP	36	0.2	180
Transition	Chromium	SS-17X-083109AX	35.2	0.2	176
Transition	Chromium	TK-01X-082509AX	35.2	0.2	176
Transition	Chromium	ELY-SS-NF-08 (2-11)	35	0.2	175
Transition	Chromium	ELY-SS-TR-03C (3-12)	35	0.2	175
Transition	Chromium	SS-05X-090209AX	34.8	0.2	174
Transition	Chromium	TG-02X-082409AX	34.6	0.2	173
Transition	Chromium	ELY-SS-SA-09 (0-4)	34	0.2	170
Transition	Chromium	ELY-SS-TR-08A (0.5-12)DUP	34	0.2	170
Transition	Chromium	ELY-SS-TR-08A (0-0.5)	34	0.2	170
Transition	Chromium	ELY-SS-TZ-39 (3-8)	34	0.2	170
Transition	Chromium	SS-04X-090209AX	34	0.2	170
Transition	Chromium	ELY-SS-NF-06 (3-12)	33	0.2	165
Transition	Chromium	ELY-SS-NF-14 (3-12)	33	0.2	165
Transition	Chromium	ELY-SS-TR-02D (0-2)	33	0.2	165
Transition	Chromium	ELY-SS-TZ-06 (0-1)	33	0.2	165
Transition	Chromium	ELY-SS-TZ-30 (0-0.5)	33	0.2	165
Transition	Chromium	SS-26X-083109AX	32.4	0.2	162
Transition	Chromium	TC-03X-082609AX	32.2	0.2	161
Transition	Chromium	ELY-SS-NF-06 (0-3)	32	0.2	160
Transition	Chromium	ELY-SS-TZ-14 (0-4)	32	0.2	160
Transition	Chromium	ELY-SS-TZ-37 (2-12)	32	0.2	160
Transition	Chromium	ELY-SS-TZ-38 (0.5-7)	32	0.2	160
Transition	Chromium	ELY-SS-TR-06B (0-3)	31	0.2	155
Transition	Chromium	TA-14X-082409AX	30.9	0.2	155

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Chromium	SS-23X-082709AX	30.1	0.2	151
Transition	Chromium	ELY-SS-NF-09 (0-1.5)	30	0.2	150
Transition	Chromium	ELY-SS-TZ-11 (1-5.5)	30	0.2	150
Transition	Chromium	ELY-SS-TZ-42 (2-12)	30	0.2	150
Transition	Chromium	ELY-SS-NF-05 (0-3)	29	0.2	145
Transition	Chromium	ELY-TP-109 (0-1)	29	0.2	145
Transition	Chromium	SS-08X-090209AX	28.4	0.2	142
Transition	Chromium	ELY-SS-NF-12 (0-2)	28	0.2	140
Transition	Chromium	ELY-SS-TR-09C (1.5-8)	28	0.2	140
Transition	Chromium	ELY-SS-TR-09D (3-12)	28	0.2	140
Transition	Chromium	ELY-SS-TZ-12 (3-8)	28	0.2	140
Transition	Chromium	ELY-SS-TZ-31 (0-3)	28	0.2	140
Transition	Chromium	ELY-SS-TZ-40 (2-10)	28	0.2	140
Transition	Chromium	ELY-SS-TR-02D (2-12)	27	0.2	135
Transition	Chromium	ELY-SS-TR-02D (2-12) DUP	27	0.2	135
Transition	Chromium	TA-04X-082409AX	26.8	0.2	134
Transition	Chromium	SS-22X-082709AX	26.1	0.2	131
Transition	Chromium	ELY-SS-TR-08D (0-2) DUP	24	0.2	120
Transition	Chromium	ELY-SS-TZ-21 (0-5)	24	0.2	120
Transition	Chromium	SS-20X-083109AX	23.1	0.2	116
Transition	Chromium	ELY-SS-TZ-11 (0-1)	23	0.2	115
Transition	Chromium	ELY-SS-TZ-36 (0-1.5)	23	0.2	115
Transition	Chromium	ELY-SS-TZ-43 (0-2.5)	23	0.2	115
Transition	Chromium	ELY-TP-104 (0-1)	23	0.2	115
Transition	Chromium	ELY-SS-NF-05 (3-11)	22	0.2	110
Transition	Chromium	ELY-SS-TR-07D (0-2)	22	0.2	110
Transition	Chromium	ELY-SS-TZ-18 (0-.5)	22	0.2	110
Transition	Chromium	SS-10X-090309AX	21.9	0.2	110
Transition	Chromium	SS-14X-083109AX	21.2	0.2	106
Transition	Chromium	ELY-SS-NF-14 (0-3)	21	0.2	105
Transition	Chromium	ELY-SS-TR-04C (0-3)	21	0.2	105
Transition	Chromium	ELY-SS-TR-09C (0-1.5)	21	0.2	105
Transition	Chromium	ELY-SS-TZ-42 (0-2)	21	0.2	105
Transition	Chromium	SS-12X-090309AX	20.6	0.2	103
Transition	Chromium	ELY-SS-NF-15 (0-2)	20	0.2	100
Transition	Chromium	ELY-SS-SA-04 (0-6)	20	0.2	100
Transition	Chromium	SS-13X-082809AX	20	0.2	100
Transition	Chromium	ELY-SS-SA-06 (0-6)	18	0.2	90.0
Transition	Chromium	ELY-SS-TR-08D (0-2)	17	0.2	85.0
Transition	Chromium	ELY-SS-TR-02B (4-11)	16	0.2	80.0
Transition	Chromium	ELY-SS-TZ-15 (0-3.5)	15	0.2	75.0
Transition	Chromium	SS-24X-083109AX	14.8	0.2	74.0
Transition	Chromium	ELY-SS-TR-02C (0-3)	14	0.2	70.0
Transition	Chromium	ELY-SS-TZ-38 (0-0.5)	14	0.2	70.0
Transition	Chromium	SS-25X-082709AX	14	0.2	70.0
Transition	Chromium	SS-21X-083109AX	13.5	0.2	67.5
Transition	Chromium	ELY-SS-TR-02A (1.5-11)	13	0.2	65.0
Transition	Chromium	SS-27X-082609AX	12.1	0.2	60.5
Transition	Chromium	ELY-SS-SA-01 (0-2)	12	0.2	60.0
Transition	Chromium	ELY-SS-TZ-35 (0-2)	12	0.2	60.0
Transition	Chromium	ELY-SS-TZ-37 (0-2)	12	0.2	60.0
Transition	Chromium	ELY-SS-TZ-39 (0-3)	12	0.2	60.0
Transition	Chromium	ELY-SS-TZ-40 (0-2)	12	0.2	60.0
Transition	Chromium	ELY-SS-TR-09B (0-2)	11	0.2	55.0
Transition	Chromium	SS-18X-082709AX	10.7	0.2	53.5
Transition	Chromium	ELY-SS-TZ-34 (0-2.5)	10	0.2	50.0
Transition	Chromium	ELY-SS-NF-16 (0-1)	9.1	0.2	45.5
Transition	Chromium	ELY-SS-NF-07 (0-2)	9	0.2	45.0
Transition	Chromium	ELY-SS-TR-02C (3-12)	9	0.2	45.0
Transition	Chromium	ELY-SS-TZ-23 (0-2.5)	8.1	0.2	40.5
Transition	Chromium	SS-19X-082709AX	7.8	0.2	39.0
Transition	Chromium	ELY-SS-TR-03B (0-2)	7.4	0.2	37.0
Transition	Chromium	ELY-SS-NF-07 (2-8)	7.3	0.2	36.5
Transition	Chromium	ELY-SS-TR-02A (0-1.5)	6	0.2	30.0
Transition	Chromium	ELY-SS-TR-07C (0-2)	5.5	0.2	27.5

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Chromium	SS-15X-083109AX	5.3	0.2	26.5
Transition	Chromium	ELY-SS-NF-17 (0-4)	5.2	0.2	26.0
Transition	Chromium	ELY-SS-TR-04B (0-1.5)	5.1	0.2	25.5
Transition	Chromium	ELY-SS-TR-02B (0-4)	4.2	0.2	21.0
Transition	Chromium	ELY-SS-TZ-12 (0-3)	3.9	0.2	19.5
Transition	Chromium	ELY-SS-NF-03 (0-4)	3.7	0.2	18.5
Transition	Chromium	ELY-SS-NF-04 (0-4) DUP	3.2	0.2	16.0
Transition	Chromium	ELY-SS-TZ-16 (0-4)	3.1	0.2	15.5
Transition	Chromium	ELY-SS-TR-03C (0-3)	2.6	0.2	13.0
Transition	Chromium	ELY-SS-TR-09D (0-3)	2.5	0.2	12.5
Transition	Cobalt	ELY-SS-SA-09 (0-4)	120	1000	0.120
Transition	Cobalt	ELY-SS-TR-02D (2-12) DUP	110	1000	0.110
Transition	Cobalt	ELY-SS-NF-03 (4-12)	87	1000	0.0870
Transition	Cobalt	ELY-SS-TR-02D (2-12)	82	1000	0.0820
Transition	Cobalt	ELY-SS-SA-04 (0-6)	73	1000	0.0730
Transition	Cobalt	ELY-SS-TZ-06 (0-1)	71	1000	0.0710
Transition	Cobalt	ELY-SS-TZ-11 (1-5.5)	70	1000	0.0700
Transition	Cobalt	TF-13X-090909BX	66.5	1000	0.0665
Transition	Cobalt	ELY-SS-TZ-21 (0-5)	60	1000	0.0600
Transition	Cobalt	ELY-SS-SA-01 (0-2)	51	1000	0.0510
Transition	Cobalt	ELY-TP-104 (0-1)	51	1000	0.0510
Transition	Cobalt	ELY-SS-NF-05 (3-11)	50	1000	0.0500
Transition	Cobalt	ELY-SS-TR-02A (1.5-11)	47	1000	0.0470
Transition	Cobalt	ELY-SS-TZ-06 (1-12)	44	1000	0.0440
Transition	Cobalt	ELY-SS-NF-05 (0-3)	42	1000	0.0420
Transition	Cobalt	ELY-SS-SA-06 (0-6)	35	1000	0.0350
Transition	Cobalt	ELY-SS-TR-03B (2-12)	35	1000	0.0350
Transition	Cobalt	ELY-SS-TR-02B (4-11)	33	1000	0.0330
Transition	Cobalt	ELY-SS-TR-02D(0-2) DUP	32	1000	0.0320
Transition	Cobalt	SS-08X-090209AX	31.6	1000	0.0316
Transition	Cobalt	SS-13X-082809AX	28.9	1000	0.0289
Transition	Cobalt	ELY-SS-TZ-11 (0-1)	28	1000	0.0280
Transition	Cobalt	ELY-SS-SA-23 (0-6)	27	1000	0.0270
Transition	Cobalt	ELY-SS-TR-05C (1-12)	27	1000	0.0270
Transition	Cobalt	ELY-SS-TZ-16 (0-4)	25	1000	0.0250
Transition	Cobalt	ELY-SS-NF-04 (0-4)	24	1000	0.0240
Transition	Cobalt	ELY-SS-TZ-12 (3-8)	23	1000	0.0230
Transition	Cobalt	ELY-SS-TR-02D (0-2)	22	1000	0.0220
Transition	Cobalt	ELY-SS-TZ-14 (0-4)	21	1000	0.0210
Transition	Cobalt	ELY-SS-TZ-21 (5-12)	21	1000	0.0210
Transition	Cobalt	ELY-SS-TR-06A (1-12)	20	1000	0.0200
Transition	Cobalt	ELY-SS-TR-09D (3-12)	20	1000	0.0200
Transition	Cobalt	SS-11X-090309AX	18.1	1000	0.0181
Transition	Cobalt	SS-23X-082709AX	18	1000	0.0180
Transition	Cobalt	TO-05X-082709AX	18	1000	0.0180
Transition	Cobalt	SS-09X-090209AX	17.1	1000	0.0171
Transition	Cobalt	ELY-SS-TR-07B (0-2)	17	1000	0.0170
Transition	Cobalt	ELY-SS-TZ-16 (4-12)	17	1000	0.0170
Transition	Cobalt	ELY-SS-TZ-29 (1-9)	17	1000	0.0170
Transition	Cobalt	ELY-SS-TZ-34 (2.5-8)	17	1000	0.0170
Transition	Cobalt	ELY-SS-TZ-37 (2-12)	17	1000	0.0170
Transition	Cobalt	ELY-SS-TZ-39 (3-8)	17	1000	0.0170
Transition	Cobalt	ELY-TP-109 (0-1)	17	1000	0.0170
Transition	Cobalt	ELY-SS-NF-01 (2-7)	16	1000	0.0160
Transition	Cobalt	ELY-SS-NF-06 (0-3)	16	1000	0.0160
Transition	Cobalt	ELY-SS-NF-11 (0-3)	16	1000	0.0160
Transition	Cobalt	ELY-SS-NF-12 (2-9)	16	1000	0.0160
Transition	Cobalt	ELY-SS-TZ-27 (0-2.5)	16	1000	0.0160
Transition	Cobalt	SS-02X-090209AX	16	1000	0.0160
Transition	Cobalt	TA-14X-082409AX	15.2	1000	0.0152
Transition	Cobalt	ELY-SS-NF-02 (0-8)	15	1000	0.0150
Transition	Cobalt	ELY-SS-NF-09 (0-1.5)	15	1000	0.0150
Transition	Cobalt	ELY-SS-TR-05C (0-1)	15	1000	0.0150
Transition	Cobalt	SS-01X-090209AX	14.9	1000	0.0149
Transition	Cobalt	ELY-SS-NF-06 (3-12)	14	1000	0.0140

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cobalt	ELY-SS-NF-09 (1.5-12)	14	1000	0.0140
Transition	Cobalt	ELY-SS-NF-10 (4-12)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TR-02C (0-3)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TR-04C (3-6)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TR-05D (0-3)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TR-06C (0-3)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TR-07B (2-8)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TR-08C (5-12)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TZ-27 (2.5-8)	14	1000	0.0140
Transition	Cobalt	ELY-SS-TZ-36 (1.5-9)	14	1000	0.0140
Transition	Cobalt	SS-26X-083109AX	13.9	1000	0.0139
Transition	Cobalt	SS-16X-090309AX	13.7	1000	0.0137
Transition	Cobalt	ELY-SS-NF-11 (3-9)	13	1000	0.0130
Transition	Cobalt	ELY-SS-TR-08C (0-5) DUP	13	1000	0.0130
Transition	Cobalt	ELY-SS-TR-08C (5-12) DUP	13	1000	0.0130
Transition	Cobalt	TI-03X-082509AX	12.6	1000	0.0126
Transition	Cobalt	SS-29X-083109AX	12.2	1000	0.0122
Transition	Cobalt	SS-28X-083109AX	12.1	1000	0.0121
Transition	Cobalt	ELY-SS-NF-08 (0-2)	12	1000	0.0120
Transition	Cobalt	ELY-SS-NF-10 (0-4)	12	1000	0.0120
Transition	Cobalt	ELY-SS-NF-13 (0-2.5)	12	1000	0.0120
Transition	Cobalt	ELY-SS-NF-13 (2.5-12)	12	1000	0.0120
Transition	Cobalt	ELY-SS-NF-15 (2-5)	12	1000	0.0120
Transition	Cobalt	ELY-SS-TR-02B (0-4)	12	1000	0.0120
Transition	Cobalt	ELY-SS-TR-07C (2-12)	12	1000	0.0120
Transition	Cobalt	ELY-SS-TR-08A (0.5-12)DUP	12	1000	0.0120
Transition	Cobalt	ELY-SS-TR-08D (2-12) DUP	12	1000	0.0120
Transition	Cobalt	ELY-SS-TZ-29 (0-1)	12	1000	0.0120
Transition	Cobalt	ELY-SS-TZ-35 (2-9)	12	1000	0.0120
Transition	Cobalt	ELY-SS-TZ-42 (2-12)	12	1000	0.0120
Transition	Cobalt	SS-03X-090209AX	11.4	1000	0.0114
Transition	Cobalt	SS-18X-082709AX	11.3	1000	0.0113
Transition	Cobalt	ELY-SS-NF-04 (4-10)	11	1000	0.0110
Transition	Cobalt	ELY-SS-NF-08 (2-11)	11	1000	0.0110
Transition	Cobalt	ELY-SS-TR-04B (1.5-12)	11	1000	0.0110
Transition	Cobalt	ELY-SS-TR-05D (3-12)	11	1000	0.0110
Transition	Cobalt	ELY-SS-TR-08D (2-12)	11	1000	0.0110
Transition	Cobalt	ELY-SS-TZ-23 (2.5-12)	11	1000	0.0110
Transition	Cobalt	ELY-SS-TZ-38 (0.5-7)	11	1000	0.0110
Transition	Cobalt	ELY-SS-TZ-42 (0-2)	11	1000	0.0110
Transition	Cobalt	SS-10X-090309AX	10.6	1000	0.0106
Transition	Cobalt	TL-04X-082509AX	10.2	1000	0.0102
Transition	Cobalt	TQ-16X-082609AX	10.2	1000	0.0102
Transition	Cobalt	TG-02X-082409AX	10.1	1000	0.0101
Transition	Cobalt	ELY-SS-NF-16 (1-12)	10	1000	0.0100
Transition	Cobalt	ELY-SS-NF-17 (4-10)	10	1000	0.0100
Transition	Cobalt	ELY-SS-TR-06B (3-7)	10	1000	0.0100
Transition	Cobalt	ELY-SS-TZ-14 (4-12)	10	1000	0.0100
Transition	Cobalt	ELY-SS-TZ-30 (0.5-12)	10	1000	0.0100
Transition	Cobalt	ELY-SS-TZ-40 (2-10)	10	1000	0.0100
Transition	Cobalt	ELY-SS-TZ-40 (0-2)	9.9	1000	0.00990
Transition	Cobalt	ELY-SS-TR-06A (0-1)	9.8	1000	0.00980
Transition	Cobalt	ELY-SS-TZ-43 (2.5-11)	9.8	1000	0.00980
Transition	Cobalt	TA-04X-082409AX	9.8	1000	0.00980
Transition	Cobalt	TP-10X-082709AX	9.7	1000	0.00970
Transition	Cobalt	ELY-SS-TR-06C (3-12)	9.6	1000	0.00960
Transition	Cobalt	ELY-SS-TR-07D (2-9)	9.6	1000	0.00960
Transition	Cobalt	ELY-SS-TR-09B (2-5)	9.6	1000	0.00960
Transition	Cobalt	ELY-SS-TR-08A (0.5-12)	9.5	1000	0.00950
Transition	Cobalt	ELY-SS-TR-08A (0-0.5) DUP	9.5	1000	0.00950
Transition	Cobalt	ELY-SS-NF-07 (2-8)	9.4	1000	0.00940
Transition	Cobalt	ELY-SS-NF-14 (3-12)	9.4	1000	0.00940
Transition	Cobalt	ELY-SS-NF-04 (4-10) DUP	9.3	1000	0.00930
Transition	Cobalt	ELY-SS-TR-08D (0-2) DUP	9.2	1000	0.00920
Transition	Cobalt	ELY-SS-TR-09C (1.5-8)	9.2	1000	0.00920

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Cobalt	SS-17X-083109AX	9.2	1000	0.00920
Transition	Cobalt	TN-02X-082509AD	9.2	1000	0.00920
Transition	Cobalt	TP-15X-073009AX	9.2	1000	0.00920
Transition	Cobalt	ELY-SS-TZ-39 (0-3)	9.1	1000	0.00910
Transition	Cobalt	ELY-SS-TZ-15 (3.5-12)	8.7	1000	0.00870
Transition	Cobalt	ELY-SS-TR-08A (0-0.5)	8.6	1000	0.00860
Transition	Cobalt	ELY-SS-TZ-31 (3-9)	8.6	1000	0.00860
Transition	Cobalt	ELY-SS-TR-02C (3-12)	8.5	1000	0.00850
Transition	Cobalt	ELY-SS-TZ-30 (0-0.5)	8.5	1000	0.00850
Transition	Cobalt	TP-15X-073009AD	8.4	1000	0.00840
Transition	Cobalt	TK-01X-082509AX	8.3	1000	0.00830
Transition	Cobalt	TN-02X-082509AX	8.3	1000	0.00830
Transition	Cobalt	ELY-SS-NF-07 (0-2)	8	1000	0.00800
Transition	Cobalt	ELY-SS-TR-08C (0-5)	8	1000	0.00800
Transition	Cobalt	SS-06X-090209AX	7.9	1000	0.00790
Transition	Cobalt	ELY-SS-TR-03C (0-3)	7.8	1000	0.00780
Transition	Cobalt	ELY-SS-TZ-18 (.5-12)	7.8	1000	0.00780
Transition	Cobalt	ELY-SS-TZ-38 (0-0.5)	7.5	1000	0.00750
Transition	Cobalt	SS-27X-082609AX	7.5	1000	0.00750
Transition	Cobalt	ELY-SS-TR-04C (0-3)	7.4	1000	0.00740
Transition	Cobalt	ELY-SS-TR-07C (0-2)	7.4	1000	0.00740
Transition	Cobalt	ELY-SS-TR-08D (0-2)	7.4	1000	0.00740
Transition	Cobalt	SS-24X-083109AX	7.3	1000	0.00730
Transition	Cobalt	ELY-SS-NF-12 (0-2)	7.1	1000	0.00710
Transition	Cobalt	ELY-SS-TR-09D (0-3)	7.1	1000	0.00710
Transition	Cobalt	SS-07X-090209AX	7.1	1000	0.00710
Transition	Cobalt	ELY-SS-TR-02A (0-1.5)	7	1000	0.00700
Transition	Cobalt	ELY-SS-NF-14 (0-3)	6.8	1000	0.00680
Transition	Cobalt	ELY-SS-NF-15 (0-2)	6.8	1000	0.00680
Transition	Cobalt	ELY-SS-TZ-31 (0-3)	6.8	1000	0.00680
Transition	Cobalt	SS-14X-083109AX	6.8	1000	0.00680
Transition	Cobalt	SS-04X-090209AX	6.6	1000	0.00660
Transition	Cobalt	ELY-SS-TR-03B (0-2)	6.4	1000	0.00640
Transition	Cobalt	ELY-SS-TR-06B (0-3)	6.3	1000	0.00630
Transition	Cobalt	ELY-SS-TZ-37 (0-2)	6.2	1000	0.00620
Transition	Cobalt	SS-22X-082709AX	6.1	1000	0.00610
Transition	Cobalt	ELY-SS-TR-09C (0-1.5)	6	1000	0.00600
Transition	Cobalt	ELY-SS-TZ-43 (0-2.5)	6	1000	0.00600
Transition	Cobalt	ELY-SS-TR-09B (0-2)	5.9	1000	0.00590
Transition	Cobalt	ELY-SS-TZ-36 (0-1.5)	5.9	1000	0.00590
Transition	Cobalt	ELY-SS-TR-07D (0-2)	5.8	1000	0.00580
Transition	Cobalt	SS-12X-090309AX	5.8	1000	0.00580
Transition	Cobalt	ELY-SS-TR-03C (3-12)	5.4	1000	0.00540
Transition	Cobalt	ELY-SS-TZ-18 (0-.5)	5.4	1000	0.00540
Transition	Cobalt	ELY-SS-TZ-15 (0-3.5)	5.1	1000	0.00510
Transition	Cobalt	SS-25X-082709AX	4.9	1000	0.00490
Transition	Cobalt	TC-03X-082609AX	4.7	1000	0.00470
Transition	Cobalt	SS-05X-090209AX	4.6	1000	0.00460
Transition	Cobalt	SS-21X-083109AX	4.5	1000	0.00450
Transition	Cobalt	SS-20X-083109AX	4.4	1000	0.00440
Transition	Cobalt	SS-15X-083109AX	4.3	1000	0.00430
Transition	Cobalt	ELY-SS-TZ-12 (0-3)	4.2	1000	0.00420
Transition	Cobalt	TQ-06X-082609AX	4.1	1000	0.00410
Transition	Cobalt	ELY-SS-TZ-34 (0-2.5)	4	1000	0.00400
Transition	Cobalt	ELY-SS-NF-17 (0-4)	3.9	1000	0.00390
Transition	Cobalt	ELY-SS-TZ-35 (0-2)	3.9	1000	0.00390
Transition	Cobalt	SS-19X-082709AX	3.9	1000	0.00390
Transition	Cobalt	ELY-SS-NF-04 (0-4) DUP	3.1	1000	0.00310
Transition	Cobalt	ELY-SS-NF-03 (0-4)	2.9	1000	0.00290
Transition	Cobalt	ELY-SS-NF-16 (0-1)	2.8	1000	0.00280
Transition	Cobalt	ELY-SS-TZ-23 (0-2.5)	2.4	1000	0.00240
Transition	Cobalt	ELY-SS-TR-04B (0-1.5)	1.8	1000	0.00180
Transition	Copper	TF-13X-090909BX	7850	80	98.1
Transition	Copper	ELY-SS-TR-08A (0.5-12)	4000	80	50.0
Transition	Copper	ELY-SS-SA-04 (0-6)	3800	80	47.5

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Copper	ELY-SS-TZ-38 (0-0.5)	3700	80	46.3
Transition	Copper	ELY-SS-TR-03B (2-12)	2900	80	36.3
Transition	Copper	ELY-SS-TR-02D (2-12) DUP	2800	80	35.0
Transition	Copper	ELY-SS-TR-02D (2-12)	2100	80	26.3
Transition	Copper	ELY-SS-NF-03 (4-12)	2000	80	25.0
Transition	Copper	ELY-SS-TZ-06 (0-1)	2000	80	25.0
Transition	Copper	ELY-SS-TR-02B (4-11)	1900	80	23.8
Transition	Copper	ELY-SS-TZ-16 (4-12)	1800	80	22.5
Transition	Copper	ELY-SS-SA-01 (0-2)	1700	80	21.3
Transition	Copper	ELY-SS-SA-06 (0-6)	1700	80	21.3
Transition	Copper	ELY-SS-SA-09 (0-4)	1600	80	20.0
Transition	Copper	ELY-SS-TR-03B (0-2)	1600	80	20.0
Transition	Copper	ELY-SS-TR-08C (0-5)	1600	80	20.0
Transition	Copper	ELY-TP-104 (0-1)	1600	80	20.0
Transition	Copper	ELY-SS-NF-05 (0-3)	1500	80	18.8
Transition	Copper	ELY-SS-TR-02A (1.5-11)	1500	80	18.8
Transition	Copper	ELY-SS-TZ-06 (1-12)	1500	80	18.8
Transition	Copper	ELY-SS-TZ-39 (3-8)	1500	80	18.8
Transition	Copper	ELY-TP-109 (0-1)	1500	80	18.8
Transition	Copper	ELY-SS-NF-05 (3-11)	1400	80	17.5
Transition	Copper	ELY-SS-TR-08A (0.5-12)DUP	1400	80	17.5
Transition	Copper	ELY-SS-TZ-11 (1-5.5)	1400	80	17.5
Transition	Copper	ELY-SS-TZ-38 (0.5-7)	1400	80	17.5
Transition	Copper	SS-27X-082609AX	1370	80	17.1
Transition	Copper	ELY-SS-TR-04C (3-6)	1300	80	16.3
Transition	Copper	ELY-SS-TR-05D (3-12)	1300	80	16.3
Transition	Copper	ELY-SS-TZ-30 (0.5-12)	1300	80	16.3
Transition	Copper	SS-18X-082709AX	1280	80	16.0
Transition	Copper	ELY-SS-TR-02D(0-2) DUP	1200	80	15.0
Transition	Copper	ELY-SS-TR-06B (3-7)	1200	80	15.0
Transition	Copper	ELY-SS-TZ-14 (4-12)	1200	80	15.0
Transition	Copper	ELY-SS-TZ-16 (0-4)	1200	80	15.0
Transition	Copper	ELY-SS-TR-06C (0-3)	1100	80	13.8
Transition	Copper	ELY-SS-TZ-30 (0-0.5)	1100	80	13.8
Transition	Copper	TO-05X-082709AX	1100	80	13.8
Transition	Copper	ELY-SS-TR-09B (0-2)	1000	80	12.5
Transition	Copper	SS-13X-082809AX	995	80	12.4
Transition	Copper	ELY-SS-TZ-14 (0-4)	980	80	12.3
Transition	Copper	ELY-SS-TZ-21 (0-5)	960	80	12.0
Transition	Copper	ELY-SS-TR-08A (0-0.5)	950	80	11.9
Transition	Copper	ELY-SS-TR-05D (0-3)	940	80	11.8
Transition	Copper	ELY-SS-TZ-35 (2-9)	940	80	11.8
Transition	Copper	ELY-SS-TR-08C (0-5) DUP	930	80	11.6
Transition	Copper	ELY-SS-TR-09C (1.5-8)	920	80	11.5
Transition	Copper	SS-11X-090309AX	897	80	11.2
Transition	Copper	ELY-SS-TR-08A (0-0.5) DUP	880	80	11.0
Transition	Copper	SS-08X-090209AX	848	80	10.6
Transition	Copper	ELY-SS-TZ-35 (0-2)	840	80	10.5
Transition	Copper	ELY-SS-TR-09C (0-1.5)	820	80	10.3
Transition	Copper	ELY-SS-TR-09D (3-12)	810	80	10.1
Transition	Copper	ELY-SS-TZ-29 (1-9)	740	80	9.25
Transition	Copper	ELY-SS-TR-06C (3-12)	730	80	9.13
Transition	Copper	SS-09X-090209AX	699	80	8.74
Transition	Copper	ELY-SS-TR-02D (0-2)	690	80	8.63
Transition	Copper	ELY-SS-TZ-36 (0-1.5)	690	80	8.63
Transition	Copper	ELY-SS-TZ-27 (0-2.5)	680	80	8.50
Transition	Copper	ELY-SS-SA-23 (0-6)	670	80	8.38
Transition	Copper	ELY-SS-TR-02B (0-4)	670	80	8.38
Transition	Copper	ELY-SS-TR-06A (0-1)	650	80	8.13
Transition	Copper	ELY-SS-TR-08D (2-12) DUP	650	80	8.13
Transition	Copper	ELY-SS-TZ-12 (3-8)	640	80	8.00
Transition	Copper	TA-14X-082409AX	632	80	7.90
Transition	Copper	ELY-SS-TR-07B (0-2)	630	80	7.88
Transition	Copper	ELY-SS-TZ-29 (0-1)	620	80	7.75
Transition	Copper	ELY-SS-TZ-27 (2.5-8)	610	80	7.63

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Copper	SS-10X-090309AX	605	80	7.56
Transition	Copper	ELY-SS-TZ-21 (5-12)	590	80	7.38
Transition	Copper	TP-15X-073009AX	584	80	7.30
Transition	Copper	ELY-SS-TR-06A (1-12)	580	80	7.25
Transition	Copper	ELY-SS-NF-13 (2.5-12)	570	80	7.13
Transition	Copper	ELY-SS-TR-07B (2-8)	560	80	7.00
Transition	Copper	ELY-SS-TR-05C (0-1)	550	80	6.88
Transition	Copper	ELY-SS-NF-09 (0-1.5)	530	80	6.63
Transition	Copper	ELY-SS-TZ-18 (.5-12)	530	80	6.63
Transition	Copper	ELY-SS-TZ-39 (0-3)	530	80	6.63
Transition	Copper	ELY-SS-NF-13 (0-2.5)	520	80	6.50
Transition	Copper	ELY-SS-TR-09B (2-5)	520	80	6.50
Transition	Copper	ELY-SS-TR-08C (5-12)	500	80	6.25
Transition	Copper	SS-02X-090209AX	494	80	6.18
Transition	Copper	ELY-SS-TZ-37 (2-12)	490	80	6.13
Transition	Copper	ELY-SS-TR-07C (2-12)	480	80	6.00
Transition	Copper	ELY-SS-TZ-34 (2.5-8)	470	80	5.88
Transition	Copper	TP-15X-073009AD	462	80	5.78
Transition	Copper	ELY-SS-TZ-15 (3.5-12)	460	80	5.75
Transition	Copper	ELY-SS-TZ-37 (0-2)	460	80	5.75
Transition	Copper	ELY-SS-TR-08C (5-12) DUP	450	80	5.63
Transition	Copper	ELY-SS-TR-05C (1-12)	430	80	5.38
Transition	Copper	ELY-SS-TR-02C (0-3)	420	80	5.25
Transition	Copper	ELY-SS-TZ-11 (0-1)	420	80	5.25
Transition	Copper	ELY-SS-TR-06B (0-3)	410	80	5.13
Transition	Copper	ELY-SS-NF-04 (0-4)	400	80	5.00
Transition	Copper	TA-04X-082409AX	365	80	4.56
Transition	Copper	SS-01X-090209AX	362	80	4.53
Transition	Copper	ELY-SS-TR-02C (3-12)	360	80	4.50
Transition	Copper	ELY-SS-TR-07C (0-2)	340	80	4.25
Transition	Copper	ELY-SS-NF-04 (4-10)	320	80	4.00
Transition	Copper	ELY-SS-NF-09 (1.5-12)	320	80	4.00
Transition	Copper	ELY-SS-NF-06 (0-3)	300	80	3.75
Transition	Copper	ELY-SS-TZ-31 (0-3)	300	80	3.75
Transition	Copper	ELY-SS-NF-06 (3-12)	290	80	3.63
Transition	Copper	TQ-06X-082609AX	288	80	3.60
Transition	Copper	ELY-SS-TR-02A (0-1.5)	280	80	3.50
Transition	Copper	ELY-SS-TZ-18 (0-.5)	280	80	3.50
Transition	Copper	ELY-SS-NF-02 (0-8)	270	80	3.38
Transition	Copper	ELY-SS-TR-03C (3-12)	270	80	3.38
Transition	Copper	ELY-SS-TZ-36 (1.5-9)	270	80	3.38
Transition	Copper	SS-17X-083109AX	265	80	3.31
Transition	Copper	ELY-SS-TZ-23 (2.5-12)	260	80	3.25
Transition	Copper	ELY-SS-TZ-40 (2-10)	260	80	3.25
Transition	Copper	ELY-SS-NF-04 (4-10) DUP	250	80	3.13
Transition	Copper	ELY-SS-TR-04B (1.5-12)	240	80	3.00
Transition	Copper	ELY-SS-TR-04C (0-3)	240	80	3.00
Transition	Copper	ELY-SS-TZ-31 (3-9)	240	80	3.00
Transition	Copper	SS-25X-082709AX	231	80	2.89
Transition	Copper	ELY-SS-TZ-15 (0-3.5)	230	80	2.88
Transition	Copper	ELY-SS-NF-01 (2-7)	220	80	2.75
Transition	Copper	ELY-SS-TR-03C (0-3)	190	80	2.38
Transition	Copper	SS-03X-090209AX	188	80	2.35
Transition	Copper	TG-02X-082409AX	182	80	2.28
Transition	Copper	ELY-SS-TR-09D (0-3)	170	80	2.13
Transition	Copper	ELY-SS-TZ-42 (2-12)	150	80	1.88
Transition	Copper	SS-12X-090309AX	149	80	1.86
Transition	Copper	SS-22X-082709AX	149	80	1.86
Transition	Copper	SS-14X-083109AX	142	80	1.78
Transition	Copper	TP-10X-082709AX	135	80	1.69
Transition	Copper	ELY-SS-NF-16 (1-12)	130	80	1.63
Transition	Copper	SS-04X-090209AX	122	80	1.53
Transition	Copper	ELY-SS-TZ-12 (0-3)	120	80	1.50
Transition	Copper	ELY-SS-NF-11 (3-9)	110	80	1.38
Transition	Copper	ELY-SS-TR-08D (2-12)	110	80	1.38

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Copper	ELY-SS-TZ-40 (0-2)	110	80	1.38
Transition	Copper	TK-01X-082509AX	110	80	1.38
Transition	Copper	TQ-16X-082609AX	109	80	1.36
Transition	Copper	SS-23X-082709AX	103	80	1.29
Transition	Copper	SS-28X-083109AX	95.4	80	1.19
Transition	Copper	ELY-SS-NF-11 (0-3)	94	80	1.18
Transition	Copper	SS-20X-083109AX	85.9	80	1.07
Transition	Copper	ELY-SS-NF-10 (0-4)	85	80	1.06
Transition	Copper	SS-16X-090309AX	80.1	80	1.00
Transition	Copper	TN-02X-082509AD	78.3	80	0.979
Transition	Copper	SS-19X-082709AX	74	80	0.925
Transition	Copper	TL-04X-082509AX	68.6	80	0.858
Transition	Copper	ELY-SS-NF-10 (4-12)	66	80	0.825
Transition	Copper	ELY-SS-TZ-42 (0-2)	66	80	0.825
Transition	Copper	SS-29X-083109AX	65.6	80	0.820
Transition	Copper	ELY-SS-TZ-34 (0-2.5)	64	80	0.800
Transition	Copper	SS-26X-083109AX	64	80	0.800
Transition	Copper	TI-03X-082509AX	61.8	80	0.773
Transition	Copper	ELY-SS-TR-07D (0-2)	61	80	0.763
Transition	Copper	TN-02X-082509AX	61	80	0.763
Transition	Copper	ELY-SS-NF-07 (2-8)	56	80	0.700
Transition	Copper	ELY-SS-NF-08 (0-2)	56	80	0.700
Transition	Copper	ELY-SS-TZ-23 (0-2.5)	56	80	0.700
Transition	Copper	ELY-SS-NF-14 (3-12)	54	80	0.675
Transition	Copper	ELY-SS-NF-17 (4-10)	53	80	0.663
Transition	Copper	ELY-SS-NF-04 (0-4) DUP	51	80	0.638
Transition	Copper	SS-21X-083109AX	50.8	80	0.635
Transition	Copper	ELY-SS-TR-08D (0-2) DUP	49	80	0.613
Transition	Copper	ELY-SS-NF-07 (0-2)	48	80	0.600
Transition	Copper	ELY-SS-NF-12 (2-9)	48	80	0.600
Transition	Copper	ELY-SS-NF-08 (2-11)	47	80	0.588
Transition	Copper	SS-24X-083109AX	45.8	80	0.573
Transition	Copper	SS-06X-090209AX	44.7	80	0.559
Transition	Copper	ELY-SS-TR-07D (2-9)	44	80	0.550
Transition	Copper	ELY-SS-TR-04B (0-1.5)	42	80	0.525
Transition	Copper	ELY-SS-TZ-43 (2.5-11)	41	80	0.513
Transition	Copper	ELY-SS-NF-14 (0-3)	37	80	0.463
Transition	Copper	ELY-SS-TR-08D (0-2)	36	80	0.450
Transition	Copper	ELY-SS-NF-15 (2-5)	35	80	0.438
Transition	Copper	ELY-SS-NF-03 (0-4)	34	80	0.425
Transition	Copper	SS-05X-090209AX	31.8	80	0.398
Transition	Copper	SS-15X-083109AX	31.4	80	0.393
Transition	Copper	SS-07X-090209AX	26.4	80	0.330
Transition	Copper	ELY-SS-NF-15 (0-2)	24	80	0.300
Transition	Copper	ELY-SS-NF-12 (0-2)	23	80	0.288
Transition	Copper	ELY-SS-TZ-43 (0-2.5)	22	80	0.275
Transition	Copper	ELY-SS-NF-16 (0-1)	21	80	0.263
Transition	Copper	TC-03X-082609AX	19.3	80	0.241
Transition	Copper	ELY-SS-NF-17 (0-4)	16	80	0.200
Transition	Iron	ELY-SS-TZ-14 (4-12)	300000	200	1500
Transition	Iron	ELY-SS-SA-06 (0-6)	170000	200	850
Transition	Iron	ELY-SS-TZ-39 (3-8)	170000	200	850
Transition	Iron	ELY-SS-TR-03B (2-12)	160000	200	800
Transition	Iron	ELY-SS-TZ-37 (2-12)	160000	200	800
Transition	Iron	ELY-SS-SA-09 (0-4)	150000	200	750
Transition	Iron	ELY-SS-NF-03 (4-12)	140000	200	700
Transition	Iron	ELY-SS-TR-06A (1-12)	140000	200	700
Transition	Iron	ELY-SS-TR-09D (3-12)	140000	200	700
Transition	Iron	ELY-TP-109 (0-1)	140000	200	700
Transition	Iron	ELY-SS-SA-23 (0-6)	130000	200	650
Transition	Iron	ELY-SS-TR-08A (0.5-12)	120000	200	600
Transition	Iron	ELY-SS-TR-08A (0.5-12)DUP	120000	200	600
Transition	Iron	ELY-SS-TZ-29 (1-9)	120000	200	600
Transition	Iron	TP-15X-073009AX	111000	200	555
Transition	Iron	ELY-SS-TR-08A (0-0.5) DUP	100000	200	500

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Iron	ELY-SS-TR-08C (5-12) DUP	100000	200	500
Transition	Iron	ELY-SS-TZ-14 (0-4)	100000	200	500
Transition	Iron	ELY-SS-TZ-16 (4-12)	100000	200	500
Transition	Iron	ELY-SS-TZ-29 (0-1)	100000	200	500
Transition	Iron	ELY-SS-TR-02D (2-12) DUP	98000	200	490
Transition	Iron	ELY-SS-TR-08C (5-12)	98000	200	490
Transition	Iron	ELY-SS-TR-09C (1.5-8)	98000	200	490
Transition	Iron	ELY-SS-TR-04C (3-6)	94000	200	470
Transition	Iron	ELY-SS-TR-08A (0-0.5)	94000	200	470
Transition	Iron	ELY-SS-NF-09 (0-1.5)	93000	200	465
Transition	Iron	TP-15X-073009AD	91600	200	458
Transition	Iron	ELY-SS-TZ-38 (0.5-7)	87000	200	435
Transition	Iron	ELY-SS-TR-06A (0-1)	86000	200	430
Transition	Iron	ELY-SS-TZ-06 (0-1)	79000	200	395
Transition	Iron	SS-11X-090309AX	78700	200	394
Transition	Iron	ELY-SS-TR-08C (0-5) DUP	78000	200	390
Transition	Iron	ELY-SS-TR-05D (3-12)	77000	200	385
Transition	Iron	ELY-SS-TR-02D (2-12)	75000	200	375
Transition	Iron	ELY-SS-TR-09C (0-1.5)	75000	200	375
Transition	Iron	TO-05X-082709AX	74000	200	370
Transition	Iron	TQ-06X-082609AX	73700	200	369
Transition	Iron	ELY-TP-104 (0-1)	73000	200	365
Transition	Iron	ELY-SS-TR-02D(0-2) DUP	72000	200	360
Transition	Iron	ELY-SS-TR-05D (0-3)	72000	200	360
Transition	Iron	ELY-SS-TR-06B (3-7)	66000	200	330
Transition	Iron	ELY-SS-SA-04 (0-6)	63000	200	315
Transition	Iron	ELY-SS-TR-03B (0-2)	62000	200	310
Transition	Iron	ELY-SS-TZ-30 (0.5-12)	60000	200	300
Transition	Iron	ELY-SS-TZ-37 (0-2)	60000	200	300
Transition	Iron	ELY-SS-NF-13 (2.5-12)	59000	200	295
Transition	Iron	ELY-SS-TZ-36 (0-1.5)	59000	200	295
Transition	Iron	ELY-SS-TZ-11 (1-5.5)	57000	200	285
Transition	Iron	ELY-SS-TR-07B (0-2)	56000	200	280
Transition	Iron	ELY-SS-SA-01 (0-2)	54000	200	270
Transition	Iron	ELY-SS-TZ-06 (1-12)	54000	200	270
Transition	Iron	ELY-SS-NF-04 (0-4)	53000	200	265
Transition	Iron	ELY-SS-TZ-12 (3-8)	53000	200	265
Transition	Iron	ELY-SS-TZ-39 (0-3)	53000	200	265
Transition	Iron	ELY-SS-TZ-27 (0-2.5)	52000	200	260
Transition	Iron	ELY-SS-TR-06C (0-3)	50000	200	250
Transition	Iron	ELY-SS-TR-06C (3-12)	50000	200	250
Transition	Iron	ELY-SS-TZ-35 (2-9)	50000	200	250
Transition	Iron	ELY-SS-TR-08C (0-5)	48000	200	240
Transition	Iron	ELY-SS-TZ-35 (0-2)	47000	200	235
Transition	Iron	ELY-SS-TZ-30 (0-0.5)	46000	200	230
Transition	Iron	ELY-SS-NF-13 (0-2.5)	43000	200	215
Transition	Iron	ELY-SS-TZ-18 (.5-12)	43000	200	215
Transition	Iron	ELY-SS-TR-06B (0-3)	42000	200	210
Transition	Iron	ELY-SS-TR-02B (4-11)	40000	200	200
Transition	Iron	ELY-SS-NF-05 (0-3)	39000	200	195
Transition	Iron	ELY-SS-TR-02D (0-2)	39000	200	195
Transition	Iron	ELY-SS-TZ-38 (0-0.5)	39000	200	195
Transition	Iron	ELY-SS-TZ-15 (3.5-12)	37000	200	185
Transition	Iron	ELY-SS-NF-05 (3-11)	36000	200	180
Transition	Iron	ELY-SS-TZ-36 (1.5-9)	36000	200	180
Transition	Iron	ELY-SS-TR-05C (1-12)	35000	200	175
Transition	Iron	ELY-SS-TZ-21 (0-5)	35000	200	175
Transition	Iron	ELY-SS-TZ-21 (5-12)	35000	200	175
Transition	Iron	SS-09X-090209AX	34300	200	172
Transition	Iron	ELY-SS-TZ-27 (2.5-8)	34000	200	170
Transition	Iron	SS-02X-090209AX	34000	200	170
Transition	Iron	ELY-SS-TR-05C (0-1)	33000	200	165
Transition	Iron	ELY-SS-TR-07B (2-8)	32000	200	160
Transition	Iron	ELY-SS-TZ-34 (2.5-8)	31000	200	155
Transition	Iron	SS-01X-090209AX	31000	200	155

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Iron	TF-13X-090909BX	30700	200	154
Transition	Iron	ELY-SS-NF-04 (4-10)	29000	200	145
Transition	Iron	SS-17X-083109AX	28700	200	144
Transition	Iron	ELY-SS-NF-09 (1.5-12)	27000	200	135
Transition	Iron	ELY-SS-NF-15 (2-5)	27000	200	135
Transition	Iron	ELY-SS-TZ-11 (0-1)	27000	200	135
Transition	Iron	SS-16X-090309AX	26300	200	132
Transition	Iron	TQ-16X-082609AX	26100	200	131
Transition	Iron	ELY-SS-NF-04 (4-10) DUP	26000	200	130
Transition	Iron	ELY-SS-NF-12 (2-9)	26000	200	130
Transition	Iron	SS-08X-090209AX	25900	200	130
Transition	Iron	SS-03X-090209AX	25300	200	127
Transition	Iron	TN-02X-082509AD	25300	200	127
Transition	Iron	ELY-SS-NF-10 (4-12)	25000	200	125
Transition	Iron	ELY-SS-TR-03C (3-12)	25000	200	125
Transition	Iron	ELY-SS-TZ-18 (0-.5)	25000	200	125
Transition	Iron	TP-10X-082709AX	24900	200	125
Transition	Iron	SS-06X-090209AX	23700	200	119
Transition	Iron	TI-03X-082509AX	23600	200	118
Transition	Iron	SS-05X-090209AX	23500	200	118
Transition	Iron	TA-14X-082409AX	23300	200	117
Transition	Iron	ELY-SS-NF-11 (0-3)	23000	200	115
Transition	Iron	SS-07X-090209AX	22800	200	114
Transition	Iron	SS-28X-083109AX	22400	200	112
Transition	Iron	ELY-SS-NF-17 (4-10)	22000	200	110
Transition	Iron	ELY-SS-TR-04B (1.5-12)	22000	200	110
Transition	Iron	ELY-SS-TR-04C (0-3)	22000	200	110
Transition	Iron	ELY-SS-TR-09B (2-5)	22000	200	110
Transition	Iron	TC-03X-082609AX	21300	200	107
Transition	Iron	ELY-SS-NF-11 (3-9)	21000	200	105
Transition	Iron	ELY-SS-TR-07C (2-12)	21000	200	105
Transition	Iron	ELY-SS-TZ-31 (3-9)	21000	200	105
Transition	Iron	SS-04X-090209AX	21000	200	105
Transition	Iron	TA-04X-082409AX	20900	200	105
Transition	Iron	SS-10X-090309AX	20800	200	104
Transition	Iron	TL-04X-082509AX	20800	200	104
Transition	Iron	TN-02X-082509AX	20300	200	102
Transition	Iron	ELY-SS-NF-01 (2-7)	20000	200	100
Transition	Iron	ELY-SS-NF-08 (0-2)	20000	200	100
Transition	Iron	ELY-SS-NF-10 (0-4)	20000	200	100
Transition	Iron	ELY-SS-NF-16 (1-12)	20000	200	100
Transition	Iron	ELY-SS-TZ-23 (2.5-12)	20000	200	100
Transition	Iron	ELY-SS-TZ-40 (2-10)	20000	200	100
Transition	Iron	TG-02X-082409AX	19800	200	99.0
Transition	Iron	SS-26X-083109AX	19600	200	98.0
Transition	Iron	ELY-SS-NF-02 (0-8)	19000	200	95.0
Transition	Iron	SS-14X-083109AX	18800	200	94.0
Transition	Iron	SS-22X-082709AX	18400	200	92.0
Transition	Iron	ELY-SS-NF-06 (0-3)	18000	200	90.0
Transition	Iron	ELY-SS-NF-06 (3-12)	18000	200	90.0
Transition	Iron	ELY-SS-TR-07D (2-9)	18000	200	90.0
Transition	Iron	ELY-SS-TR-08D (2-12) DUP	18000	200	90.0
Transition	Iron	ELY-SS-TZ-15 (0-3.5)	18000	200	90.0
Transition	Iron	ELY-SS-TZ-31 (0-3)	18000	200	90.0
Transition	Iron	ELY-SS-TZ-43 (2.5-11)	18000	200	90.0
Transition	Iron	SS-29X-083109AX	17700	200	88.5
Transition	Iron	TK-01X-082509AX	17400	200	87.0
Transition	Iron	ELY-SS-NF-07 (0-2)	17000	200	85.0
Transition	Iron	ELY-SS-NF-14 (3-12)	17000	200	85.0
Transition	Iron	SS-23X-082709AX	17000	200	85.0
Transition	Iron	ELY-SS-TR-08D (2-12)	16000	200	80.0
Transition	Iron	ELY-SS-TZ-16 (0-4)	16000	200	80.0
Transition	Iron	ELY-SS-TZ-42 (2-12)	16000	200	80.0
Transition	Iron	SS-20X-083109AX	15400	200	77.0
Transition	Iron	SS-18X-082709AX	14400	200	72.0

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Iron	ELY-SS-NF-08 (2-11)	14000	200	70.0
Transition	Iron	ELY-SS-NF-12 (0-2)	14000	200	70.0
Transition	Iron	ELY-SS-NF-14 (0-3)	14000	200	70.0
Transition	Iron	ELY-SS-TR-02C (0-3)	14000	200	70.0
Transition	Iron	ELY-SS-TR-07D (0-2)	14000	200	70.0
Transition	Iron	ELY-SS-NF-07 (2-8)	13000	200	65.0
Transition	Iron	ELY-SS-TR-02A (0-1.5)	12000	200	60.0
Transition	Iron	ELY-SS-TR-02A (1.5-11)	12000	200	60.0
Transition	Iron	ELY-SS-TZ-42 (0-2)	12000	200	60.0
Transition	Iron	ELY-SS-TZ-43 (0-2.5)	12000	200	60.0
Transition	Iron	SS-13X-082809AX	11800	200	59.0
Transition	Iron	ELY-SS-NF-15 (0-2)	11000	200	55.0
Transition	Iron	ELY-SS-TR-02C (3-12)	11000	200	55.0
Transition	Iron	ELY-SS-TR-08D (0-2) DUP	11000	200	55.0
Transition	Iron	SS-12X-090309AX	9760	200	48.8
Transition	Iron	ELY-SS-TZ-40 (0-2)	9600	200	48.0
Transition	Iron	ELY-SS-TR-03C (0-3)	9500	200	47.5
Transition	Iron	ELY-SS-TZ-12 (0-3)	9200	200	46.0
Transition	Iron	SS-24X-083109AX	8870	200	44.4
Transition	Iron	ELY-SS-TR-08D (0-2)	8800	200	44.0
Transition	Iron	SS-21X-083109AX	8560	200	42.8
Transition	Iron	ELY-SS-TR-02B (0-4)	8500	200	42.5
Transition	Iron	SS-27X-082609AX	8320	200	41.6
Transition	Iron	ELY-SS-TR-07C (0-2)	6800	200	34.0
Transition	Iron	ELY-SS-TR-09D (0-3)	6400	200	32.0
Transition	Iron	SS-19X-082709AX	6120	200	30.6
Transition	Iron	ELY-SS-TZ-34 (0-2.5)	6100	200	30.5
Transition	Iron	SS-25X-082709AX	5820	200	29.1
Transition	Iron	ELY-SS-TZ-23 (0-2.5)	5000	200	25.0
Transition	Iron	ELY-SS-NF-16 (0-1)	4800	200	24.0
Transition	Iron	ELY-SS-TR-09B (0-2)	4800	200	24.0
Transition	Iron	ELY-SS-TR-04B (0-1.5)	3900	200	19.5
Transition	Iron	SS-15X-083109AX	3400	200	17.0
Transition	Iron	ELY-SS-NF-17 (0-4)	2700	200	13.5
Transition	Iron	ELY-SS-NF-03 (0-4)	2400	200	12.0
Transition	Iron	ELY-SS-NF-04 (0-4) DUP	2400	200	12.0
Transition	Lead	ELY-SS-TZ-12 (0-3)	1700	1700	1.00
Transition	Lead	SS-01X-090209AX	295	1700	0.174
Transition	Lead	ELY-SS-TR-02C (0-3)	200	1700	0.118
Transition	Lead	ELY-SS-TR-02C (3-12)	200	1700	0.118
Transition	Lead	ELY-SS-TZ-27 (0-2.5)	200	1700	0.118
Transition	Lead	ELY-SS-SA-06 (0-6)	180	1700	0.106
Transition	Lead	ELY-SS-TR-03B (0-2)	180	1700	0.106
Transition	Lead	SS-13X-082809AX	118	1700	0.0694
Transition	Lead	SS-25X-082709AX	116	1700	0.0682
Transition	Lead	TA-14X-082409AX	116	1700	0.0682
Transition	Lead	SS-26X-083109AX	109	1700	0.0641
Transition	Lead	SS-24X-083109AX	107	1700	0.0629
Transition	Lead	ELY-SS-NF-11 (0-3)	94	1700	0.0553
Transition	Lead	SS-10X-090309AX	93.9	1700	0.0552
Transition	Lead	SS-14X-083109AX	93.9	1700	0.0552
Transition	Lead	ELY-SS-TZ-39 (3-8)	93	1700	0.0547
Transition	Lead	SS-29X-083109AX	92.8	1700	0.0546
Transition	Lead	ELY-SS-TZ-39 (0-3)	90	1700	0.0529
Transition	Lead	ELY-SS-TR-06A (1-12)	83	1700	0.0488
Transition	Lead	SS-27X-082609AX	82	1700	0.0482
Transition	Lead	SS-22X-082709AX	78.3	1700	0.0461
Transition	Lead	ELY-SS-NF-05 (0-3)	75	1700	0.0441
Transition	Lead	SS-11X-090309AX	74.9	1700	0.0441
Transition	Lead	ELY-SS-NF-09 (0-1.5)	74	1700	0.0435
Transition	Lead	ELY-SS-TR-07C (0-2)	74	1700	0.0435
Transition	Lead	SS-23X-082709AX	71.2	1700	0.0419
Transition	Lead	ELY-SS-TR-02B (4-11)	68	1700	0.0400
Transition	Lead	ELY-SS-TZ-35 (0-2)	68	1700	0.0400
Transition	Lead	ELY-SS-NF-04 (0-4) DUP	65	1700	0.0382

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Lead	SS-15X-083109AX	63.9	1700	0.0376
Transition	Lead	ELY-SS-TZ-27 (2.5-8)	63	1700	0.0371
Transition	Lead	ELY-SS-TR-03B (2-12)	62	1700	0.0365
Transition	Lead	ELY-SS-TR-08A (0-0.5)	62	1700	0.0365
Transition	Lead	ELY-SS-TZ-31 (0-3)	60	1700	0.0353
Transition	Lead	SS-17X-083109AX	59.8	1700	0.0352
Transition	Lead	ELY-SS-TR-08A (0-0.5) DUP	58	1700	0.0341
Transition	Lead	ELY-SS-TZ-21 (0-5)	58	1700	0.0341
Transition	Lead	ELY-SS-TZ-15 (0-3.5)	56	1700	0.0329
Transition	Lead	SS-28X-083109AX	55.6	1700	0.0327
Transition	Lead	ELY-SS-TR-02D (0-2)	54	1700	0.0318
Transition	Lead	ELY-SS-TZ-11 (1-5.5)	54	1700	0.0318
Transition	Lead	ELY-SS-TR-02D (2-12)	51	1700	0.0300
Transition	Lead	ELY-SS-TZ-14 (0-4)	48	1700	0.0282
Transition	Lead	SS-20X-083109AX	47	1700	0.0276
Transition	Lead	ELY-SS-TR-08A (0.5-12)	46	1700	0.0271
Transition	Lead	ELY-SS-TR-08D (0-2) DUP	46	1700	0.0271
Transition	Lead	ELY-SS-TZ-14 (4-12)	46	1700	0.0271
Transition	Lead	ELY-SS-NF-12 (0-2)	44	1700	0.0259
Transition	Lead	ELY-SS-TR-02D(0-2) DUP	44	1700	0.0259
Transition	Lead	ELY-SS-TZ-42 (0-2)	44	1700	0.0259
Transition	Lead	ELY-SS-TR-07B (0-2)	43	1700	0.0253
Transition	Lead	ELY-SS-TR-07D (0-2)	43	1700	0.0253
Transition	Lead	ELY-SS-TZ-11 (0-1)	43	1700	0.0253
Transition	Lead	ELY-SS-SA-04 (0-6)	41	1700	0.0241
Transition	Lead	ELY-SS-TR-04C (3-6)	40	1700	0.0235
Transition	Lead	ELY-SS-TR-05D (0-3)	40	1700	0.0235
Transition	Lead	SS-18X-082709AX	39.2	1700	0.0231
Transition	Lead	ELY-SS-TR-02B (0-4)	39	1700	0.0229
Transition	Lead	ELY-SS-TR-06B (0-3)	38	1700	0.0224
Transition	Lead	ELY-SS-TR-06B (3-7)	38	1700	0.0224
Transition	Lead	ELY-SS-TR-09D (0-3)	38	1700	0.0224
Transition	Lead	ELY-SS-TZ-40 (0-2)	38	1700	0.0224
Transition	Lead	SS-06X-090209AX	37.1	1700	0.0218
Transition	Lead	ELY-SS-TR-08A (0.5-12)DUP	37	1700	0.0218
Transition	Lead	ELY-SS-NF-10 (0-4)	36	1700	0.0212
Transition	Lead	ELY-SS-TZ-12 (3-8)	36	1700	0.0212
Transition	Lead	ELY-SS-NF-02 (0-8)	35	1700	0.0206
Transition	Lead	ELY-SS-NF-15 (0-2)	35	1700	0.0206
Transition	Lead	SS-07X-090209AX	34.9	1700	0.0205
Transition	Lead	SS-19X-082709AX	34.7	1700	0.0204
Transition	Lead	ELY-SS-NF-05 (3-11)	34	1700	0.0200
Transition	Lead	ELY-SS-TZ-16 (0-4)	34	1700	0.0200
Transition	Lead	ELY-SS-TZ-37 (2-12)	34	1700	0.0200
Transition	Lead	ELY-SS-TR-02A (0-1.5)	33	1700	0.0194
Transition	Lead	ELY-SS-TZ-30 (0.5-12)	33	1700	0.0194
Transition	Lead	ELY-SS-NF-14 (0-3)	32	1700	0.0188
Transition	Lead	ELY-SS-TZ-34 (0-2.5)	32	1700	0.0188
Transition	Lead	ELY-TP-109 (0-1)	32	1700	0.0188
Transition	Lead	ELY-SS-TZ-21 (5-12)	31	1700	0.0182
Transition	Lead	SS-02X-090209AX	29.7	1700	0.0175
Transition	Lead	TP-15X-073009AX	29.3	1700	0.0172
Transition	Lead	ELY-SS-TZ-30 (0-0.5)	29	1700	0.0171
Transition	Lead	ELY-SS-NF-17 (0-4)	28	1700	0.0165
Transition	Lead	ELY-SS-TZ-29 (0-1)	28	1700	0.0165
Transition	Lead	ELY-SS-TZ-40 (2-10)	28	1700	0.0165
Transition	Lead	TA-04X-082409AX	27.6	1700	0.0162
Transition	Lead	ELY-SS-NF-08 (2-11)	27	1700	0.0159
Transition	Lead	ELY-SS-SA-23 (0-6)	27	1700	0.0159
Transition	Lead	ELY-SS-TZ-16 (4-12)	27	1700	0.0159
Transition	Lead	TK-01X-082509AX	26.8	1700	0.0158
Transition	Lead	ELY-SS-TR-02D (2-12) DUP	26	1700	0.0153
Transition	Lead	ELY-SS-TZ-43 (0-2.5)	26	1700	0.0153
Transition	Lead	SS-21X-083109AX	26	1700	0.0153
Transition	Lead	ELY-SS-NF-06 (0-3)	24	1700	0.0141

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Lead	ELY-SS-TR-06A (0-1)	24	1700	0.0141
Transition	Lead	ELY-SS-TR-08C (0-5) DUP	24	1700	0.0141
Transition	Lead	ELY-SS-TR-03C (3-12)	23	1700	0.0135
Transition	Lead	ELY-SS-TR-08D (0-2)	23	1700	0.0135
Transition	Lead	ELY-SS-TZ-06 (0-1)	23	1700	0.0135
Transition	Lead	SS-09X-090209AX	22.9	1700	0.0135
Transition	Lead	TI-03X-082509AX	22.7	1700	0.0134
Transition	Lead	ELY-SS-NF-06 (3-12)	22	1700	0.0129
Transition	Lead	ELY-SS-NF-07 (0-2)	22	1700	0.0129
Transition	Lead	ELY-SS-TR-03C (0-3)	22	1700	0.0129
Transition	Lead	ELY-SS-SA-01 (0-2)	21	1700	0.0124
Transition	Lead	ELY-SS-TR-05C (0-1)	21	1700	0.0124
Transition	Lead	ELY-SS-TR-06C (0-3)	21	1700	0.0124
Transition	Lead	ELY-SS-TR-06C (3-12)	21	1700	0.0124
Transition	Lead	ELY-SS-NF-03 (4-12)	20	1700	0.0118
Transition	Lead	ELY-SS-TZ-31 (3-9)	20	1700	0.0118
Transition	Lead	ELY-SS-TZ-38 (0-0.5)	20	1700	0.0118
Transition	Lead	SS-12X-090309AX	19.5	1700	0.0115
Transition	Lead	ELY-SS-NF-16 (0-1)	19	1700	0.0112
Transition	Lead	ELY-SS-TZ-06 (1-12)	19	1700	0.0112
Transition	Lead	ELY-SS-TZ-15 (3.5-12)	19	1700	0.0112
Transition	Lead	ELY-SS-TZ-29 (1-9)	19	1700	0.0112
Transition	Lead	ELY-SS-TZ-35 (2-9)	19	1700	0.0112
Transition	Lead	ELY-SS-TZ-38 (0.5-7)	19	1700	0.0112
Transition	Lead	SS-16X-090309AX	18.7	1700	0.0110
Transition	Lead	ELY-SS-NF-11 (3-9)	18	1700	0.0106
Transition	Lead	ELY-SS-TR-08C (5-12)	18	1700	0.0106
Transition	Lead	ELY-SS-TR-08C (5-12) DUP	18	1700	0.0106
Transition	Lead	SS-03X-090209AX	17.9	1700	0.0105
Transition	Lead	TO-05X-082709AX	17.9	1700	0.0105
Transition	Lead	SS-05X-090209AX	17.8	1700	0.0105
Transition	Lead	ELY-SS-TR-04B (0-1.5)	17	1700	0.0100
Transition	Lead	TC-03X-082609AX	16.7	1700	0.00982
Transition	Lead	ELY-SS-NF-10 (4-12)	16	1700	0.00941
Transition	Lead	ELY-SS-NF-13 (0-2.5)	16	1700	0.00941
Transition	Lead	ELY-SS-SA-09 (0-4)	16	1700	0.00941
Transition	Lead	ELY-SS-TR-07B (2-8)	16	1700	0.00941
Transition	Lead	ELY-SS-TR-09B (2-5)	16	1700	0.00941
Transition	Lead	ELY-SS-TR-09D (3-12)	16	1700	0.00941
Transition	Lead	ELY-SS-TZ-23 (0-2.5)	16	1700	0.00941
Transition	Lead	ELY-SS-TZ-37 (0-2)	16	1700	0.00941
Transition	Lead	TP-10X-082709AX	15.9	1700	0.00935
Transition	Lead	SS-04X-090209AX	15.3	1700	0.00900
Transition	Lead	ELY-SS-TR-04B (1.5-12)	15	1700	0.00882
Transition	Lead	ELY-SS-TR-04C (0-3)	15	1700	0.00882
Transition	Lead	ELY-SS-TZ-34 (2.5-8)	15	1700	0.00882
Transition	Lead	TL-04X-082509AX	15	1700	0.00882
Transition	Lead	TN-02X-082509AD	14.6	1700	0.00859
Transition	Lead	TP-15X-073009AD	14.5	1700	0.00853
Transition	Lead	ELY-SS-NF-04 (0-4)	14	1700	0.00824
Transition	Lead	ELY-SS-NF-15 (2-5)	13	1700	0.00765
Transition	Lead	ELY-SS-TR-09C (1.5-8)	13	1700	0.00765
Transition	Lead	TN-02X-082509AX	12.1	1700	0.00712
Transition	Lead	ELY-SS-NF-03 (0-4)	12	1700	0.00706
Transition	Lead	ELY-SS-TR-08C (0-5)	12	1700	0.00706
Transition	Lead	ELY-TP-104 (0-1)	12	1700	0.00706
Transition	Lead	ELY-SS-TR-02A (1.5-11)	11	1700	0.00647
Transition	Lead	ELY-SS-TR-07C (2-12)	11	1700	0.00647
Transition	Lead	ELY-SS-TR-09B (0-2)	11	1700	0.00647
Transition	Lead	ELY-SS-TZ-36 (1.5-9)	11	1700	0.00647
Transition	Lead	ELY-SS-TR-09C (0-1.5)	10	1700	0.00588
Transition	Lead	ELY-SS-TZ-36 (0-1.5)	10	1700	0.00588
Transition	Lead	ELY-SS-NF-13 (2.5-12)	9.6	1700	0.00565
Transition	Lead	ELY-SS-NF-04 (4-10) DUP	9.3	1700	0.00547
Transition	Lead	SS-08X-090209AX	8.8	1700	0.00518

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Lead	ELY-SS-NF-04 (4-10)	8.6	1700	0.00506
Transition	Lead	ELY-SS-TR-07D (2-9)	8.6	1700	0.00506
Transition	Lead	TQ-16X-082609AX	8.5	1700	0.00500
Transition	Lead	ELY-SS-NF-12 (2-9)	7.8	1700	0.00459
Transition	Lead	ELY-SS-TR-05D (3-12)	7.8	1700	0.00459
Transition	Lead	TG-02X-082409AX	7.7	1700	0.00453
Transition	Lead	ELY-SS-NF-16 (1-12)	7.5	1700	0.00441
Transition	Lead	ELY-SS-TZ-18 (0-.5)	7.1	1700	0.00418
Transition	Lead	ELY-SS-NF-08 (0-2)	6.7	1700	0.00394
Transition	Lead	ELY-SS-NF-17 (4-10)	6.6	1700	0.00388
Transition	Lead	ELY-SS-TZ-42 (2-12)	6.6	1700	0.00388
Transition	Lead	ELY-SS-TR-08D (2-12) DUP	6.4	1700	0.00376
Transition	Lead	ELY-SS-NF-14 (3-12)	6.3	1700	0.00371
Transition	Lead	TQ-06X-082609AX	6.1	1700	0.00359
Transition	Lead	ELY-SS-TZ-43 (2.5-11)	6	1700	0.00353
Transition	Lead	ELY-SS-NF-09 (1.5-12)	5.7	1700	0.00335
Transition	Lead	ELY-SS-TZ-23 (2.5-12)	5.6	1700	0.00329
Transition	Lead	ELY-SS-TR-08D (2-12)	5.5	1700	0.00324
Transition	Lead	ELY-SS-TZ-18 (.5-12)	5	1700	0.00294
Transition	Lead	TF-13X-090909BX	4.8	1700	0.00282
Transition	Lead	ELY-SS-NF-01 (2-7)	4.7	1700	0.00276
Transition	Lead	ELY-SS-NF-07 (2-8)	1.1	1700	<0.001
Transition	Lead	ELY-SS-TR-05C (1-12)	0.72	1700	<0.001
Transition	Manganese	SS-13X-082809AX	8380	450	18.6
Transition	Manganese	SS-26X-083109AX	2170	450	4.82
Transition	Manganese	ELY-SS-NF-11 (0-3)	1700	450	3.78
Transition	Manganese	ELY-SS-TZ-21 (0-5)	1600	450	3.56
Transition	Manganese	ELY-SS-TZ-40 (0-2)	1600	450	3.56
Transition	Manganese	ELY-SS-NF-06 (0-3)	1200	450	2.67
Transition	Manganese	SS-24X-083109AX	1160	450	2.58
Transition	Manganese	SS-16X-090309AX	1070	450	2.38
Transition	Manganese	ELY-SS-NF-06 (3-12)	1000	450	2.22
Transition	Manganese	ELY-SS-NF-17 (0-4)	1000	450	2.22
Transition	Manganese	SS-25X-082709AX	991	450	2.20
Transition	Manganese	ELY-SS-TR-08D (0-2)	950	450	2.11
Transition	Manganese	ELY-SS-NF-15 (0-2)	900	450	2.00
Transition	Manganese	SS-27X-082609AX	893	450	1.98
Transition	Manganese	ELY-SS-TR-02D(0-2) DUP	880	450	1.96
Transition	Manganese	SS-29X-083109AX	813	450	1.81
Transition	Manganese	ELY-SS-TZ-42 (0-2)	810	450	1.80
Transition	Manganese	ELY-SS-TR-08D (0-2) DUP	790	450	1.76
Transition	Manganese	ELY-SS-NF-02 (0-8)	720	450	1.60
Transition	Manganese	TA-14X-082409AX	717	450	1.59
Transition	Manganese	ELY-SS-NF-03 (4-12)	660	450	1.47
Transition	Manganese	ELY-SS-NF-08 (2-11)	660	450	1.47
Transition	Manganese	ELY-SS-NF-11 (3-9)	660	450	1.47
Transition	Manganese	ELY-SS-TR-04C (0-3)	540	450	1.20
Transition	Manganese	TA-04X-082409AX	527	450	1.17
Transition	Manganese	ELY-SS-NF-10 (0-4)	500	450	1.11
Transition	Manganese	ELY-SS-NF-14 (0-3)	500	450	1.11
Transition	Manganese	ELY-SS-TR-02A (1.5-11)	500	450	1.11
Transition	Manganese	ELY-SS-TZ-11 (1-5.5)	480	450	1.07
Transition	Manganese	TK-01X-082509AX	467	450	1.04
Transition	Manganese	ELY-SS-NF-17 (4-10)	460	450	1.02
Transition	Manganese	SS-19X-082709AX	452	450	1.00
Transition	Manganese	SS-23X-082709AX	450	450	1.00
Transition	Manganese	SS-28X-083109AX	450	450	1.00
Transition	Manganese	SS-08X-090209AX	441	450	0.980
Transition	Manganese	ELY-SS-TR-02D (0-2)	440	450	0.978
Transition	Manganese	ELY-SS-TZ-40 (2-10)	420	450	0.933
Transition	Manganese	ELY-SS-NF-05 (3-11)	410	450	0.911
Transition	Manganese	ELY-SS-NF-10 (4-12)	410	450	0.911
Transition	Manganese	ELY-SS-TZ-11 (0-1)	410	450	0.911
Transition	Manganese	ELY-SS-NF-07 (0-2)	400	450	0.889
Transition	Manganese	ELY-SS-TR-02D (2-12) DUP	390	450	0.867

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Manganese	TO-05X-082709AX	383	450	0.851
Transition	Manganese	ELY-SS-TR-07C (2-12)	360	450	0.800
Transition	Manganese	SS-10X-090309AX	360	450	0.800
Transition	Manganese	ELY-SS-TR-02D (2-12)	350	450	0.778
Transition	Manganese	ELY-SS-TR-08D (2-12) DUP	350	450	0.778
Transition	Manganese	TL-04X-082509AX	338	450	0.751
Transition	Manganese	ELY-SS-TR-08D (2-12)	330	450	0.733
Transition	Manganese	TI-03X-082509AX	322	450	0.716
Transition	Manganese	ELY-SS-NF-16 (0-1)	320	450	0.711
Transition	Manganese	ELY-SS-TZ-12 (3-8)	320	450	0.711
Transition	Manganese	ELY-SS-TZ-42 (2-12)	320	450	0.711
Transition	Manganese	TN-02X-082509AX	315	450	0.700
Transition	Manganese	ELY-SS-TZ-14 (0-4)	310	450	0.689
Transition	Manganese	ELY-SS-TZ-27 (0-2.5)	310	450	0.689
Transition	Manganese	SS-11X-090309AX	306	450	0.680
Transition	Manganese	ELY-SS-NF-05 (0-3)	300	450	0.667
Transition	Manganese	ELY-SS-TR-07B (0-2)	300	450	0.667
Transition	Manganese	ELY-SS-TR-07B (2-8)	290	450	0.644
Transition	Manganese	TN-02X-082509AD	289	450	0.642
Transition	Manganese	ELY-SS-TZ-21 (5-12)	280	450	0.622
Transition	Manganese	ELY-TP-104 (0-1)	280	450	0.622
Transition	Manganese	ELY-SS-NF-04 (0-4)	270	450	0.600
Transition	Manganese	TP-10X-082709AX	263	450	0.584
Transition	Manganese	ELY-SS-NF-03 (0-4)	260	450	0.578
Transition	Manganese	ELY-SS-TR-04C (3-6)	260	450	0.578
Transition	Manganese	ELY-SS-TR-07D (2-9)	260	450	0.578
Transition	Manganese	ELY-SS-TZ-16 (4-12)	260	450	0.578
Transition	Manganese	ELY-SS-TZ-27 (2.5-8)	260	450	0.578
Transition	Manganese	ELY-SS-TZ-34 (2.5-8)	260	450	0.578
Transition	Manganese	SS-09X-090209AX	256	450	0.569
Transition	Manganese	ELY-SS-TZ-36 (1.5-9)	250	450	0.556
Transition	Manganese	ELY-SS-NF-08 (0-2)	240	450	0.533
Transition	Manganese	ELY-SS-NF-16 (1-12)	240	450	0.533
Transition	Manganese	ELY-SS-TR-02C (0-3)	240	450	0.533
Transition	Manganese	ELY-SS-TR-02C (3-12)	240	450	0.533
Transition	Manganese	ELY-SS-TZ-15 (3.5-12)	240	450	0.533
Transition	Manganese	ELY-SS-NF-13 (0-2.5)	230	450	0.511
Transition	Manganese	ELY-SS-TZ-06 (1-12)	230	450	0.511
Transition	Manganese	TQ-16X-082609AX	228	450	0.507
Transition	Manganese	SS-03X-090209AX	222	450	0.493
Transition	Manganese	ELY-SS-TZ-38 (0-0.5)	220	450	0.489
Transition	Manganese	SS-14X-083109AX	217	450	0.482
Transition	Manganese	SS-17X-083109AX	214	450	0.476
Transition	Manganese	ELY-SS-NF-14 (3-12)	210	450	0.467
Transition	Manganese	ELY-SS-SA-09 (0-4)	200	450	0.444
Transition	Manganese	SS-01X-090209AX	200	450	0.444
Transition	Manganese	SS-06X-090209AX	199	450	0.442
Transition	Manganese	TG-02X-082409AX	187	450	0.416
Transition	Manganese	ELY-SS-NF-01 (2-7)	180	450	0.400
Transition	Manganese	ELY-SS-NF-09 (1.5-12)	180	450	0.400
Transition	Manganese	ELY-SS-SA-04 (0-6)	180	450	0.400
Transition	Manganese	ELY-SS-TR-02B (0-4)	180	450	0.400
Transition	Manganese	ELY-SS-TR-04B (1.5-12)	180	450	0.400
Transition	Manganese	ELY-SS-TR-08C (0-5) DUP	180	450	0.400
Transition	Manganese	ELY-SS-NF-04 (4-10) DUP	170	450	0.378
Transition	Manganese	ELY-SS-TR-06C (0-3)	170	450	0.378
Transition	Manganese	ELY-SS-TZ-35 (2-9)	170	450	0.378
Transition	Manganese	TP-15X-073009AD	167	450	0.371
Transition	Manganese	TC-03X-082609AX	166	450	0.369
Transition	Manganese	ELY-SS-NF-04 (4-10)	160	450	0.356
Transition	Manganese	ELY-SS-SA-01 (0-2)	160	450	0.356
Transition	Manganese	ELY-SS-TR-03B (2-12)	160	450	0.356
Transition	Manganese	ELY-SS-TZ-18 (0-.5)	160	450	0.356
Transition	Manganese	ELY-SS-TZ-29 (1-9)	160	450	0.356
Transition	Manganese	ELY-SS-NF-13 (2.5-12)	150	450	0.333

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Manganese	ELY-SS-SA-23 (0-6)	150	450	0.333
Transition	Manganese	ELY-SS-TR-02A (0-1.5)	150	450	0.333
Transition	Manganese	ELY-SS-TR-02B (4-11)	150	450	0.333
Transition	Manganese	ELY-SS-TZ-12 (0-3)	150	450	0.333
Transition	Manganese	ELY-SS-NF-12 (0-2)	140	450	0.311
Transition	Manganese	ELY-SS-NF-12 (2-9)	140	450	0.311
Transition	Manganese	ELY-SS-TR-06C (3-12)	140	450	0.311
Transition	Manganese	ELY-SS-TR-08C (5-12)	140	450	0.311
Transition	Manganese	ELY-SS-TZ-16 (0-4)	140	450	0.311
Transition	Manganese	ELY-SS-TZ-23 (2.5-12)	140	450	0.311
Transition	Manganese	SS-12X-090309AX	139	450	0.309
Transition	Manganese	ELY-SS-TR-06A (1-12)	130	450	0.289
Transition	Manganese	ELY-SS-TR-08C (5-12) DUP	130	450	0.289
Transition	Manganese	ELY-SS-TR-09B (2-5)	130	450	0.289
Transition	Manganese	ELY-SS-TZ-29 (0-1)	130	450	0.289
Transition	Manganese	ELY-SS-TR-05C (1-12)	120	450	0.267
Transition	Manganese	ELY-SS-TZ-06 (0-1)	120	450	0.267
Transition	Manganese	ELY-SS-TZ-30 (0.5-12)	120	450	0.267
Transition	Manganese	ELY-SS-TZ-43 (0-2.5)	120	450	0.267
Transition	Manganese	SS-07X-090209AX	120	450	0.267
Transition	Manganese	SS-04X-090209AX	118	450	0.262
Transition	Manganese	SS-02X-090209AX	116	450	0.258
Transition	Manganese	SS-05X-090209AX	116	450	0.258
Transition	Manganese	ELY-SS-NF-09 (0-1.5)	110	450	0.244
Transition	Manganese	ELY-SS-TR-07D (0-2)	110	450	0.244
Transition	Manganese	ELY-SS-TZ-14 (4-12)	110	450	0.244
Transition	Manganese	ELY-SS-TZ-30 (0-0.5)	110	450	0.244
Transition	Manganese	ELY-SS-TZ-34 (0-2.5)	110	450	0.244
Transition	Manganese	ELY-SS-TZ-38 (0.5-7)	110	450	0.244
Transition	Manganese	ELY-SS-TZ-39 (3-8)	110	450	0.244
Transition	Manganese	ELY-SS-TZ-43 (2.5-11)	110	450	0.244
Transition	Manganese	ELY-TP-109 (0-1)	110	450	0.244
Transition	Manganese	TF-13X-090909BX	109	450	0.242
Transition	Manganese	ELY-SS-SA-06 (0-6)	100	450	0.222
Transition	Manganese	ELY-SS-TR-06A (0-1)	100	450	0.222
Transition	Manganese	ELY-SS-TZ-31 (3-9)	100	450	0.222
Transition	Manganese	ELY-SS-TZ-37 (2-12)	99	450	0.220
Transition	Manganese	ELY-SS-TZ-36 (0-1.5)	97	450	0.216
Transition	Manganese	ELY-SS-TR-06B (3-7)	95	450	0.211
Transition	Manganese	ELY-SS-TR-09D (3-12)	95	450	0.211
Transition	Manganese	ELY-SS-NF-15 (2-5)	94	450	0.209
Transition	Manganese	ELY-SS-TR-03C (3-12)	92	450	0.204
Transition	Manganese	TP-15X-073009AX	90	450	0.200
Transition	Manganese	ELY-SS-TZ-18 (.5-12)	89	450	0.198
Transition	Manganese	ELY-SS-TR-09C (0-1.5)	87	450	0.193
Transition	Manganese	ELY-SS-TR-08C (0-5)	84	450	0.187
Transition	Manganese	SS-18X-082709AX	83.2	450	0.185
Transition	Manganese	ELY-SS-TR-05D (0-3)	83	450	0.184
Transition	Manganese	ELY-SS-TR-08A (0-0.5)	83	450	0.184
Transition	Manganese	ELY-SS-TZ-15 (0-3.5)	83	450	0.184
Transition	Manganese	ELY-SS-TR-05D (3-12)	82	450	0.182
Transition	Manganese	ELY-SS-TR-04B (0-1.5)	81	450	0.180
Transition	Manganese	ELY-SS-TR-08A (0-0.5) DUP	81	450	0.180
Transition	Manganese	ELY-SS-TZ-31 (0-3)	81	450	0.180
Transition	Manganese	TQ-06X-082609AX	78.1	450	0.174
Transition	Manganese	ELY-SS-TZ-37 (0-2)	78	450	0.173
Transition	Manganese	ELY-SS-NF-07 (2-8)	77	450	0.171
Transition	Manganese	ELY-SS-NF-04 (0-4) DUP	74	450	0.164
Transition	Manganese	ELY-SS-TR-09C (1.5-8)	71	450	0.158
Transition	Manganese	SS-21X-083109AX	70	450	0.156
Transition	Manganese	ELY-SS-TR-08A (0.5-12)	69	450	0.153
Transition	Manganese	ELY-SS-TR-08A (0.5-12)DUP	68	450	0.151
Transition	Manganese	ELY-SS-TR-05C (0-1)	66	450	0.147
Transition	Manganese	ELY-SS-TR-06B (0-3)	66	450	0.147
Transition	Manganese	SS-20X-083109AX	62.7	450	0.139

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Manganese	SS-22X-082709AX	62.3	450	0.138
Transition	Manganese	ELY-SS-TR-07C (0-2)	56	450	0.124
Transition	Manganese	ELY-SS-TZ-39 (0-3)	54	450	0.120
Transition	Manganese	ELY-SS-TZ-23 (0-2.5)	51	450	0.113
Transition	Manganese	SS-15X-083109AX	50.3	450	0.112
Transition	Manganese	ELY-SS-TR-03B (0-2)	40	450	0.0889
Transition	Manganese	ELY-SS-TZ-35 (0-2)	38	450	0.0844
Transition	Manganese	ELY-SS-TR-09D (0-3)	36	450	0.0800
Transition	Manganese	ELY-SS-TR-03C (0-3)	33	450	0.0733
Transition	Manganese	ELY-SS-TR-09B (0-2)	29	450	0.0644
Transition	Mercury	ELY-SS-TZ-39 (3-8)	2.8	2.5	1.12
Transition	Mercury	ELY-SS-TZ-27 (0-2.5)	0.58	2.5	0.232
Transition	Mercury	ELY-SS-TZ-39 (0-3)	0.57	2.5	0.228
Transition	Mercury	ELY-SS-TR-08A (0.5-12)DUP	0.55	2.5	0.220
Transition	Mercury	ELY-SS-TR-08A (0.5-12)	0.49	2.5	0.196
Transition	Mercury	ELY-SS-SA-06 (0-6)	0.44	2.5	0.176
Transition	Mercury	ELY-SS-SA-01 (0-2)	0.42	2.5	0.168
Transition	Mercury	ELY-SS-TZ-21 (5-12)	0.38	2.5	0.152
Transition	Mercury	TA-14X-082409AX	0.36	2.5	0.144
Transition	Mercury	ELY-SS-TZ-35 (0-2)	0.35	2.5	0.140
Transition	Mercury	ELY-SS-TZ-12 (0-3)	0.34	2.5	0.136
Transition	Mercury	ELY-SS-TR-04B (1.5-12)	0.33	2.5	0.132
Transition	Mercury	ELY-SS-TZ-27 (2.5-8)	0.32	2.5	0.128
Transition	Mercury	SS-13X-082809AX	0.3	2.5	0.120
Transition	Mercury	ELY-SS-TR-04B (0-1.5)	0.27	2.5	0.108
Transition	Mercury	ELY-SS-TR-06B (0-3)	0.27	2.5	0.108
Transition	Mercury	ELY-SS-NF-04 (0-4) DUP	0.26	2.5	0.104
Transition	Mercury	ELY-SS-NF-09 (0-1.5)	0.26	2.5	0.104
Transition	Mercury	ELY-SS-TR-07C (0-2)	0.26	2.5	0.104
Transition	Mercury	ELY-SS-TZ-14 (0-4)	0.26	2.5	0.104
Transition	Mercury	ELY-SS-TZ-15 (0-3.5)	0.26	2.5	0.104
Transition	Mercury	SS-11X-090309AX	0.26	2.5	0.104
Transition	Mercury	SS-27X-082609AX	0.25	2.5	0.100
Transition	Mercury	ELY-SS-TR-08D (0-2) DUP	0.24	2.5	0.0960
Transition	Mercury	SS-15X-083109AX	0.24	2.5	0.0960
Transition	Mercury	ELY-SS-TR-06B (3-7)	0.23	2.5	0.0920
Transition	Mercury	SS-29X-083109AX	0.23	2.5	0.0920
Transition	Mercury	ELY-SS-NF-03 (0-4)	0.22	2.5	0.0880
Transition	Mercury	ELY-SS-SA-04 (0-6)	0.22	2.5	0.0880
Transition	Mercury	ELY-SS-TR-09D (0-3)	0.22	2.5	0.0880
Transition	Mercury	ELY-SS-TZ-29 (0-1)	0.22	2.5	0.0880
Transition	Mercury	ELY-SS-SA-09 (0-4)	0.21	2.5	0.0840
Transition	Mercury	ELY-SS-TZ-21 (0-5)	0.21	2.5	0.0840
Transition	Mercury	SS-26X-083109AX	0.21	2.5	0.0840
Transition	Mercury	ELY-SS-NF-15 (0-2)	0.2	2.5	0.0800
Transition	Mercury	ELY-SS-TZ-34 (0-2.5)	0.2	2.5	0.0800
Transition	Mercury	ELY-SS-NF-02 (0-8)	0.19	2.5	0.0760
Transition	Mercury	ELY-SS-NF-17 (0-4)	0.19	2.5	0.0760
Transition	Mercury	ELY-SS-TR-03C (0-3)	0.19	2.5	0.0760
Transition	Mercury	SS-14X-083109AX	0.19	2.5	0.0760
Transition	Mercury	ELY-SS-NF-04 (0-4)	0.18	2.5	0.0720
Transition	Mercury	ELY-SS-TZ-23 (0-2.5)	0.18	2.5	0.0720
Transition	Mercury	ELY-SS-TZ-42 (0-2)	0.18	2.5	0.0720
Transition	Mercury	SS-17X-083109AX	0.17	2.5	0.0680
Transition	Mercury	SS-25X-082709AX	0.17	2.5	0.0680
Transition	Mercury	ELY-SS-TR-08A (0-0.5)	0.16	2.5	0.0640
Transition	Mercury	ELY-SS-TZ-38 (0-0.5)	0.16	2.5	0.0640
Transition	Mercury	ELY-SS-TZ-40 (0-2)	0.16	2.5	0.0640
Transition	Mercury	ELY-SS-TR-02B (0-4)	0.15	2.5	0.0600
Transition	Mercury	SS-19X-082709AX	0.15	2.5	0.0600
Transition	Mercury	ELY-SS-TR-02D(0-2) DUP	0.14	2.5	0.0560
Transition	Mercury	ELY-SS-TR-03B (0-2)	0.14	2.5	0.0560
Transition	Mercury	ELY-SS-TR-04C (3-6)	0.14	2.5	0.0560
Transition	Mercury	ELY-SS-TR-08A (0-0.5) DUP	0.14	2.5	0.0560
Transition	Mercury	ELY-SS-TZ-16 (0-4)	0.14	2.5	0.0560

TABLE I-1

**SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT**

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Mercury	SS-18X-082709AX	0.14	2.5	0.0560
Transition	Mercury	ELY-SS-TR-02D (0-2)	0.13	2.5	0.0520
Transition	Mercury	ELY-SS-TR-04C (0-3)	0.13	2.5	0.0520
Transition	Mercury	ELY-SS-TR-05D (0-3)	0.13	2.5	0.0520
Transition	Mercury	SS-22X-082709AX	0.13	2.5	0.0520
Transition	Mercury	SS-24X-083109AX	0.13	2.5	0.0520
Transition	Mercury	ELY-SS-NF-05 (0-3)	0.12	2.5	0.0480
Transition	Mercury	ELY-SS-NF-06 (3-12)	0.12	2.5	0.0480
Transition	Mercury	ELY-SS-NF-11 (0-3)	0.12	2.5	0.0480
Transition	Mercury	ELY-SS-TR-09B (0-2)	0.12	2.5	0.0480
Transition	Mercury	ELY-SS-TZ-37 (0-2)	0.12	2.5	0.0480
Transition	Mercury	ELY-SS-TZ-43 (0-2.5)	0.12	2.5	0.0480
Transition	Mercury	SS-10X-090309AX	0.12	2.5	0.0480
Transition	Mercury	TA-04X-082409AX	0.12	2.5	0.0480
Transition	Mercury	ELY-SS-NF-06 (0-3)	0.11	2.5	0.0440
Transition	Mercury	ELY-SS-NF-08 (2-11)	0.11	2.5	0.0440
Transition	Mercury	SS-07X-090209AX	0.11	2.5	0.0440
Transition	Mercury	ELY-SS-NF-14 (0-3)	0.1	2.5	0.0400
Transition	Mercury	ELY-SS-NF-16 (0-1)	0.1	2.5	0.0400
Transition	Mercury	ELY-SS-TR-07D (0-2)	0.1	2.5	0.0400
Transition	Mercury	ELY-SS-TR-08D (0-2)	0.1	2.5	0.0400
Transition	Mercury	ELY-SS-TZ-14 (4-12)	0.1	2.5	0.0400
Transition	Mercury	SS-06X-090209AX	0.1	2.5	0.0400
Transition	Mercury	ELY-SS-TR-07B (0-2)	0.094	2.5	0.0376
Transition	Mercury	ELY-SS-TR-09C (0-1.5)	0.094	2.5	0.0376
Transition	Mercury	ELY-SS-NF-13 (0-2.5)	0.092	2.5	0.0368
Transition	Mercury	ELY-SS-TZ-29 (1-9)	0.091	2.5	0.0364
Transition	Mercury	ELY-SS-TR-02B (4-11)	0.09	2.5	0.0360
Transition	Mercury	SS-01X-090209AX	0.088	2.5	0.0352
Transition	Mercury	ELY-SS-TR-06C (0-3)	0.087	2.5	0.0348
Transition	Mercury	ELY-SS-TR-05D (3-12)	0.085	2.5	0.0340
Transition	Mercury	SS-20X-083109AX	0.081	2.5	0.0324
Transition	Mercury	SS-23X-082709AX	0.081	2.5	0.0324
Transition	Mercury	ELY-SS-NF-05 (3-11)	0.079	2.5	0.0316
Transition	Mercury	SS-05X-090209AX	0.079	2.5	0.0316
Transition	Mercury	ELY-SS-NF-15 (2-5)	0.078	2.5	0.0312
Transition	Mercury	SS-12X-090309AX	0.078	2.5	0.0312
Transition	Mercury	SS-28X-083109AX	0.078	2.5	0.0312
Transition	Mercury	ELY-SS-TZ-36 (1.5-9)	0.077	2.5	0.0308
Transition	Mercury	ELY-SS-TZ-06 (0-1)	0.076	2.5	0.0304
Transition	Mercury	TN-02X-082509AD	0.075	2.5	0.0300
Transition	Mercury	ELY-SS-TR-02C (0-3)	0.074	2.5	0.0296
Transition	Mercury	ELY-SS-TR-03B (2-12)	0.074	2.5	0.0296
Transition	Mercury	ELY-SS-TZ-18 (0-.5)	0.074	2.5	0.0296
Transition	Mercury	SS-02X-090209AX	0.074	2.5	0.0296
Transition	Mercury	ELY-SS-TZ-15 (3.5-12)	0.073	2.5	0.0292
Transition	Mercury	ELY-SS-TZ-16 (4-12)	0.073	2.5	0.0292
Transition	Mercury	ELY-TP-109 (0-1)	0.072	2.5	0.0288
Transition	Mercury	TI-03X-082509AX	0.071	2.5	0.0284
Transition	Mercury	ELY-SS-TZ-30 (0.5-12)	0.07	2.5	0.0280
Transition	Mercury	TK-01X-082509AX	0.07	2.5	0.0280
Transition	Mercury	ELY-SS-TZ-30 (0-0.5)	0.069	2.5	0.0276
Transition	Mercury	ELY-SS-NF-12 (0-2)	0.068	2.5	0.0272
Transition	Mercury	ELY-SS-TR-08C (0-5)	0.065	2.5	0.0260
Transition	Mercury	ELY-SS-TZ-12 (3-8)	0.065	2.5	0.0260
Transition	Mercury	ELY-SS-TZ-36 (0-1.5)	0.065	2.5	0.0260
Transition	Mercury	ELY-SS-NF-08 (0-2)	0.064	2.5	0.0256
Transition	Mercury	ELY-SS-TR-06C (3-12)	0.061	2.5	0.0244
Transition	Mercury	ELY-SS-TZ-11 (1-5.5)	0.061	2.5	0.0244
Transition	Mercury	SS-16X-090309AX	0.061	2.5	0.0244
Transition	Mercury	ELY-SS-NF-10 (0-4)	0.059	2.5	0.0236
Transition	Mercury	ELY-SS-NF-17 (4-10)	0.059	2.5	0.0236
Transition	Mercury	TN-02X-082509AX	0.059	2.5	0.0236
Transition	Mercury	ELY-SS-TR-06A (0-1)	0.058	2.5	0.0232
Transition	Mercury	SS-09X-090209AX	0.058	2.5	0.0232

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Mercury	ELY-SS-TR-07D (2-9)	0.057	2.5	0.0228
Transition	Mercury	SS-21X-083109AX	0.057	2.5	0.0228
Transition	Mercury	TP-10X-082709AX	0.057	2.5	0.0228
Transition	Mercury	ELY-SS-TR-02D (2-12) DUP	0.055	2.5	0.0220
Transition	Mercury	ELY-SS-TR-08D (2-12)	0.055	2.5	0.0220
Transition	Mercury	ELY-SS-TZ-35 (2-9)	0.055	2.5	0.0220
Transition	Mercury	ELY-SS-TR-07C (2-12)	0.053	2.5	0.0212
Transition	Mercury	ELY-SS-NF-07 (0-2)	0.051	2.5	0.0204
Transition	Mercury	ELY-SS-TR-07B (2-8)	0.051	2.5	0.0204
Transition	Mercury	ELY-SS-SA-23 (0-6)	0.05	2.5	0.0200
Transition	Mercury	TC-03X-082609AX	0.049	2.5	0.0196
Transition	Mercury	TL-04X-082509AX	0.048	2.5	0.0192
Transition	Mercury	ELY-SS-TR-08C (5-12)	0.046	2.5	0.0184
Transition	Mercury	ELY-SS-TZ-34 (2.5-8)	0.046	2.5	0.0184
Transition	Mercury	ELY-SS-NF-04 (4-10)	0.045	2.5	0.0180
Transition	Mercury	ELY-SS-NF-14 (3-12)	0.045	2.5	0.0180
Transition	Mercury	ELY-SS-TR-06A (1-12)	0.045	2.5	0.0180
Transition	Mercury	ELY-SS-TR-08C (0-5) DUP	0.045	2.5	0.0180
Transition	Mercury	ELY-SS-TZ-23 (2.5-12)	0.045	2.5	0.0180
Transition	Mercury	SS-04X-090209AX	0.045	2.5	0.0180
Transition	Mercury	ELY-SS-NF-09 (1.5-12)	0.044	2.5	0.0176
Transition	Mercury	ELY-SS-TR-02A (0-1.5)	0.044	2.5	0.0176
Transition	Mercury	ELY-SS-TR-02D (2-12)	0.044	2.5	0.0176
Transition	Mercury	ELY-SS-TR-03C (3-12)	0.044	2.5	0.0176
Transition	Mercury	ELY-SS-NF-03 (4-12)	0.042	2.5	0.0168
Transition	Mercury	ELY-SS-TR-05C (0-1)	0.042	2.5	0.0168
Transition	Mercury	ELY-SS-TZ-06 (1-12)	0.042	2.5	0.0168
Transition	Mercury	ELY-SS-NF-04 (4-10) DUP	0.041	2.5	0.0164
Transition	Mercury	ELY-SS-NF-16 (1-12)	0.04	2.5	0.0160
Transition	Mercury	SS-03X-090209AX	0.039	2.5	0.0156
Transition	Mercury	ELY-SS-NF-10 (4-12)	0.037	2.5	0.0148
Transition	Mercury	TQ-06X-082609AX	0.037	2.5	0.0148
Transition	Mercury	ELY-SS-TZ-43 (2.5-11)	0.034	2.5	0.0136
Transition	Mercury	TG-02X-082409AX	0.034	2.5	0.0136
Transition	Mercury	TQ-16X-082609AX	0.033	2.5	0.0132
Transition	Mercury	ELY-SS-NF-11 (3-9)	0.032	2.5	0.0128
Transition	Mercury	ELY-SS-TR-08D (2-12) DUP	0.032	2.5	0.0128
Transition	Mercury	ELY-SS-TZ-31 (3-9)	0.032	2.5	0.0128
Transition	Mercury	ELY-SS-TR-05C (1-12)	0.031	2.5	0.0124
Transition	Mercury	ELY-SS-TZ-11 (0-1)	0.03	2.5	0.0120
Transition	Mercury	ELY-SS-NF-12 (2-9)	0.029	2.5	0.0116
Transition	Mercury	ELY-SS-TR-02C (3-12)	0.028	2.5	0.0112
Transition	Mercury	ELY-SS-TZ-40 (2-10)	0.028	2.5	0.0112
Transition	Mercury	ELY-SS-TZ-42 (2-12)	0.026	2.5	0.0104
Transition	Mercury	ELY-SS-NF-07 (2-8)	0.022	2.5	0.00880
Transition	Mercury	ELY-SS-TZ-38 (0.5-7)	0.022	2.5	0.00880
Transition	Mercury	ELY-SS-TR-08C (5-12) DUP	0.021	2.5	0.00840
Transition	Mercury	ELY-SS-NF-13 (2.5-12)	0.02	2.5	0.00800
Transition	Mercury	ELY-SS-TR-02A (1.5-11)	0.02	2.5	0.00800
Transition	Mercury	ELY-SS-NF-01 (2-7)	0.017	2.5	0.00680
Transition	Mercury	ELY-SS-TZ-18 (.5-12)	0.009	2.5	0.00360
Transition	Mercury	ELY-SS-TZ-31 (0-3)	0.007	2.5	0.00280
Transition	Molybdenum	ELY-SS-SA-06 (0-6)	27	200	0.135
Transition	Molybdenum	ELY-SS-TZ-39 (3-8)	26	200	0.130
Transition	Molybdenum	ELY-SS-TZ-37 (2-12)	20	200	0.100
Transition	Molybdenum	ELY-SS-TR-06A (1-12)	18	200	0.0900
Transition	Molybdenum	ELY-SS-TR-09D (3-12)	18	200	0.0900
Transition	Molybdenum	ELY-SS-SA-09 (0-4)	17	200	0.0850
Transition	Molybdenum	ELY-SS-TR-08A (0.5-12)DUP	17	200	0.0850
Transition	Molybdenum	ELY-SS-TR-03B (2-12)	16	200	0.0800
Transition	Molybdenum	ELY-SS-NF-09 (0-1.5)	15	200	0.0750
Transition	Molybdenum	ELY-SS-TZ-29 (1-9)	12	200	0.0600
Transition	Molybdenum	ELY-SS-TZ-06 (0-1)	11	200	0.0550
Transition	Molybdenum	ELY-SS-TZ-14 (4-12)	11	200	0.0550
Transition	Molybdenum	ELY-SS-TZ-29 (0-1)	11	200	0.0550

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Molybdenum	TP-15X-073009AX	10.2	200	0.0510
Transition	Molybdenum	ELY-SS-TR-08A (0.5-12)	10	200	0.0500
Transition	Molybdenum	ELY-SS-TR-08A (0-0.5) DUP	10	200	0.0500
Transition	Molybdenum	ELY-SS-TR-02D (2-12) DUP	9.8	200	0.0490
Transition	Molybdenum	ELY-TP-109 (0-1)	9.8	200	0.0490
Transition	Molybdenum	ELY-SS-TR-08A (0-0.5)	9.4	200	0.0470
Transition	Molybdenum	ELY-SS-TR-09C (1.5-8)	8.4	200	0.0420
Transition	Molybdenum	ELY-SS-TR-08C (5-12) DUP	7.5	200	0.0375
Transition	Molybdenum	ELY-SS-TR-02D(0-2) DUP	6.8	200	0.0340
Transition	Molybdenum	TP-15X-073009AD	6.8	200	0.0340
Transition	Molybdenum	ELY-SS-TZ-37 (0-2)	6.7	200	0.0335
Transition	Molybdenum	ELY-SS-TR-02D (2-12)	6.6	200	0.0330
Transition	Molybdenum	ELY-SS-TZ-39 (0-3)	6.5	200	0.0325
Transition	Molybdenum	ELY-SS-TR-04C (3-6)	6.3	200	0.0315
Transition	Molybdenum	ELY-SS-TZ-36 (0-1.5)	6.3	200	0.0315
Transition	Molybdenum	ELY-SS-SA-04 (0-6)	6	200	0.0300
Transition	Molybdenum	ELY-SS-TR-09C (0-1.5)	5.9	200	0.0295
Transition	Molybdenum	ELY-SS-TZ-30 (0-0.5)	5.8	200	0.0290
Transition	Molybdenum	ELY-SS-SA-01 (0-2)	5.6	200	0.0280
Transition	Molybdenum	ELY-SS-TR-08C (5-12)	5.6	200	0.0280
Transition	Molybdenum	ELY-SS-TZ-27 (0-2.5)	5.6	200	0.0280
Transition	Molybdenum	ELY-SS-TZ-16 (4-12)	5.3	200	0.0265
Transition	Molybdenum	ELY-SS-TR-06A (0-1)	5	200	0.0250
Transition	Molybdenum	ELY-SS-TZ-14 (0-4)	4.7	200	0.0235
Transition	Molybdenum	ELY-TP-104 (0-1)	4.4	200	0.0220
Transition	Molybdenum	ELY-SS-TZ-38 (0.5-7)	4.3	200	0.0215
Transition	Molybdenum	ELY-SS-NF-13 (2.5-12)	4.2	200	0.0210
Transition	Molybdenum	ELY-SS-TR-06B (3-7)	4.2	200	0.0210
Transition	Molybdenum	ELY-SS-TZ-11 (1-5.5)	4.2	200	0.0210
Transition	Molybdenum	ELY-SS-TZ-38 (0-0.5)	4.2	200	0.0210
Transition	Molybdenum	ELY-SS-TZ-06 (1-12)	4.1	200	0.0205
Transition	Molybdenum	ELY-SS-TZ-35 (0-2)	3.9	200	0.0195
Transition	Molybdenum	ELY-SS-TR-05D (0-3)	3.8	200	0.0190
Transition	Molybdenum	ELY-SS-NF-03 (4-12)	3.7	200	0.0185
Transition	Molybdenum	TO-05X-082709AX	3.7	200	0.0185
Transition	Molybdenum	ELY-SS-TR-02B (4-11)	3.6	200	0.0180
Transition	Molybdenum	ELY-SS-TR-06B (0-3)	3.6	200	0.0180
Transition	Molybdenum	ELY-SS-TR-06C (3-12)	3.4	200	0.0170
Transition	Molybdenum	ELY-SS-TZ-30 (0.5-12)	3.4	200	0.0170
Transition	Molybdenum	ELY-SS-TR-02D (0-2)	3.2	200	0.0160
Transition	Molybdenum	ELY-SS-TR-05D (3-12)	3.1	200	0.0155
Transition	Molybdenum	ELY-SS-NF-05 (3-11)	3	200	0.0150
Transition	Molybdenum	SS-17X-083109AX	2.9	200	0.0145
Transition	Molybdenum	ELY-SS-TZ-15 (3.5-12)	2.8	200	0.0140
Transition	Molybdenum	ELY-SS-NF-05 (0-3)	2.7	200	0.0135
Transition	Molybdenum	SS-13X-082809AX	2.7	200	0.0135
Transition	Molybdenum	ELY-SS-TR-07B (0-2)	2.6	200	0.0130
Transition	Molybdenum	ELY-SS-TZ-35 (2-9)	2.5	200	0.0125
Transition	Molybdenum	ELY-SS-TR-06C (0-3)	2.4	200	0.0120
Transition	Molybdenum	ELY-SS-TZ-21 (0-5)	2.4	200	0.0120
Transition	Molybdenum	SS-02X-090209AX	2.4	200	0.0120
Transition	Molybdenum	SS-11X-090309AX	2.4	200	0.0120
Transition	Molybdenum	ELY-SS-TZ-15 (0-3.5)	2	200	0.0100
Transition	Molybdenum	ELY-SS-TZ-36 (1.5-9)	2	200	0.0100
Transition	Molybdenum	SS-22X-082709AX	2	200	0.0100
Transition	Molybdenum	SS-01X-090209AX	1.9	200	0.00950
Transition	Molybdenum	ELY-SS-NF-13 (0-2.5)	1.8	200	0.00900
Transition	Molybdenum	ELY-SS-TR-04C (0-3)	1.7	200	0.00850
Transition	Molybdenum	SS-14X-083109AX	1.7	200	0.00850
Transition	Molybdenum	ELY-SS-TZ-31 (3-9)	1.6	200	0.00800
Transition	Molybdenum	SS-09X-090209AX	1.6	200	0.00800
Transition	Molybdenum	ELY-SS-TR-02C (0-3)	1.5	200	0.00750
Transition	Molybdenum	ELY-SS-TZ-11 (0-1)	1.5	200	0.00750
Transition	Molybdenum	ELY-SS-TZ-12 (0-3)	1.5	200	0.00750
Transition	Molybdenum	SS-08X-090209AX	1.5	200	0.00750

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SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Molybdenum	SS-25X-082709AX	1.4	200	0.00700
Transition	Molybdenum	ELY-SS-TZ-27 (2.5-8)	1.3	200	0.00650
Transition	Molybdenum	ELY-SS-TZ-31 (0-3)	1.3	200	0.00650
Transition	Molybdenum	SS-20X-083109AX	1.3	200	0.00650
Transition	Molybdenum	ELY-SS-NF-06 (3-12)	1.2	200	0.00600
Transition	Molybdenum	ELY-SS-TR-02C (3-12)	1.2	200	0.00600
Transition	Molybdenum	ELY-SS-TR-07B (2-8)	1.2	200	0.00600
Transition	Molybdenum	SS-27X-082609AX	1.2	200	0.00600
Transition	Molybdenum	ELY-SS-TR-07D (2-9)	1.1	200	0.00550
Transition	Molybdenum	SS-10X-090309AX	1.1	200	0.00550
Transition	Molybdenum	TA-14X-082409AX	1	200	0.00500
Transition	Molybdenum	ELY-SS-TR-02A (1.5-11)	0.95	200	0.00475
Transition	Molybdenum	ELY-SS-TR-05C (0-1)	0.95	200	0.00475
Transition	Molybdenum	TA-04X-082409AX	0.95	200	0.00475
Transition	Molybdenum	SS-29X-083109AX	0.9	200	0.00450
Transition	Molybdenum	ELY-SS-TR-09D (0-3)	0.87	200	0.00435
Transition	Molybdenum	ELY-SS-TZ-42 (0-2)	0.87	200	0.00435
Transition	Molybdenum	ELY-SS-TR-07C (0-2)	0.86	200	0.00430
Transition	Molybdenum	SS-19X-082709AX	0.85	200	0.00425
Transition	Molybdenum	SS-18X-082709AX	0.84	200	0.00420
Transition	Molybdenum	TQ-06X-082609AX	0.84	200	0.00420
Transition	Molybdenum	SS-26X-083109AX	0.81	200	0.00405
Transition	Molybdenum	SS-23X-082709AX	0.79	200	0.00395
Transition	Molybdenum	ELY-SS-NF-07 (0-2)	0.78	200	0.00390
Transition	Molybdenum	ELY-SS-NF-07 (2-8)	0.76	200	0.00380
Transition	Molybdenum	ELY-SS-TZ-16 (0-4)	0.76	200	0.00380
Transition	Molybdenum	TN-02X-082509AX	0.73	200	0.00365
Transition	Molybdenum	SS-28X-083109AX	0.72	200	0.00360
Transition	Molybdenum	TL-04X-082509AX	0.69	200	0.00345
Transition	Molybdenum	ELY-SS-TR-02B (0-4)	0.68	200	0.00340
Transition	Molybdenum	ELY-SS-TR-03C (0-3)	0.66	200	0.00330
Transition	Molybdenum	ELY-SS-NF-04 (0-4)	0.64	200	0.00320
Transition	Molybdenum	SS-03X-090209AX	0.63	200	0.00315
Transition	Molybdenum	ELY-SS-NF-14 (0-3)	0.62	200	0.00310
Transition	Molybdenum	TP-10X-082709AX	0.62	200	0.00310
Transition	Molybdenum	ELY-SS-TR-07D (0-2)	0.61	200	0.00305
Transition	Molybdenum	SS-15X-083109AX	0.6	200	0.00300
Transition	Molybdenum	SS-21X-083109AX	0.6	200	0.00300
Transition	Molybdenum	TN-02X-082509AD	0.58	200	0.00290
Transition	Molybdenum	ELY-SS-NF-04 (0-4) DUP	0.55	200	0.00275
Transition	Molybdenum	TG-02X-082409AX	0.55	200	0.00275
Transition	Molybdenum	ELY-SS-NF-04 (4-10)	0.54	200	0.00270
Transition	Molybdenum	ELY-SS-TZ-40 (0-2)	0.53	200	0.00265
Transition	Molybdenum	SS-24X-083109AX	0.52	200	0.00260
Transition	Molybdenum	TK-01X-082509AX	0.5	200	0.00250
Transition	Molybdenum	SS-16X-090309AX	0.49	200	0.00245
Transition	Molybdenum	SS-05X-090209AX	0.48	200	0.00240
Transition	Molybdenum	SS-06X-090209AX	0.48	200	0.00240
Transition	Molybdenum	ELY-SS-TZ-34 (0-2.5)	0.45	200	0.00225
Transition	Molybdenum	SS-07X-090209AX	0.45	200	0.00225
Transition	Molybdenum	SS-04X-090209AX	0.44	200	0.00220
Transition	Molybdenum	ELY-SS-NF-04 (4-10) DUP	0.43	200	0.00215
Transition	Molybdenum	TI-03X-082509AX	0.43	200	0.00215
Transition	Molybdenum	ELY-SS-NF-02 (0-8)	0.41	200	0.00205
Transition	Molybdenum	ELY-SS-TR-02A (0-1.5)	0.37	200	0.00185
Transition	Molybdenum	ELY-SS-TZ-42 (2-12)	0.37	200	0.00185
Transition	Molybdenum	TC-03X-082609AX	0.33	200	0.00165
Transition	Molybdenum	TQ-16X-082609AX	0.33	200	0.00165
Transition	Molybdenum	SS-12X-090309AX	0.32	200	0.00160
Transition	Molybdenum	ELY-SS-NF-16 (0-1)	0.2	200	0.00100
Transition	Nickel	ELY-SS-NF-03 (4-12)	110	280	0.393
Transition	Nickel	SS-11X-090309AX	66.3	280	0.237
Transition	Nickel	ELY-SS-NF-04 (0-4)	61	280	0.218
Transition	Nickel	SS-13X-082809AX	57.7	280	0.206
Transition	Nickel	ELY-SS-NF-12 (2-9)	53	280	0.189

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Nickel	ELY-SS-TR-02D(0-2) DUP	50	280	0.179
Transition	Nickel	ELY-SS-TZ-21 (5-12)	43	280	0.154
Transition	Nickel	TI-03X-082509AX	42.6	280	0.152
Transition	Nickel	ELY-SS-TR-05C (1-12)	41	280	0.146
Transition	Nickel	SS-03X-090209AX	40.8	280	0.146
Transition	Nickel	TQ-16X-082609AX	40.1	280	0.143
Transition	Nickel	ELY-SS-NF-15 (2-5)	39	280	0.139
Transition	Nickel	ELY-SS-NF-08 (0-2)	38	280	0.136
Transition	Nickel	ELY-SS-TR-07B (2-8)	37	280	0.132
Transition	Nickel	TF-13X-090909BX	36.9	280	0.132
Transition	Nickel	SS-29X-083109AX	36.2	280	0.129
Transition	Nickel	ELY-SS-NF-09 (1.5-12)	36	280	0.129
Transition	Nickel	ELY-SS-NF-10 (4-12)	35	280	0.125
Transition	Nickel	TN-02X-082509AD	34.7	280	0.124
Transition	Nickel	SS-01X-090209AX	34.2	280	0.122
Transition	Nickel	ELY-SS-TR-04C (3-6)	34	280	0.121
Transition	Nickel	ELY-SS-TZ-23 (2.5-12)	34	280	0.121
Transition	Nickel	ELY-SS-TZ-34 (2.5-8)	34	280	0.121
Transition	Nickel	SS-26X-083109AX	33.2	280	0.119
Transition	Nickel	ELY-SS-NF-11 (0-3)	33	280	0.118
Transition	Nickel	ELY-SS-TZ-27 (2.5-8)	33	280	0.118
Transition	Nickel	SS-28X-083109AX	32.9	280	0.118
Transition	Nickel	TP-10X-082709AX	32.8	280	0.117
Transition	Nickel	ELY-SS-TR-03B (2-12)	32	280	0.114
Transition	Nickel	ELY-SS-TZ-36 (1.5-9)	32	280	0.114
Transition	Nickel	SS-16X-090309AX	32	280	0.114
Transition	Nickel	SS-02X-090209AX	31.1	280	0.111
Transition	Nickel	ELY-SS-NF-11 (3-9)	31	280	0.111
Transition	Nickel	ELY-SS-TR-04B (1.5-12)	31	280	0.111
Transition	Nickel	ELY-SS-TZ-06 (1-12)	31	280	0.111
Transition	Nickel	TK-01X-082509AX	30.3	280	0.108
Transition	Nickel	ELY-SS-NF-10 (0-4)	30	280	0.107
Transition	Nickel	ELY-SS-NF-16 (1-12)	30	280	0.107
Transition	Nickel	ELY-SS-TR-06C (0-3)	30	280	0.107
Transition	Nickel	ELY-SS-TR-07C (2-12)	30	280	0.107
Transition	Nickel	TL-04X-082509AX	29.7	280	0.106
Transition	Nickel	TG-02X-082409AX	29.6	280	0.106
Transition	Nickel	SS-09X-090209AX	29.2	280	0.104
Transition	Nickel	ELY-SS-NF-08 (2-11)	29	280	0.104
Transition	Nickel	ELY-SS-TR-08D (2-12) DUP	29	280	0.104
Transition	Nickel	SS-06X-090209AX	28.7	280	0.103
Transition	Nickel	ELY-SS-NF-13 (0-2.5)	28	280	0.100
Transition	Nickel	ELY-SS-NF-17 (4-10)	28	280	0.100
Transition	Nickel	TN-02X-082509AX	27.8	280	0.0993
Transition	Nickel	SS-27X-082609AX	27.4	280	0.0979
Transition	Nickel	SS-08X-090209AX	27.3	280	0.0975
Transition	Nickel	ELY-SS-TR-07D (2-9)	27	280	0.0964
Transition	Nickel	ELY-SS-TR-08D (2-12)	27	280	0.0964
Transition	Nickel	ELY-SS-TZ-43 (2.5-11)	27	280	0.0964
Transition	Nickel	ELY-SS-NF-02 (0-8)	26	280	0.0929
Transition	Nickel	ELY-SS-NF-14 (3-12)	26	280	0.0929
Transition	Nickel	ELY-SS-TZ-18 (.5-12)	26	280	0.0929
Transition	Nickel	SS-07X-090209AX	25.1	280	0.0896
Transition	Nickel	SS-17X-083109AX	25.1	280	0.0896
Transition	Nickel	ELY-SS-NF-04 (4-10)	25	280	0.0893
Transition	Nickel	ELY-SS-TR-02D (0-2)	25	280	0.0893
Transition	Nickel	ELY-SS-TZ-21 (0-5)	25	280	0.0893
Transition	Nickel	ELY-SS-TZ-40 (2-10)	25	280	0.0893
Transition	Nickel	ELY-SS-NF-06 (0-3)	24	280	0.0857
Transition	Nickel	ELY-SS-NF-06 (3-12)	24	280	0.0857
Transition	Nickel	ELY-SS-NF-13 (2.5-12)	24	280	0.0857
Transition	Nickel	ELY-SS-TR-09B (2-5)	24	280	0.0857
Transition	Nickel	ELY-SS-TZ-06 (0-1)	24	280	0.0857
Transition	Nickel	ELY-SS-TZ-30 (0.5-12)	24	280	0.0857
Transition	Nickel	SS-04X-090209AX	23.7	280	0.0846

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SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Nickel	TA-14X-082409AX	23.6	280	0.0843
Transition	Nickel	TQ-06X-082609AX	23.3	280	0.0832
Transition	Nickel	SS-23X-082709AX	23.1	280	0.0825
Transition	Nickel	ELY-SS-TR-06C (3-12)	23	280	0.0821
Transition	Nickel	TO-05X-082709AX	22.7	280	0.0811
Transition	Nickel	ELY-SS-NF-12 (0-2)	22	280	0.0786
Transition	Nickel	ELY-SS-TR-08D (0-2) DUP	22	280	0.0786
Transition	Nickel	ELY-SS-TZ-31 (3-9)	22	280	0.0786
Transition	Nickel	ELY-SS-TZ-35 (2-9)	22	280	0.0786
Transition	Nickel	ELY-SS-NF-04 (4-10) DUP	20	280	0.0714
Transition	Nickel	ELY-SS-NF-14 (0-3)	20	280	0.0714
Transition	Nickel	ELY-SS-TZ-11 (0-1)	20	280	0.0714
Transition	Nickel	ELY-SS-TZ-11 (1-5.5)	20	280	0.0714
Transition	Nickel	ELY-SS-TZ-12 (3-8)	20	280	0.0714
Transition	Nickel	ELY-SS-TZ-27 (0-2.5)	20	280	0.0714
Transition	Nickel	TA-04X-082409AX	19.2	280	0.0686
Transition	Nickel	ELY-SS-NF-01 (2-7)	19	280	0.0679
Transition	Nickel	ELY-SS-NF-05 (0-3)	19	280	0.0679
Transition	Nickel	ELY-SS-TR-05C (0-1)	19	280	0.0679
Transition	Nickel	ELY-SS-TR-06A (0-1)	19	280	0.0679
Transition	Nickel	ELY-SS-TR-06B (3-7)	19	280	0.0679
Transition	Nickel	ELY-SS-TZ-29 (1-9)	19	280	0.0679
Transition	Nickel	ELY-SS-NF-09 (0-1.5)	18	280	0.0643
Transition	Nickel	ELY-SS-NF-15 (0-2)	18	280	0.0643
Transition	Nickel	ELY-SS-TR-02D (2-12)	18	280	0.0643
Transition	Nickel	ELY-SS-TZ-30 (0-0.5)	18	280	0.0643
Transition	Nickel	SS-05X-090209AX	17.4	280	0.0621
Transition	Nickel	ELY-SS-SA-04 (0-6)	17	280	0.0607
Transition	Nickel	ELY-SS-TR-02D (2-12) DUP	17	280	0.0607
Transition	Nickel	ELY-SS-TR-05D (0-3)	17	280	0.0607
Transition	Nickel	ELY-SS-TR-08D (0-2)	17	280	0.0607
Transition	Nickel	ELY-SS-TZ-31 (0-3)	17	280	0.0607
Transition	Nickel	ELY-SS-TZ-42 (2-12)	17	280	0.0607
Transition	Nickel	ELY-TP-104 (0-1)	17	280	0.0607
Transition	Nickel	TP-15X-073009AD	17	280	0.0607
Transition	Nickel	SS-10X-090309AX	16.7	280	0.0596
Transition	Nickel	SS-20X-083109AX	16.1	280	0.0575
Transition	Nickel	ELY-SS-NF-05 (3-11)	16	280	0.0571
Transition	Nickel	ELY-SS-TR-02A (1.5-11)	16	280	0.0571
Transition	Nickel	ELY-SS-TR-04C (0-3)	16	280	0.0571
Transition	Nickel	ELY-SS-TZ-15 (3.5-12)	16	280	0.0571
Transition	Nickel	ELY-SS-TZ-40 (0-2)	16	280	0.0571
Transition	Nickel	ELY-SS-TZ-42 (0-2)	16	280	0.0571
Transition	Nickel	ELY-SS-TZ-43 (0-2.5)	16	280	0.0571
Transition	Nickel	SS-14X-083109AX	15.9	280	0.0568
Transition	Nickel	SS-22X-082709AX	15.8	280	0.0564
Transition	Nickel	SS-25X-082709AX	15.6	280	0.0557
Transition	Nickel	TC-03X-082609AX	15.6	280	0.0557
Transition	Nickel	TP-15X-073009AX	15.5	280	0.0554
Transition	Nickel	ELY-SS-SA-23 (0-6)	15	280	0.0536
Transition	Nickel	ELY-SS-TR-03C (3-12)	15	280	0.0536
Transition	Nickel	ELY-SS-TR-05D (3-12)	15	280	0.0536
Transition	Nickel	ELY-SS-TR-07D (0-2)	15	280	0.0536
Transition	Nickel	ELY-SS-TR-02B (4-11)	14	280	0.0500
Transition	Nickel	ELY-SS-TR-06B (0-3)	14	280	0.0500
Transition	Nickel	SS-24X-083109AX	13.7	280	0.0489
Transition	Nickel	ELY-SS-TR-02C (0-3)	13	280	0.0464
Transition	Nickel	ELY-SS-TZ-14 (0-4)	13	280	0.0464
Transition	Nickel	ELY-SS-TR-07B (0-2)	12	280	0.0429
Transition	Nickel	ELY-SS-TZ-14 (4-12)	12	280	0.0429
Transition	Nickel	ELY-SS-TZ-29 (0-1)	12	280	0.0429
Transition	Nickel	ELY-SS-TZ-38 (0.5-7)	12	280	0.0429
Transition	Nickel	ELY-SS-SA-01 (0-2)	11	280	0.0393
Transition	Nickel	ELY-SS-TR-08A (0.5-12)	11	280	0.0393
Transition	Nickel	ELY-SS-TZ-16 (0-4)	11	280	0.0393

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Nickel	ELY-SS-TZ-16 (4-12)	11	280	0.0393
Transition	Nickel	ELY-SS-TZ-18 (0-.5)	11	280	0.0393
Transition	Nickel	ELY-SS-TZ-37 (2-12)	11	280	0.0393
Transition	Nickel	SS-12X-090309AX	10.6	280	0.0379
Transition	Nickel	SS-18X-082709AX	10.5	280	0.0375
Transition	Nickel	ELY-SS-TR-02C (3-12)	10	280	0.0357
Transition	Nickel	ELY-SS-TR-07C (0-2)	10	280	0.0357
Transition	Nickel	ELY-SS-TR-08A (0.5-12)DUP	10	280	0.0357
Transition	Nickel	ELY-SS-TR-08A (0-0.5) DUP	10	280	0.0357
Transition	Nickel	ELY-SS-TZ-39 (0-3)	10	280	0.0357
Transition	Nickel	ELY-SS-TR-08C (0-5) DUP	9.6	280	0.0343
Transition	Nickel	ELY-SS-TR-09D (3-12)	9.6	280	0.0343
Transition	Nickel	ELY-SS-TR-08A (0-0.5)	9.1	280	0.0325
Transition	Nickel	ELY-SS-TR-09C (1.5-8)	9.1	280	0.0325
Transition	Nickel	ELY-TP-109 (0-1)	9.1	280	0.0325
Transition	Nickel	ELY-SS-NF-07 (2-8)	9	280	0.0321
Transition	Nickel	ELY-SS-SA-06 (0-6)	8.9	280	0.0318
Transition	Nickel	ELY-SS-TZ-15 (0-3.5)	8.8	280	0.0314
Transition	Nickel	ELY-SS-TZ-38 (0-0.5)	8.7	280	0.0311
Transition	Nickel	SS-21X-083109AX	8.6	280	0.0307
Transition	Nickel	ELY-SS-TZ-36 (0-1.5)	8.5	280	0.0304
Transition	Nickel	ELY-SS-NF-07 (0-2)	8.1	280	0.0289
Transition	Nickel	ELY-SS-TZ-39 (3-8)	8	280	0.0286
Transition	Nickel	ELY-SS-NF-04 (0-4) DUP	7.9	280	0.0282
Transition	Nickel	ELY-SS-SA-09 (0-4)	7.9	280	0.0282
Transition	Nickel	ELY-SS-TZ-34 (0-2.5)	7.5	280	0.0268
Transition	Nickel	ELY-SS-NF-16 (0-1)	7.4	280	0.0264
Transition	Nickel	ELY-SS-TR-03B (0-2)	7.4	280	0.0264
Transition	Nickel	ELY-SS-TZ-23 (0-2.5)	7.4	280	0.0264
Transition	Nickel	SS-15X-083109AX	7.4	280	0.0264
Transition	Nickel	ELY-SS-TR-09C (0-1.5)	7.2	280	0.0257
Transition	Nickel	SS-19X-082709AX	7.2	280	0.0257
Transition	Nickel	ELY-SS-TZ-12 (0-3)	6.9	280	0.0246
Transition	Nickel	ELY-SS-NF-17 (0-4)	6.6	280	0.0236
Transition	Nickel	ELY-SS-TR-02B (0-4)	6.4	280	0.0229
Transition	Nickel	ELY-SS-TZ-35 (0-2)	6.3	280	0.0225
Transition	Nickel	ELY-SS-TR-09B (0-2)	6.2	280	0.0221
Transition	Nickel	ELY-SS-TR-02A (0-1.5)	6	280	0.0214
Transition	Nickel	ELY-SS-TR-09D (0-3)	6	280	0.0214
Transition	Nickel	ELY-SS-TZ-37 (0-2)	6	280	0.0214
Transition	Nickel	ELY-SS-TR-08C (5-12) DUP	5.7	280	0.0204
Transition	Nickel	ELY-SS-TR-06A (1-12)	5.2	280	0.0186
Transition	Nickel	ELY-SS-TR-08C (5-12)	5.1	280	0.0182
Transition	Nickel	ELY-SS-TR-03C (0-3)	4.9	280	0.0175
Transition	Nickel	ELY-SS-NF-03 (0-4)	4.1	280	0.0146
Transition	Nickel	ELY-SS-TR-04B (0-1.5)	3.9	280	0.0139
Transition	Nickel	ELY-SS-TR-08C (0-5)	3.6	280	0.0129
Transition	Selenium	ELY-SS-TR-06A (1-12)	83	4.1	20.2
Transition	Selenium	ELY-SS-TZ-39 (3-8)	76	4.1	18.5
Transition	Selenium	ELY-SS-SA-06 (0-6)	72	4.1	17.6
Transition	Selenium	ELY-SS-TZ-37 (2-12)	66	4.1	16.1
Transition	Selenium	ELY-SS-TR-09D (3-12)	63	4.1	15.4
Transition	Selenium	ELY-SS-TR-03B (2-12)	62	4.1	15.1
Transition	Selenium	ELY-SS-TZ-14 (4-12)	55	4.1	13.4
Transition	Selenium	ELY-SS-TZ-29 (1-9)	44	4.1	10.7
Transition	Selenium	ELY-SS-TR-08A (0.5-12)	42	4.1	10.2
Transition	Selenium	ELY-TP-109 (0-1)	41	4.1	10.0
Transition	Selenium	ELY-SS-TR-08C (5-12) DUP	40	4.1	9.76
Transition	Selenium	ELY-SS-TR-02B (4-11)	38	4.1	9.27
Transition	Selenium	ELY-SS-TR-08A (0.5-12)DUP	38	4.1	9.27
Transition	Selenium	ELY-SS-TR-09C (1.5-8)	36	4.1	8.78
Transition	Selenium	ELY-SS-NF-09 (0-1.5)	35	4.1	8.54
Transition	Selenium	ELY-SS-TZ-14 (0-4)	34	4.1	8.29
Transition	Selenium	ELY-SS-TR-08A (0-0.5) DUP	33	4.1	8.05
Transition	Selenium	ELY-SS-TR-08C (5-12)	33	4.1	8.05

TABLE I-1

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ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Selenium	ELY-SS-TZ-29 (0-1)	32	4.1	7.80
Transition	Selenium	ELY-SS-TZ-16 (4-12)	31	4.1	7.56
Transition	Selenium	ELY-SS-TR-08A (0-0.5)	28	4.1	6.83
Transition	Selenium	ELY-SS-TZ-38 (0.5-7)	28	4.1	6.83
Transition	Selenium	ELY-SS-TR-09C (0-1.5)	27	4.1	6.59
Transition	Selenium	ELY-SS-SA-23 (0-6)	26	4.1	6.34
Transition	Selenium	ELY-SS-TR-04C (3-6)	25	4.1	6.10
Transition	Selenium	ELY-SS-TR-06A (0-1)	25	4.1	6.10
Transition	Selenium	ELY-SS-TZ-37 (0-2)	25	4.1	6.10
Transition	Selenium	ELY-SS-TR-08C (0-5) DUP	24	4.1	5.85
Transition	Selenium	TP-15X-073009AX	23.7	4.1	5.78
Transition	Selenium	ELY-SS-SA-09 (0-4)	22	4.1	5.37
Transition	Selenium	ELY-SS-TR-08C (0-5)	22	4.1	5.37
Transition	Selenium	ELY-SS-TZ-36 (0-1.5)	21	4.1	5.12
Transition	Selenium	ELY-SS-TZ-39 (0-3)	20	4.1	4.88
Transition	Selenium	ELY-SS-TR-03B (0-2)	19	4.1	4.63
Transition	Selenium	ELY-SS-TZ-06 (0-1)	19	4.1	4.63
Transition	Selenium	TP-15X-073009AD	18.4	4.1	4.49
Transition	Selenium	ELY-SS-TR-02D(0-2) DUP	18	4.1	4.39
Transition	Selenium	ELY-SS-TR-05D (3-12)	18	4.1	4.39
Transition	Selenium	ELY-SS-NF-13 (2.5-12)	17	4.1	4.15
Transition	Selenium	ELY-SS-TR-06B (3-7)	17	4.1	4.15
Transition	Selenium	ELY-SS-TR-05D (0-3)	16	4.1	3.90
Transition	Selenium	ELY-SS-SA-04 (0-6)	15	4.1	3.66
Transition	Selenium	ELY-SS-TR-06C (3-12)	15	4.1	3.66
Transition	Selenium	ELY-SS-TZ-35 (0-2)	15	4.1	3.66
Transition	Selenium	ELY-SS-TZ-38 (0-0.5)	15	4.1	3.66
Transition	Selenium	ELY-SS-TR-07B (0-2)	14	4.1	3.41
Transition	Selenium	ELY-SS-SA-01 (0-2)	13	4.1	3.17
Transition	Selenium	ELY-SS-TZ-27 (0-2.5)	13	4.1	3.17
Transition	Selenium	ELY-SS-TZ-30 (0.5-12)	13	4.1	3.17
Transition	Selenium	ELY-SS-TR-06B (0-3)	12	4.1	2.93
Transition	Selenium	ELY-SS-TZ-06 (1-12)	12	4.1	2.93
Transition	Selenium	ELY-SS-TZ-21 (0-5)	12	4.1	2.93
Transition	Selenium	ELY-SS-TR-02A (1.5-11)	11	4.1	2.68
Transition	Selenium	ELY-SS-TR-02D (2-12) DUP	11	4.1	2.68
Transition	Selenium	ELY-SS-TR-06C (0-3)	11	4.1	2.68
Transition	Selenium	ELY-SS-TZ-30 (0-0.5)	11	4.1	2.68
Transition	Selenium	SS-13X-082809AX	10.4	4.1	2.54
Transition	Selenium	ELY-SS-NF-03 (4-12)	9.9	4.1	2.41
Transition	Selenium	ELY-SS-TZ-35 (2-9)	9.6	4.1	2.34
Transition	Selenium	ELY-SS-TR-02D (2-12)	9.4	4.1	2.29
Transition	Selenium	ELY-SS-TR-02D (0-2)	9.3	4.1	2.27
Transition	Selenium	ELY-SS-TZ-12 (3-8)	9.1	4.1	2.22
Transition	Selenium	ELY-TP-104 (0-1)	9	4.1	2.20
Transition	Selenium	ELY-SS-NF-13 (0-2.5)	8.3	4.1	2.02
Transition	Selenium	ELY-SS-TZ-11 (1-5.5)	8.3	4.1	2.02
Transition	Selenium	ELY-SS-TZ-15 (3.5-12)	8.1	4.1	1.98
Transition	Selenium	ELY-SS-TR-04C (0-3)	7.8	4.1	1.90
Transition	Selenium	ELY-SS-TZ-16 (0-4)	7.8	4.1	1.90
Transition	Selenium	ELY-SS-TZ-36 (1.5-9)	7.7	4.1	1.88
Transition	Selenium	TO-05X-082709AX	7.7	4.1	1.88
Transition	Selenium	ELY-SS-TZ-15 (0-3.5)	7.1	4.1	1.73
Transition	Selenium	ELY-SS-TZ-18 (0-.5)	7.1	4.1	1.73
Transition	Selenium	ELY-SS-TR-02B (0-4)	6.6	4.1	1.61
Transition	Selenium	ELY-SS-TZ-12 (0-3)	6	4.1	1.46
Transition	Selenium	SS-25X-082709AX	5.9	4.1	1.44
Transition	Selenium	ELY-SS-NF-05 (0-3)	5.6	4.1	1.37
Transition	Selenium	ELY-SS-TR-05C (0-1)	5.3	4.1	1.29
Transition	Selenium	ELY-SS-TR-09D (0-3)	5.2	4.1	1.27
Transition	Selenium	ELY-SS-TZ-42 (0-2)	4.8	4.1	1.17
Transition	Selenium	SS-22X-082709AX	4.8	4.1	1.17
Transition	Selenium	ELY-SS-TR-03C (0-3)	4.6	4.1	1.12
Transition	Selenium	ELY-SS-NF-09 (1.5-12)	4.5	4.1	1.10
Transition	Selenium	SS-17X-083109AX	4.4	4.1	1.07

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Selenium	ELY-SS-NF-05 (3-11)	4.3	4.1	1.05
Transition	Selenium	SS-02X-090209AX	4.2	4.1	1.02
Transition	Selenium	ELY-SS-TR-07B (2-8)	4.1	4.1	1.00
Transition	Selenium	SS-27X-082609AX	4	4.1	0.976
Transition	Selenium	ELY-SS-TR-07C (0-2)	3.9	4.1	0.951
Transition	Selenium	ELY-SS-NF-04 (0-4)	3.7	4.1	0.902
Transition	Selenium	ELY-SS-TR-09B (2-5)	3.7	4.1	0.902
Transition	Selenium	ELY-SS-TR-03C (3-12)	3.6	4.1	0.878
Transition	Selenium	ELY-SS-TZ-21 (5-12)	3.5	4.1	0.854
Transition	Selenium	ELY-SS-NF-04 (4-10)	3.3	4.1	0.805
Transition	Selenium	SS-01X-090209AX	3.3	4.1	0.805
Transition	Selenium	SS-11X-090309AX	3.3	4.1	0.805
Transition	Selenium	SS-18X-082709AX	3.3	4.1	0.805
Transition	Selenium	ELY-SS-TZ-34 (2.5-8)	3.2	4.1	0.780
Transition	Selenium	ELY-SS-TZ-18 (.5-12)	3.1	4.1	0.756
Transition	Selenium	ELY-SS-TZ-40 (0-2)	3.1	4.1	0.756
Transition	Selenium	ELY-SS-TR-02A (0-1.5)	3	4.1	0.732
Transition	Selenium	ELY-SS-TZ-31 (0-3)	3	4.1	0.732
Transition	Selenium	ELY-SS-TZ-34 (0-2.5)	3	4.1	0.732
Transition	Selenium	SS-09X-090209AX	3	4.1	0.732
Transition	Selenium	SS-14X-083109AX	2.9	4.1	0.707
Transition	Selenium	ELY-SS-NF-01 (2-7)	2.7	4.1	0.659
Transition	Selenium	ELY-SS-TZ-11 (0-1)	2.7	4.1	0.659
Transition	Selenium	TQ-06X-082609AX	2.7	4.1	0.659
Transition	Selenium	ELY-SS-NF-04 (0-4) DUP	2.6	4.1	0.634
Transition	Selenium	ELY-SS-NF-17 (4-10)	2.6	4.1	0.634
Transition	Selenium	ELY-SS-TR-02C (0-3)	2.6	4.1	0.634
Transition	Selenium	ELY-SS-TR-02C (3-12)	2.6	4.1	0.634
Transition	Selenium	ELY-SS-TR-05C (1-12)	2.6	4.1	0.634
Transition	Selenium	ELY-SS-TZ-43 (0-2.5)	2.6	4.1	0.634
Transition	Selenium	ELY-SS-TZ-23 (0-2.5)	2.5	4.1	0.610
Transition	Selenium	ELY-SS-TZ-31 (3-9)	2.5	4.1	0.610
Transition	Selenium	ELY-SS-NF-15 (0-2)	2.4	4.1	0.585
Transition	Selenium	SS-08X-090209AX	2.4	4.1	0.585
Transition	Selenium	ELY-SS-TR-07D (0-2)	2.1	4.1	0.512
Transition	Selenium	ELY-SS-TR-08D (0-2) DUP	2.1	4.1	0.512
Transition	Selenium	ELY-SS-NF-07 (0-2)	2	4.1	0.488
Transition	Selenium	SS-10X-090309AX	2	4.1	0.488
Transition	Selenium	ELY-SS-TZ-23 (2.5-12)	1.8	4.1	0.439
Transition	Selenium	ELY-SS-NF-02 (0-8)	1.7	4.1	0.415
Transition	Selenium	ELY-SS-TR-04B (0-1.5)	1.7	4.1	0.415
Transition	Selenium	ELY-SS-TR-09B (0-2)	1.7	4.1	0.415
Transition	Selenium	ELY-SS-NF-14 (0-3)	1.6	4.1	0.390
Transition	Selenium	ELY-SS-NF-14 (3-12)	1.6	4.1	0.390
Transition	Selenium	ELY-SS-TR-04B (1.5-12)	1.6	4.1	0.390
Transition	Selenium	ELY-SS-TR-07C (2-12)	1.6	4.1	0.390
Transition	Selenium	ELY-SS-TR-07D (2-9)	1.6	4.1	0.390
Transition	Selenium	ELY-SS-TR-08D (2-12) DUP	1.6	4.1	0.390
Transition	Selenium	SS-20X-083109AX	1.6	4.1	0.390
Transition	Selenium	ELY-SS-NF-03 (0-4)	1.5	4.1	0.366
Transition	Selenium	ELY-SS-NF-12 (0-2)	1.5	4.1	0.366
Transition	Selenium	ELY-SS-TR-08D (0-2)	1.5	4.1	0.366
Transition	Selenium	ELY-SS-TR-08D (2-12)	1.5	4.1	0.366
Transition	Selenium	SS-15X-083109AX	1.5	4.1	0.366
Transition	Selenium	ELY-SS-NF-12 (2-9)	1.4	4.1	0.341
Transition	Selenium	ELY-SS-NF-17 (0-4)	1.4	4.1	0.341
Transition	Selenium	SS-19X-082709AX	1.4	4.1	0.341
Transition	Selenium	TA-14X-082409AX	1.4	4.1	0.341
Transition	Selenium	ELY-SS-NF-16 (0-1)	1.2	4.1	0.293
Transition	Selenium	SS-23X-082709AX	1.2	4.1	0.293
Transition	Selenium	SS-29X-083109AX	1.1	4.1	0.268
Transition	Selenium	TA-04X-082409AX	1	4.1	0.244
Transition	Selenium	SS-05X-090209AX	0.97	4.1	0.237
Transition	Selenium	SS-06X-090209AX	0.94	4.1	0.229
Transition	Selenium	SS-26X-083109AX	0.9	4.1	0.220

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Selenium	TG-02X-082409AX	0.85	4.1	0.207
Transition	Selenium	SS-12X-090309AX	0.8	4.1	0.195
Transition	Selenium	TP-10X-082709AX	0.76	4.1	0.185
Transition	Selenium	SS-28X-083109AX	0.7	4.1	0.171
Transition	Selenium	TL-04X-082509AX	0.69	4.1	0.168
Transition	Selenium	TN-02X-082509AD	0.68	4.1	0.166
Transition	Selenium	SS-07X-090209AX	0.66	4.1	0.161
Transition	Selenium	TC-03X-082609AX	0.63	4.1	0.154
Transition	Selenium	SS-04X-090209AX	0.62	4.1	0.151
Transition	Selenium	TN-02X-082509AX	0.62	4.1	0.151
Transition	Selenium	SS-24X-083109AX	0.6	4.1	0.146
Transition	Selenium	SS-21X-083109AX	0.59	4.1	0.144
Transition	Selenium	TI-03X-082509AX	0.58	4.1	0.141
Transition	Selenium	SS-03X-090209AX	0.57	4.1	0.139
Transition	Selenium	SS-16X-090309AX	0.47	4.1	0.115
Transition	Selenium	TQ-16X-082609AX	0.46	4.1	0.112
Transition	Selenium	TK-01X-082509AX	0.42	4.1	0.102
Transition	Silver	ELY-SS-TR-09D (0-3)	22	50	0.440
Transition	Silver	ELY-SS-TZ-39 (0-3)	14	50	0.280
Transition	Silver	ELY-SS-TZ-39 (3-8)	14	50	0.280
Transition	Silver	ELY-SS-TR-06C (0-3)	13	50	0.260
Transition	Silver	ELY-SS-SA-06 (0-6)	12	50	0.240
Transition	Silver	ELY-SS-TZ-14 (0-4)	12	50	0.240
Transition	Silver	ELY-SS-TR-03B (2-12)	11	50	0.220
Transition	Silver	ELY-SS-TR-05D (0-3)	11	50	0.220
Transition	Silver	ELY-SS-TZ-35 (0-2)	11	50	0.220
Transition	Silver	ELY-SS-TR-03B (0-2)	10	50	0.200
Transition	Silver	ELY-SS-TR-09B (0-2)	10	50	0.200
Transition	Silver	ELY-SS-TR-06B (0-3)	9.9	50	0.198
Transition	Silver	ELY-SS-TR-08C (0-5)	9.6	50	0.192
Transition	Silver	ELY-SS-NF-09 (0-1.5)	9.3	50	0.186
Transition	Silver	ELY-SS-TR-08A (0.5-12)	9	50	0.180
Transition	Silver	ELY-SS-TZ-14 (4-12)	8.2	50	0.164
Transition	Silver	ELY-SS-TZ-06 (0-1)	7.8	50	0.156
Transition	Silver	ELY-SS-TZ-16 (0-4)	7.2	50	0.144
Transition	Silver	ELY-SS-TR-08A (0.5-12)DUP	7	50	0.140
Transition	Silver	ELY-SS-TR-06A (0-1)	6.4	50	0.128
Transition	Silver	ELY-SS-TR-07C (0-2)	6.4	50	0.128
Transition	Silver	ELY-SS-TZ-37 (0-2)	6.2	50	0.124
Transition	Silver	ELY-SS-TZ-29 (0-1)	6	50	0.120
Transition	Silver	ELY-SS-SA-09 (0-4)	5.9	50	0.118
Transition	Silver	ELY-SS-TR-08A (0-0.5) DUP	5.9	50	0.118
Transition	Silver	ELY-SS-TR-06A (1-12)	5.8	50	0.116
Transition	Silver	ELY-SS-TR-06B (3-7)	5.7	50	0.114
Transition	Silver	ELY-SS-TR-03C (0-3)	5.5	50	0.110
Transition	Silver	ELY-SS-TZ-37 (2-12)	5.4	50	0.108
Transition	Silver	ELY-SS-TR-08A (0-0.5)	4.7	50	0.0940
Transition	Silver	ELY-TP-109 (0-1)	4.6	50	0.0920
Transition	Silver	ELY-SS-TR-09D (3-12)	4.4	50	0.0880
Transition	Silver	ELY-SS-TR-02D(0-2) DUP	4.3	50	0.0860
Transition	Silver	ELY-SS-TZ-38 (0-0.5)	4.3	50	0.0860
Transition	Silver	ELY-SS-TR-07B (0-2)	4	50	0.0800
Transition	Silver	ELY-SS-TZ-12 (0-3)	4	50	0.0800
Transition	Silver	ELY-SS-TZ-16 (4-12)	4	50	0.0800
Transition	Silver	ELY-SS-TZ-38 (0.5-7)	4	50	0.0800
Transition	Silver	SS-01X-090209AX	4	50	0.0800
Transition	Silver	SS-22X-082709AX	4	50	0.0800
Transition	Silver	ELY-SS-SA-04 (0-6)	3.9	50	0.0780
Transition	Silver	ELY-SS-TZ-15 (0-3.5)	3.8	50	0.0760
Transition	Silver	SS-18X-082709AX	3.7	50	0.0740
Transition	Silver	ELY-SS-TR-09C (0-1.5)	3.6	50	0.0720
Transition	Silver	ELY-SS-TZ-29 (1-9)	3.5	50	0.0700
Transition	Silver	ELY-SS-TZ-35 (2-9)	3.2	50	0.0640
Transition	Silver	ELY-SS-TZ-18 (0-.5)	3	50	0.0600
Transition	Silver	SS-11X-090309AX	3	50	0.0600

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Silver	ELY-SS-SA-23 (0-6)	2.9	50	0.0580
Transition	Silver	ELY-SS-TR-02D (0-2)	2.9	50	0.0580
Transition	Silver	ELY-SS-TR-09B (2-5)	2.9	50	0.0580
Transition	Silver	ELY-SS-TR-04C (3-6)	2.8	50	0.0560
Transition	Silver	ELY-SS-TZ-27 (0-2.5)	2.8	50	0.0560
Transition	Silver	ELY-SS-TZ-36 (0-1.5)	2.7	50	0.0540
Transition	Silver	ELY-SS-TR-08C (5-12)	2.6	50	0.0520
Transition	Silver	ELY-SS-TZ-31 (0-3)	2.5	50	0.0500
Transition	Silver	TP-15X-073009AX	2.5	50	0.0500
Transition	Silver	ELY-SS-NF-13 (0-2.5)	2.4	50	0.0480
Transition	Silver	ELY-SS-TR-05D (3-12)	2.4	50	0.0480
Transition	Silver	ELY-SS-TR-09C (1.5-8)	2.4	50	0.0480
Transition	Silver	SS-17X-083109AX	2.4	50	0.0480
Transition	Silver	TF-13X-090909BX	2.4	50	0.0480
Transition	Silver	ELY-SS-TR-08C (0-5) DUP	2.2	50	0.0440
Transition	Silver	ELY-SS-TR-08C (5-12) DUP	2.1	50	0.0420
Transition	Silver	ELY-SS-SA-01 (0-2)	1.9	50	0.0380
Transition	Silver	ELY-SS-TZ-06 (1-12)	1.9	50	0.0380
Transition	Silver	TP-15X-073009AD	1.8	50	0.0360
Transition	Silver	ELY-SS-TR-02D (2-12) DUP	1.7	50	0.0340
Transition	Silver	ELY-SS-TR-06C (3-12)	1.7	50	0.0340
Transition	Silver	ELY-SS-TR-02B (4-11)	1.6	50	0.0320
Transition	Silver	SS-27X-082609AX	1.6	50	0.0320
Transition	Silver	ELY-SS-NF-05 (0-3)	1.5	50	0.0300
Transition	Silver	SS-02X-090209AX	1.5	50	0.0300
Transition	Silver	SS-09X-090209AX	1.5	50	0.0300
Transition	Silver	SS-14X-083109AX	1.5	50	0.0300
Transition	Silver	ELY-SS-TR-02D (2-12)	1.4	50	0.0280
Transition	Silver	ELY-SS-TZ-30 (0-0.5)	1.4	50	0.0280
Transition	Silver	ELY-SS-TZ-31 (3-9)	1.4	50	0.0280
Transition	Silver	TO-05X-082709AX	1.4	50	0.0280
Transition	Silver	TQ-06X-082609AX	1.4	50	0.0280
Transition	Silver	ELY-SS-NF-09 (1.5-12)	1.3	50	0.0260
Transition	Silver	ELY-SS-TZ-21 (0-5)	1.3	50	0.0260
Transition	Silver	ELY-SS-TZ-40 (0-2)	1.3	50	0.0260
Transition	Silver	ELY-SS-TZ-12 (3-8)	1.2	50	0.0240
Transition	Silver	ELY-SS-TZ-30 (0.5-12)	1.2	50	0.0240
Transition	Silver	SS-08X-090209AX	1.1	50	0.0220
Transition	Silver	ELY-SS-NF-03 (4-12)	1	50	0.0200
Transition	Silver	ELY-SS-NF-13 (2.5-12)	1	50	0.0200
Transition	Silver	ELY-SS-TR-02B (0-4)	1	50	0.0200
Transition	Silver	ELY-SS-TR-05C (0-1)	0.91	50	0.0182
Transition	Silver	ELY-SS-TZ-34 (0-2.5)	0.9	50	0.0180
Transition	Silver	ELY-SS-TZ-15 (3.5-12)	0.87	50	0.0174
Transition	Silver	SS-10X-090309AX	0.86	50	0.0172
Transition	Silver	ELY-SS-TR-04C (0-3)	0.83	50	0.0166
Transition	Silver	ELY-SS-TZ-36 (1.5-9)	0.83	50	0.0166
Transition	Silver	SS-25X-082709AX	0.77	50	0.0154
Transition	Silver	ELY-SS-TZ-21 (5-12)	0.73	50	0.0146
Transition	Silver	SS-29X-083109AX	0.73	50	0.0146
Transition	Silver	ELY-SS-TR-02A (1.5-11)	0.71	50	0.0142
Transition	Silver	ELY-SS-TR-08D (0-2) DUP	0.65	50	0.0130
Transition	Silver	ELY-SS-NF-15 (0-2)	0.62	50	0.0124
Transition	Silver	ELY-SS-TR-03C (3-12)	0.55	50	0.0110
Transition	Silver	ELY-SS-TZ-23 (0-2.5)	0.55	50	0.0110
Transition	Silver	ELY-SS-TZ-42 (0-2)	0.55	50	0.0110
Transition	Silver	SS-03X-090209AX	0.54	50	0.0108
Transition	Silver	ELY-SS-TR-07B (2-8)	0.53	50	0.0106
Transition	Silver	ELY-SS-TR-08D (0-2)	0.52	50	0.0104
Transition	Silver	ELY-SS-TZ-34 (2.5-8)	0.51	50	0.0102
Transition	Silver	SS-19X-082709AX	0.51	50	0.0102
Transition	Silver	SS-24X-083109AX	0.51	50	0.0102
Transition	Silver	SS-28X-083109AX	0.5	50	0.0100
Transition	Silver	ELY-SS-TR-07D (0-2)	0.49	50	0.00980
Transition	Silver	SS-04X-090209AX	0.45	50	0.00900

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Silver	SS-20X-083109AX	0.42	50	0.00840
Transition	Silver	SS-23X-082709AX	0.41	50	0.00820
Transition	Silver	SS-15X-083109AX	0.4	50	0.00800
Transition	Silver	ELY-SS-TR-02C (3-12)	0.38	50	0.00760
Transition	Silver	TP-10X-082709AX	0.38	50	0.00760
Transition	Silver	TQ-16X-082609AX	0.38	50	0.00760
Transition	Silver	SS-26X-083109AX	0.36	50	0.00720
Transition	Silver	ELY-SS-NF-17 (0-4)	0.35	50	0.00700
Transition	Silver	TA-14X-082409AX	0.35	50	0.00700
Transition	Silver	ELY-SS-NF-01 (2-7)	0.33	50	0.00660
Transition	Silver	ELY-SS-NF-02 (0-8)	0.33	50	0.00660
Transition	Silver	ELY-SS-NF-14 (0-3)	0.33	50	0.00660
Transition	Silver	ELY-SS-TZ-40 (2-10)	0.33	50	0.00660
Transition	Silver	SS-06X-090209AX	0.33	50	0.00660
Transition	Silver	SS-05X-090209AX	0.32	50	0.00640
Transition	Silver	ELY-SS-TR-04B (0-1.5)	0.31	50	0.00620
Transition	Silver	ELY-SS-NF-04 (0-4)	0.3	50	0.00600
Transition	Silver	ELY-SS-TR-07C (2-12)	0.29	50	0.00580
Transition	Silver	TA-04X-082409AX	0.29	50	0.00580
Transition	Silver	TL-04X-082509AX	0.28	50	0.00560
Transition	Silver	ELY-SS-NF-16 (0-1)	0.27	50	0.00540
Transition	Silver	TI-03X-082509AX	0.27	50	0.00540
Transition	Silver	ELY-SS-NF-04 (4-10) DUP	0.23	50	0.00460
Transition	Silver	ELY-SS-NF-04 (0-4) DUP	0.21	50	0.00420
Transition	Silver	ELY-SS-NF-15 (2-5)	0.21	50	0.00420
Transition	Silver	TG-02X-082409AX	0.18	50	0.00360
Transition	Silver	ELY-SS-NF-03 (0-4)	0.17	50	0.00340
Transition	Silver	ELY-SS-NF-07 (0-2)	0.17	50	0.00340
Transition	Silver	TN-02X-082509AD	0.17	50	0.00340
Transition	Silver	ELY-SS-NF-16 (1-12)	0.16	50	0.00320
Transition	Silver	ELY-SS-TR-07D (2-9)	0.16	50	0.00320
Transition	Silver	SS-21X-083109AX	0.16	50	0.00320
Transition	Silver	TN-02X-082509AX	0.16	50	0.00320
Transition	Silver	ELY-SS-TZ-42 (2-12)	0.13	50	0.00260
Transition	Silver	ELY-SS-TR-04B (1.5-12)	0.12	50	0.00240
Transition	Silver	ELY-SS-NF-04 (4-10)	0.11	50	0.00220
Transition	Silver	ELY-SS-TR-05C (1-12)	0.11	50	0.00220
Transition	Vanadium	ELY-SS-NF-03 (4-12)	400	20	20.0
Transition	Vanadium	ELY-SS-TZ-39 (3-8)	130	20	6.50
Transition	Vanadium	SS-11X-090309AX	128	20	6.40
Transition	Vanadium	ELY-SS-TR-03B (2-12)	120	20	6.00
Transition	Vanadium	ELY-SS-TR-08C (5-12)	120	20	6.00
Transition	Vanadium	ELY-SS-TR-08C (5-12) DUP	120	20	6.00
Transition	Vanadium	ELY-SS-TZ-29 (1-9)	120	20	6.00
Transition	Vanadium	ELY-SS-NF-04 (0-4)	110	20	5.50
Transition	Vanadium	ELY-SS-SA-23 (0-6)	110	20	5.50
Transition	Vanadium	ELY-SS-TR-08C (0-5) DUP	110	20	5.50
Transition	Vanadium	ELY-SS-TZ-16 (4-12)	110	20	5.50
Transition	Vanadium	ELY-SS-TR-05D (3-12)	100	20	5.00
Transition	Vanadium	ELY-SS-TZ-14 (4-12)	99	20	4.95
Transition	Vanadium	ELY-SS-TZ-29 (0-1)	86	20	4.30
Transition	Vanadium	ELY-SS-SA-06 (0-6)	85	20	4.25
Transition	Vanadium	ELY-SS-TZ-37 (2-12)	85	20	4.25
Transition	Vanadium	ELY-SS-TZ-27 (0-2.5)	84	20	4.20
Transition	Vanadium	ELY-SS-TR-02D(0-2) DUP	82	20	4.10
Transition	Vanadium	ELY-SS-TR-04C (3-6)	80	20	4.00
Transition	Vanadium	ELY-SS-TR-08C (0-5)	78	20	3.90
Transition	Vanadium	ELY-SS-TZ-21 (5-12)	76	20	3.80
Transition	Vanadium	ELY-SS-NF-09 (0-1.5)	71	20	3.55
Transition	Vanadium	ELY-SS-TR-05C (1-12)	71	20	3.55
Transition	Vanadium	ELY-SS-TR-08A (0.5-12)	68	20	3.40
Transition	Vanadium	ELY-SS-SA-09 (0-4)	67	20	3.35
Transition	Vanadium	ELY-SS-TR-08A (0.5-12)DUP	67	20	3.35
Transition	Vanadium	ELY-SS-TR-08A (0-0.5) DUP	67	20	3.35
Transition	Vanadium	ELY-SS-TR-05D (0-3)	66	20	3.30

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Vanadium	TP-15X-073009AX	63.9	20	3.20
Transition	Vanadium	ELY-SS-TR-07B (0-2)	63	20	3.15
Transition	Vanadium	ELY-SS-TR-08A (0-0.5)	62	20	3.10
Transition	Vanadium	SS-09X-090209AX	61.6	20	3.08
Transition	Vanadium	ELY-SS-TZ-27 (2.5-8)	60	20	3.00
Transition	Vanadium	ELY-SS-NF-10 (4-12)	59	20	2.95
Transition	Vanadium	ELY-SS-NF-11 (0-3)	59	20	2.95
Transition	Vanadium	ELY-SS-TZ-34 (2.5-8)	59	20	2.95
Transition	Vanadium	SS-28X-083109AX	58.2	20	2.91
Transition	Vanadium	ELY-SS-TR-06A (0-1)	58	20	2.90
Transition	Vanadium	ELY-SS-TZ-35 (2-9)	57	20	2.85
Transition	Vanadium	ELY-SS-NF-04 (4-10)	56	20	2.80
Transition	Vanadium	ELY-SS-NF-13 (2.5-12)	56	20	2.80
Transition	Vanadium	TP-15X-073009AD	55.3	20	2.77
Transition	Vanadium	TO-05X-082709AX	55.2	20	2.76
Transition	Vanadium	ELY-SS-NF-15 (2-5)	55	20	2.75
Transition	Vanadium	ELY-SS-TR-06A (1-12)	55	20	2.75
Transition	Vanadium	ELY-SS-TR-09C (1.5-8)	55	20	2.75
Transition	Vanadium	ELY-SS-TR-09D (3-12)	55	20	2.75
Transition	Vanadium	ELY-SS-TZ-14 (0-4)	55	20	2.75
Transition	Vanadium	SS-16X-090309AX	54.8	20	2.74
Transition	Vanadium	SS-05X-090209AX	53.5	20	2.68
Transition	Vanadium	ELY-SS-NF-04 (4-10) DUP	53	20	2.65
Transition	Vanadium	TQ-06X-082609AX	52.8	20	2.64
Transition	Vanadium	ELY-SS-NF-07 (0-2)	52	20	2.60
Transition	Vanadium	ELY-SS-NF-17 (4-10)	52	20	2.60
Transition	Vanadium	ELY-SS-TZ-36 (1.5-9)	52	20	2.60
Transition	Vanadium	SS-03X-090209AX	51.1	20	2.56
Transition	Vanadium	ELY-SS-TR-06C (0-3)	51	20	2.55
Transition	Vanadium	ELY-SS-TZ-30 (0.5-12)	51	20	2.55
Transition	Vanadium	ELY-TP-109 (0-1)	51	20	2.55
Transition	Vanadium	TQ-16X-082609AX	50.5	20	2.53
Transition	Vanadium	ELY-SS-NF-11 (3-9)	50	20	2.50
Transition	Vanadium	ELY-SS-TR-06C (3-12)	50	20	2.50
Transition	Vanadium	ELY-SS-NF-01 (2-7)	49	20	2.45
Transition	Vanadium	ELY-SS-TR-05C (0-1)	49	20	2.45
Transition	Vanadium	ELY-SS-TR-07B (2-8)	49	20	2.45
Transition	Vanadium	TC-03X-082609AX	48.6	20	2.43
Transition	Vanadium	TN-02X-082509AD	48.3	20	2.42
Transition	Vanadium	ELY-SS-NF-12 (2-9)	48	20	2.40
Transition	Vanadium	ELY-SS-TR-06B (3-7)	48	20	2.40
Transition	Vanadium	SS-01X-090209AX	47.6	20	2.38
Transition	Vanadium	SS-06X-090209AX	47.5	20	2.38
Transition	Vanadium	TP-10X-082709AX	47.5	20	2.38
Transition	Vanadium	ELY-SS-NF-09 (1.5-12)	47	20	2.35
Transition	Vanadium	ELY-SS-NF-13 (0-2.5)	47	20	2.35
Transition	Vanadium	ELY-SS-TR-04B (1.5-12)	47	20	2.35
Transition	Vanadium	ELY-SS-TZ-06 (1-12)	47	20	2.35
Transition	Vanadium	SS-07X-090209AX	46.3	20	2.32
Transition	Vanadium	SS-17X-083109AX	46.3	20	2.32
Transition	Vanadium	ELY-SS-TZ-15 (3.5-12)	46	20	2.30
Transition	Vanadium	TL-04X-082509AX	46	20	2.30
Transition	Vanadium	ELY-SS-TZ-42 (2-12)	45	20	2.25
Transition	Vanadium	ELY-SS-NF-10 (0-4)	44	20	2.20
Transition	Vanadium	ELY-SS-TR-06B (0-3)	44	20	2.20
Transition	Vanadium	ELY-SS-TZ-18 (.5-12)	44	20	2.20
Transition	Vanadium	ELY-SS-TZ-23 (2.5-12)	44	20	2.20
Transition	Vanadium	ELY-SS-TZ-39 (0-3)	44	20	2.20
Transition	Vanadium	SS-02X-090209AX	43.2	20	2.16
Transition	Vanadium	SS-26X-083109AX	43.2	20	2.16
Transition	Vanadium	ELY-SS-TR-02D (0-2)	43	20	2.15
Transition	Vanadium	ELY-SS-TZ-06 (0-1)	43	20	2.15
Transition	Vanadium	ELY-SS-TZ-21 (0-5)	43	20	2.15
Transition	Vanadium	SS-29X-083109AX	42.9	20	2.15
Transition	Vanadium	ELY-SS-TR-07C (2-12)	42	20	2.10

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Vanadium	ELY-SS-TR-09B (2-5)	42	20	2.10
Transition	Vanadium	ELY-SS-TR-09C (0-1.5)	41	20	2.05
Transition	Vanadium	ELY-SS-TZ-31 (0-3)	41	20	2.05
Transition	Vanadium	ELY-SS-TZ-43 (2.5-11)	41	20	2.05
Transition	Vanadium	ELY-SS-TZ-36 (0-1.5)	40	20	2.00
Transition	Vanadium	TI-03X-082509AX	39.6	20	1.98
Transition	Vanadium	SS-04X-090209AX	39.2	20	1.96
Transition	Vanadium	SS-22X-082709AX	39.2	20	1.96
Transition	Vanadium	ELY-SS-NF-07 (2-8)	39	20	1.95
Transition	Vanadium	ELY-SS-NF-08 (0-2)	39	20	1.95
Transition	Vanadium	ELY-SS-TR-03C (3-12)	39	20	1.95
Transition	Vanadium	ELY-SS-TZ-30 (0-0.5)	39	20	1.95
Transition	Vanadium	SS-14X-083109AX	38.2	20	1.91
Transition	Vanadium	ELY-SS-NF-14 (3-12)	38	20	1.90
Transition	Vanadium	ELY-SS-NF-16 (1-12)	38	20	1.90
Transition	Vanadium	ELY-SS-TR-07D (2-9)	38	20	1.90
Transition	Vanadium	ELY-SS-TZ-31 (3-9)	38	20	1.90
Transition	Vanadium	TN-02X-082509AX	37.9	20	1.90
Transition	Vanadium	TG-02X-082409AX	37.6	20	1.88
Transition	Vanadium	ELY-SS-TZ-35 (0-2)	37	20	1.85
Transition	Vanadium	ELY-SS-TZ-38 (0.5-7)	37	20	1.85
Transition	Vanadium	ELY-SS-NF-05 (0-3)	36	20	1.80
Transition	Vanadium	ELY-SS-TZ-11 (1-5.5)	36	20	1.80
Transition	Vanadium	SS-23X-082709AX	36	20	1.80
Transition	Vanadium	SS-08X-090209AX	35.2	20	1.76
Transition	Vanadium	ELY-SS-TR-08D (2-12) DUP	35	20	1.75
Transition	Vanadium	ELY-SS-TZ-42 (0-2)	35	20	1.75
Transition	Vanadium	TA-14X-082409AX	34.9	20	1.75
Transition	Vanadium	ELY-SS-NF-02 (0-8)	34	20	1.70
Transition	Vanadium	ELY-SS-TR-08D (2-12)	34	20	1.70
Transition	Vanadium	TK-01X-082509AX	33.8	20	1.69
Transition	Vanadium	TF-13X-090909BX	33.6	20	1.68
Transition	Vanadium	ELY-SS-NF-06 (3-12)	33	20	1.65
Transition	Vanadium	ELY-SS-TR-02D (2-12)	33	20	1.65
Transition	Vanadium	ELY-SS-TR-02D (2-12) DUP	33	20	1.65
Transition	Vanadium	ELY-SS-NF-06 (0-3)	32	20	1.60
Transition	Vanadium	ELY-SS-NF-08 (2-11)	32	20	1.60
Transition	Vanadium	ELY-SS-NF-12 (0-2)	32	20	1.60
Transition	Vanadium	ELY-SS-NF-14 (0-3)	32	20	1.60
Transition	Vanadium	ELY-SS-TZ-12 (3-8)	32	20	1.60
Transition	Vanadium	ELY-SS-TZ-37 (0-2)	32	20	1.60
Transition	Vanadium	SS-10X-090309AX	31.4	20	1.57
Transition	Vanadium	TA-04X-082409AX	31.3	20	1.57
Transition	Vanadium	SS-20X-083109AX	31.1	20	1.56
Transition	Vanadium	ELY-SS-TR-07D (0-2)	31	20	1.55
Transition	Vanadium	ELY-SS-TR-02C (0-3)	30	20	1.50
Transition	Vanadium	ELY-SS-TZ-43 (0-2.5)	30	20	1.50
Transition	Vanadium	ELY-SS-TZ-40 (2-10)	28	20	1.40
Transition	Vanadium	ELY-SS-SA-04 (0-6)	27	20	1.35
Transition	Vanadium	ELY-SS-NF-15 (0-2)	26	20	1.30
Transition	Vanadium	ELY-SS-TR-08D (0-2) DUP	26	20	1.30
Transition	Vanadium	ELY-SS-TZ-15 (0-3.5)	26	20	1.30
Transition	Vanadium	ELY-TP-104 (0-1)	26	20	1.30
Transition	Vanadium	SS-25X-082709AX	25.4	20	1.27
Transition	Vanadium	ELY-SS-TR-04C (0-3)	25	20	1.25
Transition	Vanadium	ELY-SS-TZ-11 (0-1)	25	20	1.25
Transition	Vanadium	ELY-SS-NF-05 (3-11)	23	20	1.15
Transition	Vanadium	ELY-SS-SA-01 (0-2)	21	20	1.05
Transition	Vanadium	ELY-SS-TR-02C (3-12)	21	20	1.05
Transition	Vanadium	SS-13X-082809AX	20.6	20	1.03
Transition	Vanadium	SS-24X-083109AX	20.5	20	1.03
Transition	Vanadium	SS-21X-083109AX	20.3	20	1.02
Transition	Vanadium	ELY-SS-TR-02B (4-11)	20	20	1.00
Transition	Vanadium	ELY-SS-TZ-18 (0-.5)	20	20	1.00
Transition	Vanadium	ELY-SS-TR-02A (1.5-11)	19	20	0.950

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Vanadium	ELY-SS-TZ-38 (0-0.5)	19	20	0.950
Transition	Vanadium	SS-12X-090309AX	18.3	20	0.915
Transition	Vanadium	ELY-SS-TR-08D (0-2)	18	20	0.900
Transition	Vanadium	SS-19X-082709AX	16.1	20	0.805
Transition	Vanadium	ELY-SS-TZ-40 (0-2)	16	20	0.800
Transition	Vanadium	ELY-SS-TR-07C (0-2)	15	20	0.750
Transition	Vanadium	SS-27X-082609AX	14.4	20	0.720
Transition	Vanadium	ELY-SS-TZ-12 (0-3)	14	20	0.700
Transition	Vanadium	SS-18X-082709AX	13.5	20	0.675
Transition	Vanadium	ELY-SS-TZ-34 (0-2.5)	13	20	0.650
Transition	Vanadium	SS-15X-083109AX	12.9	20	0.645
Transition	Vanadium	ELY-SS-NF-16 (0-1)	12	20	0.600
Transition	Vanadium	ELY-SS-TZ-23 (0-2.5)	11	20	0.550
Transition	Vanadium	ELY-SS-TZ-16 (0-4)	9.7	20	0.485
Transition	Vanadium	ELY-SS-TR-02A (0-1.5)	9.6	20	0.480
Transition	Vanadium	ELY-SS-TR-09B (0-2)	9.4	20	0.470
Transition	Vanadium	ELY-SS-TR-03B (0-2)	9.3	20	0.465
Transition	Vanadium	ELY-SS-NF-17 (0-4)	8	20	0.400
Transition	Vanadium	ELY-SS-TR-09D (0-3)	7.4	20	0.370
Transition	Vanadium	ELY-SS-TR-02B (0-4)	7.3	20	0.365
Transition	Vanadium	ELY-SS-NF-03 (0-4)	7.2	20	0.360
Transition	Vanadium	ELY-SS-TR-04B (0-1.5)	7.2	20	0.360
Transition	Vanadium	ELY-SS-NF-04 (0-4) DUP	6	20	0.300
Transition	Vanadium	ELY-SS-TR-03C (0-3)	5.2	20	0.260
Transition	Zinc	ELY-SS-TR-02D (2-12) DUP	1500	120	12.5
Transition	Zinc	ELY-SS-TR-02D (2-12)	1000	120	8.33
Transition	Zinc	ELY-SS-SA-09 (0-4)	730	120	6.08
Transition	Zinc	ELY-TP-104 (0-1)	560	120	4.67
Transition	Zinc	ELY-SS-TZ-11 (1-5.5)	550	120	4.58
Transition	Zinc	ELY-SS-NF-05 (3-11)	470	120	3.92
Transition	Zinc	ELY-SS-NF-03 (4-12)	460	120	3.83
Transition	Zinc	ELY-SS-NF-05 (0-3)	360	120	3.00
Transition	Zinc	ELY-SS-TZ-40 (0-2)	330	120	2.75
Transition	Zinc	ELY-SS-TR-03B (0-2)	320	120	2.67
Transition	Zinc	ELY-SS-SA-01 (0-2)	310	120	2.58
Transition	Zinc	ELY-SS-SA-04 (0-6)	300	120	2.50
Transition	Zinc	ELY-SS-TR-03B (2-12)	280	120	2.33
Transition	Zinc	SS-26X-083109AX	225	120	1.88
Transition	Zinc	ELY-SS-TR-02A (1.5-11)	210	120	1.75
Transition	Zinc	ELY-SS-TR-02D(0-2) DUP	200	120	1.67
Transition	Zinc	ELY-SS-TZ-11 (0-1)	200	120	1.67
Transition	Zinc	SS-29X-083109AX	195	120	1.63
Transition	Zinc	ELY-SS-SA-06 (0-6)	190	120	1.58
Transition	Zinc	ELY-SS-TR-08D (0-2)	190	120	1.58
Transition	Zinc	ELY-SS-TZ-16 (4-12)	190	120	1.58
Transition	Zinc	ELY-SS-TZ-38 (0-0.5)	190	120	1.58
Transition	Zinc	ELY-SS-TR-02B (0-4)	180	120	1.50
Transition	Zinc	ELY-SS-TZ-06 (1-12)	180	120	1.50
Transition	Zinc	ELY-SS-TZ-34 (0-2.5)	180	120	1.50
Transition	Zinc	ELY-SS-TR-02D (0-2)	170	120	1.42
Transition	Zinc	ELY-SS-TR-06A (1-12)	170	120	1.42
Transition	Zinc	ELY-SS-TZ-27 (0-2.5)	170	120	1.42
Transition	Zinc	SS-11X-090309AX	164	120	1.37
Transition	Zinc	ELY-SS-TR-04C (0-3)	160	120	1.33
Transition	Zinc	ELY-SS-TZ-14 (0-4)	160	120	1.33
Transition	Zinc	ELY-SS-TZ-29 (1-9)	160	120	1.33
Transition	Zinc	SS-19X-082709AX	160	120	1.33
Transition	Zinc	ELY-SS-NF-03 (0-4)	150	120	1.25
Transition	Zinc	ELY-SS-TR-02C (3-12)	150	120	1.25
Transition	Zinc	ELY-SS-NF-15 (0-2)	140	120	1.17
Transition	Zinc	ELY-SS-SA-23 (0-6)	140	120	1.17
Transition	Zinc	ELY-SS-TR-08C (0-5) DUP	140	120	1.17
Transition	Zinc	ELY-SS-TZ-06 (0-1)	140	120	1.17
Transition	Zinc	ELY-SS-TZ-29 (0-1)	140	120	1.17
Transition	Zinc	TA-14X-082409AX	136	120	1.13

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Zinc	ELY-SS-NF-09 (0-1.5)	130	120	1.08
Transition	Zinc	ELY-SS-TR-04C (3-6)	130	120	1.08
Transition	Zinc	ELY-SS-TR-08C (5-12)	130	120	1.08
Transition	Zinc	ELY-SS-TZ-21 (5-12)	130	120	1.08
Transition	Zinc	ELY-SS-TZ-42 (0-2)	130	120	1.08
Transition	Zinc	ELY-TP-109 (0-1)	130	120	1.08
Transition	Zinc	SS-10X-090309AX	129	120	1.08
Transition	Zinc	SS-14X-083109AX	122	120	1.02
Transition	Zinc	SS-24X-083109AX	122	120	1.02
Transition	Zinc	ELY-SS-NF-08 (2-11)	120	120	1.00
Transition	Zinc	ELY-SS-NF-11 (0-3)	120	120	1.00
Transition	Zinc	ELY-SS-NF-17 (0-4)	120	120	1.00
Transition	Zinc	ELY-SS-TR-02B (4-11)	120	120	1.00
Transition	Zinc	ELY-SS-TR-02C (0-3)	120	120	1.00
Transition	Zinc	ELY-SS-TR-05C (1-12)	120	120	1.00
Transition	Zinc	ELY-SS-TR-07B (0-2)	120	120	1.00
Transition	Zinc	ELY-SS-TR-08A (0-0.5)	120	120	1.00
Transition	Zinc	ELY-SS-TR-08C (5-12) DUP	120	120	1.00
Transition	Zinc	SS-17X-083109AX	113	120	0.942
Transition	Zinc	TA-04X-082409AX	113	120	0.942
Transition	Zinc	ELY-SS-NF-06 (0-3)	110	120	0.917
Transition	Zinc	ELY-SS-NF-13 (0-2.5)	110	120	0.917
Transition	Zinc	ELY-SS-TR-08A (0-0.5) DUP	110	120	0.917
Transition	Zinc	ELY-SS-TZ-34 (2.5-8)	110	120	0.917
Transition	Zinc	SS-01X-090209AX	108	120	0.900
Transition	Zinc	TF-13X-090909BX	107	120	0.892
Transition	Zinc	SS-22X-082709AX	103	120	0.858
Transition	Zinc	ELY-SS-TR-02A (0-1.5)	100	120	0.833
Transition	Zinc	ELY-SS-TR-05D (0-3)	100	120	0.833
Transition	Zinc	ELY-SS-TR-08C (0-5)	100	120	0.833
Transition	Zinc	ELY-SS-TR-08D (0-2) DUP	100	120	0.833
Transition	Zinc	ELY-SS-TZ-12 (3-8)	100	120	0.833
Transition	Zinc	ELY-SS-NF-04 (0-4)	99	120	0.825
Transition	Zinc	ELY-SS-TR-08A (0.5-12)DUP	99	120	0.825
Transition	Zinc	SS-27X-082609AX	99	120	0.825
Transition	Zinc	SS-09X-090209AX	97.1	120	0.809
Transition	Zinc	ELY-SS-NF-06 (3-12)	97	120	0.808
Transition	Zinc	ELY-SS-TZ-14 (4-12)	97	120	0.808
Transition	Zinc	ELY-SS-TZ-37 (0-2)	97	120	0.808
Transition	Zinc	ELY-SS-TZ-39 (0-3)	97	120	0.808
Transition	Zinc	ELY-SS-TZ-39 (3-8)	95	120	0.792
Transition	Zinc	ELY-SS-NF-02 (0-8)	94	120	0.783
Transition	Zinc	ELY-SS-TR-06C (0-3)	93	120	0.775
Transition	Zinc	ELY-SS-TR-08A (0.5-12)	93	120	0.775
Transition	Zinc	ELY-SS-TZ-38 (0.5-7)	89	120	0.742
Transition	Zinc	ELY-SS-TZ-27 (2.5-8)	88	120	0.733
Transition	Zinc	ELY-SS-NF-13 (2.5-12)	87	120	0.725
Transition	Zinc	ELY-SS-TZ-30 (0-0.5)	86	120	0.717
Transition	Zinc	TO-05X-082709AX	85.7	120	0.714
Transition	Zinc	ELY-SS-TZ-21 (0-5)	82	120	0.683
Transition	Zinc	ELY-SS-TR-06C (3-12)	81	120	0.675
Transition	Zinc	ELY-SS-TR-09D (0-3)	80	120	0.667
Transition	Zinc	ELY-SS-NF-10 (0-4)	79	120	0.658
Transition	Zinc	ELY-SS-TZ-12 (0-3)	79	120	0.658
Transition	Zinc	ELY-SS-TR-07B (2-8)	78	120	0.650
Transition	Zinc	TI-03X-082509AX	77.5	120	0.646
Transition	Zinc	ELY-SS-TR-04B (1.5-12)	77	120	0.642
Transition	Zinc	ELY-SS-TR-06B (0-3)	77	120	0.642
Transition	Zinc	TP-10X-082709AX	76.1	120	0.634
Transition	Zinc	ELY-SS-TR-06A (0-1)	76	120	0.633
Transition	Zinc	TQ-16X-082609AX	76	120	0.633
Transition	Zinc	TK-01X-082509AX	75.1	120	0.626
Transition	Zinc	ELY-SS-TZ-16 (0-4)	75	120	0.625
Transition	Zinc	ELY-SS-TR-03C (3-12)	74	120	0.617
Transition	Zinc	SS-02X-090209AX	73.5	120	0.613

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Zinc	ELY-SS-NF-14 (0-3)	72	120	0.600
Transition	Zinc	ELY-SS-TR-05C (0-1)	72	120	0.600
Transition	Zinc	TN-02X-082509AD	72	120	0.600
Transition	Zinc	SS-23X-082709AX	71.7	120	0.598
Transition	Zinc	ELY-SS-NF-04 (0-4) DUP	71	120	0.592
Transition	Zinc	ELY-SS-NF-16 (0-1)	71	120	0.592
Transition	Zinc	SS-15X-083109AX	69.2	120	0.577
Transition	Zinc	ELY-SS-TZ-36 (1.5-9)	69	120	0.575
Transition	Zinc	ELY-SS-TR-06B (3-7)	68	120	0.567
Transition	Zinc	SS-16X-090309AX	67.5	120	0.563
Transition	Zinc	ELY-SS-TZ-15 (0-3.5)	67	120	0.558
Transition	Zinc	ELY-SS-TZ-35 (2-9)	66	120	0.550
Transition	Zinc	ELY-SS-NF-11 (3-9)	64	120	0.533
Transition	Zinc	ELY-SS-TZ-30 (0.5-12)	64	120	0.533
Transition	Zinc	ELY-SS-TZ-18 (0-.5)	62	120	0.517
Transition	Zinc	ELY-SS-NF-09 (1.5-12)	61	120	0.508
Transition	Zinc	SS-28X-083109AX	60.1	120	0.501
Transition	Zinc	ELY-SS-NF-10 (4-12)	60	120	0.500
Transition	Zinc	ELY-SS-NF-12 (0-2)	60	120	0.500
Transition	Zinc	SS-20X-083109AX	59.5	120	0.496
Transition	Zinc	ELY-SS-TR-08D (2-12) DUP	59	120	0.492
Transition	Zinc	TN-02X-082509AX	58.6	120	0.488
Transition	Zinc	ELY-SS-TR-07D (0-2)	58	120	0.483
Transition	Zinc	ELY-SS-TR-07D (2-9)	58	120	0.483
Transition	Zinc	ELY-SS-TZ-43 (0-2.5)	58	120	0.483
Transition	Zinc	SS-06X-090209AX	56.8	120	0.473
Transition	Zinc	ELY-SS-NF-08 (0-2)	56	120	0.467
Transition	Zinc	ELY-SS-TR-07C (2-12)	56	120	0.467
Transition	Zinc	ELY-SS-TZ-31 (3-9)	56	120	0.467
Transition	Zinc	SS-03X-090209AX	55.8	120	0.465
Transition	Zinc	SS-07X-090209AX	55.6	120	0.463
Transition	Zinc	TL-04X-082509AX	55.2	120	0.460
Transition	Zinc	ELY-SS-TR-09D (3-12)	55	120	0.458
Transition	Zinc	SS-08X-090209AX	54.5	120	0.454
Transition	Zinc	SS-18X-082709AX	52.8	120	0.440
Transition	Zinc	ELY-SS-NF-04 (4-10)	52	120	0.433
Transition	Zinc	ELY-SS-NF-15 (2-5)	52	120	0.433
Transition	Zinc	TP-15X-073009AX	51.2	120	0.427
Transition	Zinc	ELY-SS-TR-05D (3-12)	51	120	0.425
Transition	Zinc	TP-15X-073009AD	50.7	120	0.423
Transition	Zinc	ELY-SS-TR-07C (0-2)	50	120	0.417
Transition	Zinc	ELY-SS-TZ-15 (3.5-12)	50	120	0.417
Transition	Zinc	SS-13X-082809AX	49.2	120	0.410
Transition	Zinc	ELY-SS-TZ-23 (2.5-12)	49	120	0.408
Transition	Zinc	SS-04X-090209AX	47.1	120	0.393
Transition	Zinc	ELY-SS-TR-08D (2-12)	47	120	0.392
Transition	Zinc	ELY-SS-NF-17 (4-10)	46	120	0.383
Transition	Zinc	ELY-SS-TR-09B (2-5)	46	120	0.383
Transition	Zinc	ELY-SS-TZ-40 (2-10)	46	120	0.383
Transition	Zinc	ELY-SS-NF-07 (0-2)	45	120	0.375
Transition	Zinc	ELY-SS-TZ-18 (.5-12)	45	120	0.375
Transition	Zinc	ELY-SS-TZ-37 (2-12)	45	120	0.375
Transition	Zinc	ELY-SS-TZ-42 (2-12)	45	120	0.375
Transition	Zinc	ELY-SS-NF-04 (4-10) DUP	44	120	0.367
Transition	Zinc	ELY-SS-NF-12 (2-9)	44	120	0.367
Transition	Zinc	ELY-SS-NF-14 (3-12)	44	120	0.367
Transition	Zinc	ELY-SS-TZ-31 (0-3)	44	120	0.367
Transition	Zinc	ELY-SS-TZ-35 (0-2)	44	120	0.367
Transition	Zinc	TC-03X-082609AX	43.8	120	0.365
Transition	Zinc	SS-25X-082709AX	43.2	120	0.360
Transition	Zinc	ELY-SS-TR-09C (1.5-8)	43	120	0.358
Transition	Zinc	ELY-SS-NF-16 (1-12)	42	120	0.350
Transition	Zinc	ELY-SS-TZ-36 (0-1.5)	42	120	0.350
Transition	Zinc	SS-05X-090209AX	41.6	120	0.347
Transition	Zinc	ELY-SS-NF-01 (2-7)	40	120	0.333

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Transition	Zinc	ELY-SS-TZ-23 (0-2.5)	40	120	0.333
Transition	Zinc	ELY-SS-TR-09C (0-1.5)	39	120	0.325
Transition	Zinc	ELY-SS-TZ-43 (2.5-11)	38	120	0.317
Transition	Zinc	TQ-06X-082609AX	38	120	0.317
Transition	Zinc	SS-12X-090309AX	37.2	120	0.310
Transition	Zinc	ELY-SS-TR-03C (0-3)	35	120	0.292
Transition	Zinc	ELY-SS-TR-04B (0-1.5)	35	120	0.292
Transition	Zinc	TG-02X-082409AX	30.3	120	0.253
Transition	Zinc	ELY-SS-TR-09B (0-2)	30	120	0.250
Transition	Zinc	SS-21X-083109AX	28.8	120	0.240
Transition	Zinc	ELY-SS-NF-07 (2-8)	24	120	0.200
Background	Arsenic	ELY-SS-BK-07B (0-3)	4.3	0.25	17.2
Background	Arsenic	ELY-SS-BK-07C (0-4)	3.4	0.25	13.6
Background	Arsenic	ELY-SS-BK-15C (0-2.5)	2.7	0.25	10.8
Background	Arsenic	ELY-SS-BK-08C (0-12)	2.6	0.25	10.4
Background	Arsenic	ELY-SS-BK-08A (0-10)	2.3	0.25	9.20
Background	Arsenic	ELY-SS-BK-15B (0-0.5)	2.2	0.25	8.80
Background	Arsenic	ELY-SS-BK-10B (0-1)	2.1	0.25	8.40
Background	Arsenic	ELY-SS-BK-10A (0-6)	1.9	0.25	7.60
Background	Arsenic	ELY-SS-BK-15A (0-2)	1.9	0.25	7.60
Background	Arsenic	ELY-SS-BK-14C (0-1)	1.8	0.25	7.20
Background	Arsenic	ELY-SS-BK-07A (0-3)	1.5	0.25	6.00
Background	Arsenic	ELY-SS-BK-08B (0-7)	1.5	0.25	6.00
Background	Arsenic	ELY-SS-BK-10C (0-6) DUP	1.4	0.25	5.60
Background	Arsenic	ELY-SS-BK-14A (0-1)	1.3	0.25	5.20
Background	Arsenic	ELY-SS-BK-14B (0-8)	1	0.25	4.00
Background	Arsenic	ELY-SS-BK-10C (0-6)	0.91	0.25	3.64
Background	Cadmium	ELY-SS-BK-07C (0-4)	0.52	140	0.00371
Background	Cadmium	ELY-SS-BK-15B (0-0.5)	0.52	140	0.00371
Background	Cadmium	ELY-SS-BK-08C (0-12)	0.4	140	0.00286
Background	Cadmium	ELY-SS-BK-15C (0-2.5)	0.32	140	0.00229
Background	Cadmium	ELY-SS-BK-15A (0-2)	0.28	140	0.00200
Background	Cadmium	ELY-SS-BK-14C (0-1)	0.25	140	0.00179
Background	Cadmium	ELY-SS-BK-08B (0-7)	0.21	140	0.00150
Background	Cadmium	ELY-SS-BK-14B (0-8)	0.2	140	0.00143
Background	Chromium	ELY-SS-BK-07A (0-3)	32	0.2	160
Background	Chromium	ELY-SS-BK-08C (0-12)	32	0.2	160
Background	Chromium	ELY-SS-BK-10A (0-6)	30	0.2	150
Background	Chromium	ELY-SS-BK-10B (0-1)	30	0.2	150
Background	Chromium	ELY-SS-BK-10C (0-6) DUP	30	0.2	150
Background	Chromium	ELY-SS-BK-14B (0-8)	29	0.2	145
Background	Chromium	ELY-SS-BK-10C (0-6)	28	0.2	140
Background	Chromium	ELY-SS-BK-08A (0-10)	24	0.2	120
Background	Chromium	ELY-SS-BK-14C (0-1)	23	0.2	115
Background	Chromium	ELY-SS-BK-07B (0-3)	22	0.2	110
Background	Chromium	ELY-SS-BK-07C (0-4)	18	0.2	90.0
Background	Chromium	ELY-SS-BK-14A (0-1)	18	0.2	90.0
Background	Chromium	ELY-SS-BK-08B (0-7)	12	0.2	60.0
Background	Chromium	ELY-SS-BK-15B (0-0.5)	3.4	0.2	17.0
Background	Chromium	ELY-SS-BK-15C (0-2.5)	2.4	0.2	12.0
Background	Chromium	ELY-SS-BK-15A (0-2)	1.4	0.2	7.00
Background	Cobalt	ELY-SS-BK-07A (0-3)	16	1000	0.0160
Background	Cobalt	ELY-SS-BK-08C (0-12)	14	1000	0.0140
Background	Cobalt	ELY-SS-BK-07B (0-3)	8.7	1000	0.00870
Background	Cobalt	ELY-SS-BK-10C (0-6) DUP	8	1000	0.00800
Background	Cobalt	ELY-SS-BK-10A (0-6)	7.8	1000	0.00780
Background	Cobalt	ELY-SS-BK-08A (0-10)	7.7	1000	0.00770
Background	Cobalt	ELY-SS-BK-10B (0-1)	7.6	1000	0.00760
Background	Cobalt	ELY-SS-BK-07C (0-4)	7.4	1000	0.00740
Background	Cobalt	ELY-SS-BK-10C (0-6)	6.7	1000	0.00670
Background	Cobalt	ELY-SS-BK-14C (0-1)	5.9	1000	0.00590
Background	Cobalt	ELY-SS-BK-14A (0-1)	5.6	1000	0.00560
Background	Cobalt	ELY-SS-BK-08B (0-7)	4.6	1000	0.00460
Background	Cobalt	ELY-SS-BK-14B (0-8)	3.8	1000	0.00380
Background	Cobalt	ELY-SS-BK-15B (0-0.5)	1.3	1000	0.00130

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Background	Cobalt	ELY-SS-BK-15C (0-2.5)	0.92	1000	<0.001
Background	Cobalt	ELY-SS-BK-15A (0-2)	0.35	1000	<0.001
Background	Copper	ELY-SS-BK-07A (0-3)	45	80	0.563
Background	Copper	ELY-SS-BK-07B (0-3)	26	80	0.325
Background	Copper	ELY-SS-BK-08C (0-12)	23	80	0.288
Background	Copper	ELY-SS-BK-07C (0-4)	20	80	0.250
Background	Copper	ELY-SS-BK-08A (0-10)	14	80	0.175
Background	Copper	ELY-SS-BK-10A (0-6)	14	80	0.175
Background	Copper	ELY-SS-BK-10C (0-6) DUP	14	80	0.175
Background	Copper	ELY-SS-BK-10B (0-1)	13	80	0.163
Background	Copper	ELY-SS-BK-10C (0-6)	13	80	0.163
Background	Copper	ELY-SS-BK-14A (0-1)	12	80	0.150
Background	Copper	ELY-SS-BK-14C (0-1)	11	80	0.138
Background	Copper	ELY-SS-BK-08B (0-7)	10	80	0.125
Background	Copper	ELY-SS-BK-15B (0-0.5)	8	80	0.100
Background	Copper	ELY-SS-BK-14B (0-8)	7.9	80	0.0988
Background	Copper	ELY-SS-BK-15C (0-2.5)	6.4	80	0.0800
Background	Copper	ELY-SS-BK-15A (0-2)	5.5	80	0.0688
Background	Iron	ELY-SS-BK-07A (0-3)	31000	200	155
Background	Iron	ELY-SS-BK-07B (0-3)	25000	200	125
Background	Iron	ELY-SS-BK-08C (0-12)	22000	200	110
Background	Iron	ELY-SS-BK-07C (0-4)	20000	200	100
Background	Iron	ELY-SS-BK-08A (0-10)	16000	200	80.0
Background	Iron	ELY-SS-BK-10A (0-6)	16000	200	80.0
Background	Iron	ELY-SS-BK-10B (0-1)	15000	200	75.0
Background	Iron	ELY-SS-BK-14C (0-1)	15000	200	75.0
Background	Iron	ELY-SS-BK-10C (0-6) DUP	14000	200	70.0
Background	Iron	ELY-SS-BK-10C (0-6)	13000	200	65.0
Background	Iron	ELY-SS-BK-14B (0-8)	10000	200	50.0
Background	Iron	ELY-SS-BK-14A (0-1)	9500	200	47.5
Background	Iron	ELY-SS-BK-08B (0-7)	8700	200	43.5
Background	Iron	ELY-SS-BK-15B (0-0.5)	3500	200	17.5
Background	Iron	ELY-SS-BK-15C (0-2.5)	1800	200	9.00
Background	Iron	ELY-SS-BK-15A (0-2)	780	200	3.90
Background	Lead	ELY-SS-BK-07B (0-3)	77	1700	0.0453
Background	Lead	ELY-SS-BK-15C (0-2.5)	71	1700	0.0418
Background	Lead	ELY-SS-BK-07C (0-4)	59	1700	0.0347
Background	Lead	ELY-SS-BK-15B (0-0.5)	36	1700	0.0212
Background	Lead	ELY-SS-BK-15A (0-2)	28	1700	0.0165
Background	Lead	ELY-SS-BK-10B (0-1)	25	1700	0.0147
Background	Lead	ELY-SS-BK-08A (0-10)	19	1700	0.0112
Background	Lead	ELY-SS-BK-08C (0-12)	18	1700	0.0106
Background	Lead	ELY-SS-BK-10A (0-6)	17	1700	0.0100
Background	Lead	ELY-SS-BK-14C (0-1)	13	1700	0.00765
Background	Lead	ELY-SS-BK-07A (0-3)	12	1700	0.00706
Background	Lead	ELY-SS-BK-08B (0-7)	12	1700	0.00706
Background	Lead	ELY-SS-BK-14B (0-8)	11	1700	0.00647
Background	Lead	ELY-SS-BK-10C (0-6) DUP	9.6	1700	0.00565
Background	Lead	ELY-SS-BK-14A (0-1)	8.6	1700	0.00506
Background	Lead	ELY-SS-BK-10C (0-6)	7.8	1700	0.00459
Background	Manganese	ELY-SS-BK-08B (0-7)	7800	450	17.3
Background	Manganese	ELY-SS-BK-08C (0-12)	5200	450	11.6
Background	Manganese	ELY-SS-BK-07A (0-3)	1700	450	3.78
Background	Manganese	ELY-SS-BK-08A (0-10)	1700	450	3.78
Background	Manganese	ELY-SS-BK-07C (0-4)	940	450	2.09
Background	Manganese	ELY-SS-BK-10B (0-1)	930	450	2.07
Background	Manganese	ELY-SS-BK-10C (0-6) DUP	710	450	1.58
Background	Manganese	ELY-SS-BK-07B (0-3)	620	450	1.38
Background	Manganese	ELY-SS-BK-10A (0-6)	600	450	1.33
Background	Manganese	ELY-SS-BK-10C (0-6)	590	450	1.31
Background	Manganese	ELY-SS-BK-14C (0-1)	290	450	0.644
Background	Manganese	ELY-SS-BK-14B (0-8)	150	450	0.333
Background	Manganese	ELY-SS-BK-14A (0-1)	98	450	0.218
Background	Manganese	ELY-SS-BK-15A (0-2)	45	450	0.100
Background	Manganese	ELY-SS-BK-15B (0-0.5)	44	450	0.0978

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Background	Manganese	ELY-SS-BK-15C (0-2.5)	26	450	0.0578
Background	Mercury	ELY-SS-BK-15C (0-2.5)	0.29	2.5	0.116
Background	Mercury	ELY-SS-BK-15A (0-2)	0.27	2.5	0.108
Background	Mercury	ELY-SS-BK-07C (0-4)	0.21	2.5	0.0840
Background	Mercury	ELY-SS-BK-07B (0-3)	0.19	2.5	0.0760
Background	Mercury	ELY-SS-BK-15B (0-0.5)	0.16	2.5	0.0640
Background	Mercury	ELY-SS-BK-10B (0-1)	0.14	2.5	0.0560
Background	Mercury	ELY-SS-BK-08C (0-12)	0.13	2.5	0.0520
Background	Mercury	ELY-SS-BK-14A (0-1)	0.12	2.5	0.0480
Background	Mercury	ELY-SS-BK-08A (0-10)	0.088	2.5	0.0352
Background	Mercury	ELY-SS-BK-10A (0-6)	0.084	2.5	0.0336
Background	Mercury	ELY-SS-BK-07A (0-3)	0.082	2.5	0.0328
Background	Mercury	ELY-SS-BK-10C (0-6) DUP	0.064	2.5	0.0256
Background	Mercury	ELY-SS-BK-08B (0-7)	0.06	2.5	0.0240
Background	Mercury	ELY-SS-BK-10C (0-6)	0.052	2.5	0.0208
Background	Mercury	ELY-SS-BK-14C (0-1)	0.052	2.5	0.0208
Background	Mercury	ELY-SS-BK-14B (0-8)	0.02	2.5	0.00800
Background	Molybdenum	ELY-SS-BK-14C (0-1)	0.64	200	0.00320
Background	Molybdenum	ELY-SS-BK-15B (0-0.5)	0.64	200	0.00320
Background	Molybdenum	ELY-SS-BK-15C (0-2.5)	0.37	200	0.00185
Background	Molybdenum	ELY-SS-BK-14B (0-8)	0.29	200	0.00145
Background	Nickel	ELY-SS-BK-08C (0-12)	30	280	0.107
Background	Nickel	ELY-SS-BK-07A (0-3)	28	280	0.100
Background	Nickel	ELY-SS-BK-10B (0-1)	21	280	0.0750
Background	Nickel	ELY-SS-BK-10C (0-6) DUP	21	280	0.0750
Background	Nickel	ELY-SS-BK-10A (0-6)	20	280	0.0714
Background	Nickel	ELY-SS-BK-10C (0-6)	19	280	0.0679
Background	Nickel	ELY-SS-BK-07B (0-3)	18	280	0.0643
Background	Nickel	ELY-SS-BK-08A (0-10)	18	280	0.0643
Background	Nickel	ELY-SS-BK-07C (0-4)	15	280	0.0536
Background	Nickel	ELY-SS-BK-14A (0-1)	13	280	0.0464
Background	Nickel	ELY-SS-BK-14B (0-8)	12	280	0.0429
Background	Nickel	ELY-SS-BK-14C (0-1)	11	280	0.0393
Background	Nickel	ELY-SS-BK-08B (0-7)	9.5	280	0.0339
Background	Nickel	ELY-SS-BK-15B (0-0.5)	6.8	280	0.0243
Background	Nickel	ELY-SS-BK-15C (0-2.5)	4.4	280	0.0157
Background	Nickel	ELY-SS-BK-15A (0-2)	3.5	280	0.0125
Background	Selenium	ELY-SS-BK-07B (0-3)	2.9	4.1	0.707
Background	Selenium	ELY-SS-BK-07C (0-4)	2.5	4.1	0.610
Background	Selenium	ELY-SS-BK-15C (0-2.5)	2.3	4.1	0.561
Background	Selenium	ELY-SS-BK-08C (0-12)	2.2	4.1	0.537
Background	Selenium	ELY-SS-BK-15B (0-0.5)	2.2	4.1	0.537
Background	Selenium	ELY-SS-BK-07A (0-3)	2.1	4.1	0.512
Background	Selenium	ELY-SS-BK-14C (0-1)	1.8	4.1	0.439
Background	Selenium	ELY-SS-BK-15A (0-2)	1.8	4.1	0.439
Background	Selenium	ELY-SS-BK-08A (0-10)	1.5	4.1	0.366
Background	Selenium	ELY-SS-BK-10B (0-1)	1.5	4.1	0.366
Background	Selenium	ELY-SS-BK-14A (0-1)	1.4	4.1	0.341
Background	Selenium	ELY-SS-BK-10A (0-6)	1.2	4.1	0.293
Background	Selenium	ELY-SS-BK-14B (0-8)	1.2	4.1	0.293
Background	Selenium	ELY-SS-BK-10C (0-6) DUP	1	4.1	0.244
Background	Selenium	ELY-SS-BK-08B (0-7)	0.98	4.1	0.239
Background	Selenium	ELY-SS-BK-10C (0-6)	0.94	4.1	0.229
Background	Silver	ELY-SS-BK-08C (0-12)	1.4	50	0.0280
Background	Silver	ELY-SS-BK-15C (0-2.5)	0.28	50	0.00560
Background	Silver	ELY-SS-BK-14C (0-1)	0.18	50	0.00360
Background	Silver	ELY-SS-BK-15A (0-2)	0.079	50	0.00158
Background	Vanadium	ELY-SS-BK-07A (0-3)	59	20	2.95
Background	Vanadium	ELY-SS-BK-07B (0-3)	58	20	2.90
Background	Vanadium	ELY-SS-BK-07C (0-4)	40	20	2.00
Background	Vanadium	ELY-SS-BK-08C (0-12)	39	20	1.95
Background	Vanadium	ELY-SS-BK-10A (0-6)	32	20	1.60
Background	Vanadium	ELY-SS-BK-10B (0-1)	32	20	1.60
Background	Vanadium	ELY-SS-BK-14C (0-1)	32	20	1.60
Background	Vanadium	ELY-SS-BK-10C (0-6) DUP	30	20	1.50

TABLE I-1

SAMPLE BY SAMPLE COMPARISON OF DETECTED SOIL CONCENTRATIONS WITH SOIL-BASED TRVS FOR SOIL INVERTEBRATES
ELY COPPER MINE SUPERFUND SITE
VERSHIRE, VT

Location	Analyte	Sample_ID	Result (mg/kg)	TRV (mg/kg)	Ratio
Background	Vanadium	ELY-SS-BK-08A (0-10)	28	20	1.40
Background	Vanadium	ELY-SS-BK-14B (0-8)	27	20	1.35
Background	Vanadium	ELY-SS-BK-10C (0-6)	26	20	1.30
Background	Vanadium	ELY-SS-BK-14A (0-1)	18	20	0.900
Background	Vanadium	ELY-SS-BK-08B (0-7)	15	20	0.750
Background	Vanadium	ELY-SS-BK-15B (0-0.5)	11	20	0.550
Background	Vanadium	ELY-SS-BK-15C (0-2.5)	9.2	20	0.460
Background	Vanadium	ELY-SS-BK-15A (0-2)	3.9	20	0.195
Background	Zinc	ELY-SS-BK-07C (0-4)	86	120	0.717
Background	Zinc	ELY-SS-BK-08A (0-10)	74	120	0.617
Background	Zinc	ELY-SS-BK-08C (0-12)	74	120	0.617
Background	Zinc	ELY-SS-BK-07A (0-3)	56	120	0.467
Background	Zinc	ELY-SS-BK-10C (0-6) DUP	49	120	0.408
Background	Zinc	ELY-SS-BK-10C (0-6)	44	120	0.367
Background	Zinc	ELY-SS-BK-10B (0-1)	41	120	0.342
Background	Zinc	ELY-SS-BK-08B (0-7)	40	120	0.333
Background	Zinc	ELY-SS-BK-07B (0-3)	37	120	0.308
Background	Zinc	ELY-SS-BK-10A (0-6)	37	120	0.308
Background	Zinc	ELY-SS-BK-15B (0-0.5)	31	120	0.258
Background	Zinc	ELY-SS-BK-15A (0-2)	30	120	0.250
Background	Zinc	ELY-SS-BK-14C (0-1)	26	120	0.217
Background	Zinc	ELY-SS-BK-14A (0-1)	25	120	0.208
Background	Zinc	ELY-SS-BK-14B (0-8)	21	120	0.175
Background	Zinc	ELY-SS-BK-15C (0-2.5)	17	120	0.142