2021 Hazardous Waste Scanning Project

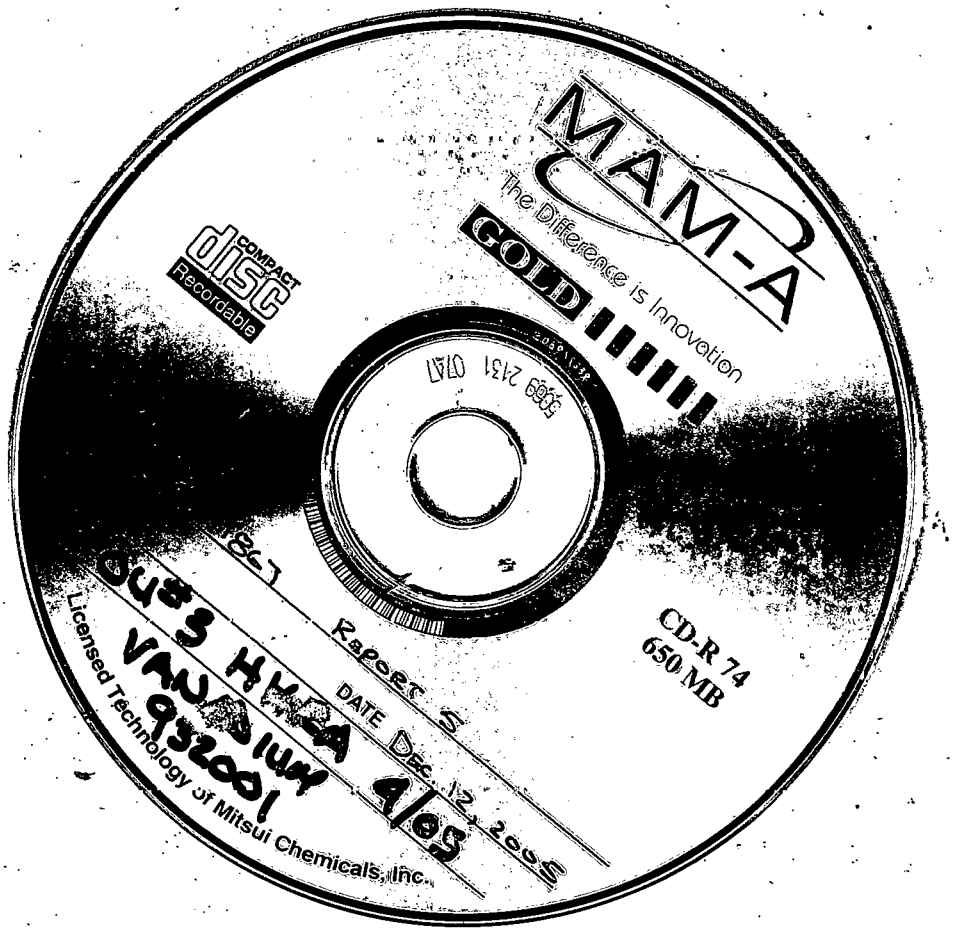
File Form Naming Convention.

(*File_Type*).(*Program*).(*Site_Number*).(*YYYY-MM-DD*).(*File_Name*).pdf

Note 1: Each category is separated by a period "."
Note 2: Each word within category is separated by an underscore "_"

Specific File Naming Convention Label:

report.HW.932001.2005-11-23.Human-Health_Risk_003.pdf


MAM-A
The Difference is Innovation
GOLD
COMPACT disc Recordable
CD-R 74
650 MB
Licensed Technology of Mitsui Chemicals, Inc.


MAM-A
The Difference is Innovation
GOLD
CD-R 74
650 MB
COMPACT
disc
Recordable
Report S
DATE
1987
FIX-UP
ARCHIVE NO.
TITLE HHRA, Vanadium Site
Licensed Technology of Mitsui Chemicals, Inc.

932001
Admin. Record

HUMAN HEALTH RISK ASSESSMENT
OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA
TOWN OF NIAGARA, NEW YORK

New York State Department of Environmental Conservation

Human Health Risk Assessment

☐ Approved ☐ Approved as Noted ☐ Disapproved

COMMISSIONER OF ENVIRONMENTAL CONSERVATION

Designated Representative

Date 10/23/05

TABLE OF CONTENTS

HUMAN HEALTH RISK ASSESSMENT OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA
TOWN OF NIAGARA, NEW YORK

New York State Department of Environmental Conservation

Human Health Risk Assessment

☑ Approved ☐ Approved As Noted ☐ Resubmit With Revisions ☐ Disapproved

COMMISSIONER OF ENVIRONMENTAL CONSERVATION

Michael J. Horton
Designated Representative

Date 11/23/05

PRINTED ON
APR 07 2005

Prepared by:
Conestoga-Rovers & Associates
651 Colby Drive
Waterloo, Ontario
Canada N2V 1C2

Office: 519•884•0510
Fax: 519•884•0525

APRIL 2005
REF. NO. 19867 (5)
This report is printed on recycled paper.

TABLE OF CONTENTS

LIST OF FIGURES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF TABLES
(Following Text)

LIST OF APPENDICES

1.0 INTRODUCTION

The Vanadium Corporation of America (Vanadium) site is located in the Town of Niagara, Niagara County, New York. The Vanadium site currently includes property parcels owned by Airco Properties, Inc., SKW Metals and Alloys, Inc., and the New York Power Authority (NYPA) and Niagara Mohawk Power Corporation (NiMo). The New York State Department of Environmental Conservation (NYSDEC) has designated the Vanadium site as a Class 2 inactive hazardous waste disposal site. NYSDEC has designated the SKW Metals and Alloys, Inc. parcel as Operable Unit 1 (OU1); the Airco Properties, Inc. parcel as Operable Unit 2 (OU2); and the NYPA and NiMo parcel as Operable Unit 3 (OU3). OU3 will herein be referred to as the "Site".

An Order on Consent (Index No. B9-0470-94-12) was executed by NYSDEC and NYPA, NiMo, and Cypres Amax Minerals Company (Respondents) for OU3. The Order on Consent outlines the scope of work for conducting a Remedial Investigation/Feasibility Study (RI/FS) for OU3. As presented in the Order on Consent, the work performed was done in a phased manner, as summarized below:

Phase 1 – Additional Data Collection;

Phase 2 – Evaluation of Human Health Impacts;

Phase 3 – Remedial Investigation Report; and

Phase 4 – Remedial Alternatives Analysis/Feasibility Study.

This document entitled "Human Health Risk Assessment" was prepared to meet the requirements of Phase 2 – Evaluation of Human Health Impacts. A Phase II Work Plan was submitted to NYSDEC in November 2004 (CRA, 2004a).

1.1 OBJECTIVE OF THE HHRA

The purpose of the HHRA is to evaluate the potential human health risks posed by Site-related chemicals under current and potential future Site conditions, assuming no additional remedial actions are taken at the Site. The specific goals of the risk assessment are:

- identify and provide analysis of baseline risks (defined as risks that might exist if no further remediation were applied at the Site);
- provide a basis for determining the level of chemicals that can remain on Site and still not adversely impact public health; and

- provide a basis for comparing potential health impacts of various remedial alternatives.

1.2 ORGANIZATION OF THE HHRA

This HHRA was conducted in accordance with the following Comprehensive Environmental Response, Compensation and Liability Act of 1989 (CERCLA) guidance and Risk Assessment Guidance for Superfund (RAGS) documents:

- USEPA Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part) A, EPA/540/1-89/002, December 1989 (USEPA, 1989)
- USEPA RAGS Supplemental Guidance, Standard Default Exposure Factors, Interim Final, OSWER Directive 9285.6-03, March 25, 1991 (USEPA, 1991a)
- USEPA Exposure Factors Handbook, EPA/600/P-95/002Fa, August 1997 (USEPA, 1997)
- USEPA RAGS Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments, Interim, Publication 9285.7-01D, January 1998 (USEPA, 1998a)
- USEPA RAGS Part E, Supplemental Guidance, Dermal Risk Assessment, Final, July 2004 (USEPA, 2004a).

The HHRA is organized as follows:

- Section 1.0: Introduction

  Presents background information relevant to this HHRA, presents the purpose of this HHRA, and outlines the organization of this HHRA.

- Section 2.0: Site Characterization

  Presents a brief summary of the nature and extent of the contamination or hazard identification due to the historical operations at the Site, presents the Conceptual Site Model (CSM), and presents the selection of Chemicals of Potential Concern (COPCs).

- Section 3.0: Exposure Assessment

  Presents a summary of the exposure settings, identifies the potential exposure pathways, and quantifies exposure based on the exposure assumptions.

- Section 4.0: Toxicity Assessment

  Presents a summary of the toxicity data used to calculate the non-carcinogenic hazards and carcinogenic risks.

- Section 5.0: Risk Characterization

  Presents an assessment of the potential risks to human health posed by soil, groundwater, surface water, sediment, and air impacts and includes the uncertainty analysis.

A list of references cited in the HHRA is presented in Section 6.0.

2.0 SITE CHARACTERIZATION

2.1 SITE DESCRIPTION

The Vanadium site is located in the Town of Niagara, Niagara County, New York. The Vanadium site location is presented on Figure 2.1, and a Vanadium site plan is presented on Figure 2.2. The property is bounded on the north by an automobile depot and vacant property, to the west by Witmer Road (Route 31), on the east by Interstate 190, and on the south by vacant land and industrial facilities. The nearest water bodies are the Lower Niagara River located approximately 1.4 miles west of the property and the NYPA reservoir, located approximately 0.8 miles north of the property. Water transfer units (conduits) are located beneath the NYPA property. These conduits transfer water from the Upper Niagara River, located to the south, to the NYPA reservoir. Numerous high voltage electrical transmission lines cross the Site.

The Vanadium site consists of a 25-acre parcel owned by Airco Properties, Inc. (Airco), a 37-acre parcel owned by SKW Alloys, Inc. (SKW), and right-of-way comprising approximately 88 acres owned by NiMo and the NYPA. The SKW parcel has been designated by NYSDEC as OU1, the Airco parcel has been designated as OU2, and the NYPA and NiMo parcel has been designated as OU3 (the "Site").

2.2 GENERAL SITE USE

There are currently no buildings on the Site. Numerous high voltage electrical transmission lines cross the Site (see Figure 2.2).

Access to the Site is restricted from the west (Witmer Road). However, access from the eastern side of the Site is less restricted, and there is evidence of trespasser use on Site (e.g., all-terrain vehicle tracks).

2.3 PREVIOUS INVESTIGATIONS

Several investigations have been performed at the Vanadium site. The majority of the previous investigations focussed on OU1 and OU2. Investigation activities on OU3 commenced in 1996. This section presents a brief summary of the investigation activities that have been performed at OU3.

NYSDEC Investigations - 1996

In 1996, NYSDEC performed an investigation under the Immediate Investigative Work Assignment (IIWA) program to evaluate OU3. The investigation by NYSDEC included installing eight monitoring wells for groundwater sampling, 12 soil borings for soil sampling, two test pit samples to investigate the waste piles, and the collection of surface water and sediment samples from an existing pond located near soil boring SB-2. The results of the IIWA are presented in the IIWA Report (NYSDEC, 1997).

NYSDEC Investigations – 1999/2000

In 1999 and 2000, NYSDEC performed an IIWA Investigation for the NiMo Right-of-Way (ROW) to determine the presence and location of any waste/fill areas and to determine if the NiMo ROW is the source of the volatile organic contamination found in the Union Carbide (UCAR) well BW-4. The first phase of the investigation consisted of the installation of two overburden and bedrock groundwater monitoring well pairs, and subsequent groundwater sampling. The second phase included an on-Site soil/waste investigation, Site survey/mapping, soil/waste sampling, and laboratory analysis. The results of these investigations are presented in the IIWA Report, Niagara Mohawk Right-of-Way Site (NYSDEC, 2001).

Golder Associates Inc. - 2001

In 2001, Golder Associates performed supplemental investigations at the Site that included the collection and analyses of groundwater samples and water level measurements from the existing Site monitoring wells. Seven water samples were collected and analyzed for Target Analyte List (TAL) metals and hexavalent chromium. The results of the Golder Site investigations are presented in their report entitled "Delineation of Surface Water Bodies, Wetlands, and Ecological Receptors at the Former Vanadium Corporation of America Site" (Golder, 2001).

Conestoga-Rovers & Associates – 2003/2004

In 2003, Conestoga-Rovers & Associates (CRA) performed a Phase I Investigation at OU3. This investigation included the advancement of 15 soil borings for soil sampling, installation of 14 monitoring wells for shallow groundwater sampling, collection of hydraulic water level measurements, excavation of 21 test pit locations to delineate the extent of slag, collection of 31 surface soil samples from across the Site, and the collection of surface water and sediment samples from 17 locations from the existing

ponds/water bodies on Site. All samples were analyzed for TAL metals and hexavalent chromium. The soil and sediment samples were also laboratory analyzed for pH. The results are presented in the Phase I Letter Report (CRA, 2004b).

Relevant data collected during these investigations were included in the preparation of the HHRA, as described in Section 2.6.

2.4 NATURE AND EXTENT OF CONTAMINATION

Through previous investigation at OU3, it has been determined that the primary contaminants are TAL metals, hexavalent chromium, and pH. The following sections provide brief discussions of the chemical distribution in surface soil, subsurface soil, sediment, surface water, and groundwater. It is to be noted that surface soil and subsurface soil also include slag material. Surface soil, slag material, and subsurface soil sample locations are presented on Figures 2.3, 2,4, and 2.5, respectively. Groundwater sample locations are presented on Figure 2.6. Surface water and sediment sample locations are presented on Figure 2.7.

2.4.1 SURFACE SOIL

The results of the Phase I investigations indicate that beryllium, total chromium, copper, iron, mercury, nickel, selenium, vanadium, and zinc were detected above the NYSDEC TAGM 4046 Determination of Soil Cleanup Objectives and Cleanup Levels (RSCOs). Elevated hexavalent chromium and pH values were also detected in surface soils. In general, the highest concentrations of total and hexavalent chromium, copper, nickel, and selenium in the surface soils were detected in the areas of exposed slag. Lower concentrations were generally detected in areas where the slag is covered by common fill or topsoil. More information can be found in the Phase I Letter Report (CRA, 2004b).

2.4.2 SUBSURFACE SOIL

The subsurface soil samples collected from the slag/fill material had elevated concentrations of primarily total chromium, hexavalent chromium, and pH relative to the underlying native soil. Some of the slag samples also had elevated concentrations of copper, nickel, and zinc relative to the native soils. Several slag/fill and native soil samples also had concentrations of arsenic above the RSCO. Additional information is provided in the Phase I Letter Report (CRA, 2004b).

2.4.3 GROUNDWATER

The historical groundwater data indicate that the shallow groundwater is impacted with elevated concentrations of primarily total chromium, hexavalent chromium, and manganese. Much lower concentrations of these parameters were detected in the overburden and bedrock wells. The historical Site data are presented in the Phase I Work Plan (CRA, 2003).

The results of the Phase I investigations indicate that the highest concentrations of total chromium and total hexavalent chromium in shallow groundwater were detected in the center of the Site at monitoring wells MW-19 and MW-18, respectively. Additional information can be found in the Phase I Letter Report (CRA, 2004b).

2.4.4 SURFACE WATER

Surface water samples have been collected from the ditches and pond located on Site (see Figure 2.7). The results of the Phase I investigations indicate that, in general, iron and thallium were detected at concentrations above the NYSDEC Ambient Water Quality Standards (AWQS) in the surface water. Elevated concentrations of hexavalent chromium were also detected in surface water. The highest concentration of total chromium was detected along the ditch at the southwestern end of the Site (SW-11). The highest concentrations of hexavalent chromium were detected along the western edge of the identified slag area (SW-14).

2.4.5 SEDIMENT

Sediment samples have been collected from the ditches and pond located on Site (see Figure 2.7). The results of the Phase I investigations indicate that, in general, total chromium, copper, manganese, and zinc were detected at concentrations above the NYSDEC Lowest Effect Levels (LELs) and Severe Effect Levels (SELs) in sediment samples. Elevated hexavalent chromium and pH values were also detected in sediments. The highest concentrations of total chromium were detected in the ditch at the north end of the Site, north of and within the large pond in the middle of the Site, at the western end of the ditch that runs along the southern portion of the Site adjacent to the fence line and across Witmer Road. The highest concentrations of manganese and zinc were also found at the western end of the ditch and across Witmer Road.

Hexavalent chromium was only detected north of the large pond in the center of the Site. The highest pH values were detected around the large pond in the middle of the Site, the ditch that runs along the fence line at the north end of the Site, south of the slag area, and the east end of the ditch running along the southern portion of the Site.

2.5 CONCEPTUAL SITE MODEL

In order to evaluate the significance of the impacted media at the Site, the potential pathways by which individuals may come in contact with these media must be determined. The combination of factors (chemical source, media of concern, release mechanisms, and potential receptors) that could produce a complete exposure pathway and lead to human uptake of chemicals at the Site are assessed in what is defined as a Conceptual Site Model (CSM). The CSM for the Site is presented on Figure 2.8. Briefly, the following human receptors have been identified at the Site: maintenance worker, trespasser, industrial/commercial worker, and construction/utility worker.

Potentially impacted media at the Site include surface soil and slag, subsurface soil and slag, groundwater, air, surface water, and sediment. For the purpose of this work, surface soil and slag were considered to be the top 2 inches, and soil and slag was be considered to be 0 to 10 feet below ground surface (bgs), in accordance with NYSDEC guidance (NYSDEC, 2002). Air is also considered a potentially impacted medium based on the soil impacts, and the subsequent potential for particulate release into ambient air. Ingestion, dermal contact, and inhalation are the potential routes of exposure. All of these factors are evaluated in the CSM.

The Site contains surface soil and slag, subsurface soil and slag, groundwater, surface water, and sediment impacted by metals and elevated pH. Potential human receptors to these contaminants include maintenance workers, trespassers, industrial/commercial workers, and construction/utility worker.

Exposure pathways involving soils typically include direct contact to chemicals of potential concern (COPCs) in soil through incidental ingestion and dermal contact. Indirect exposure pathways for soil can involve soil-to-air, soil-to-groundwater, and soil-to-biota (i.e., vegetative cover).

The Site also contains groundwater impacted by metals. Potential human receptors to these contaminants include construction/utility worker exposure during ground intrusive activities.

Exposure pathways involving groundwater typically include direct contact to COPCs in water through ingestion of potable drinking water and dermal contact. Indirect exposure pathways for groundwater can involve groundwater-to-air, groundwater-to-surface water, and groundwater-to-biota (i.e., groundwater uptake by vegetative cover). There is no current potable use of groundwater at the Site. Groundwater at the Site discharges into the NYPA underground hydro conduits where it is conveyed to the forebay before ultimately discharging to the Niagara River. Hence, there is no potential for groundwater at the Site to impact groundwater off Site.

Exposure pathways involving surface water typically include direct contact to COPCs in water through incidental ingestion and dermal contact.

Exposure pathways involving sediment typically include direct contact to chemicals of potential concern (COPCs) in sediment through incidental ingestion and dermal contact.

Currently, there are no buildings on Site. It is highly unlikely that any buildings would be constructed on the Site in the future. Therefore, the soil-to-indoor air and groundwater-to-indoor air were not evaluated as a potential future exposure.

Exposure pathways involving air typically include direct inhalation of COPCs in air.

Potential exposure to soil and slag were evaluated as a combined soil and slag data set as well as two separate soil and slag data sets. The three separate exposure scenarios were evaluated to determine the risk and hazards associated with each exposure media for all the potential on-Site receptors.

Table 2.1 presents a summary of the potentially complete pathways and relevant receptors to be evaluated in the risk assessment.

2.6 SELECTION OF CHEMICALS OF POTENTIAL CONCERN (COPCs)

This section presents the process for establishing COPCs for the Site. COPCs are chemicals related to the Site that pose the greatest potential public health risk. In general, detected chemicals are identified as COPCs based upon their concentrations and known toxicity characteristics.

As part of the identification of COPCs, the selection of COCs for each medium was completed using a screening process. The COPC screening process involved a

comparison of the maximum detected concentration of each contaminant in a specific medium to a risk-based concentration associated with target risks and conservative default exposure assumptions. The most up-to-date risk-based concentrations (RBCs) from USEPA Region III (R3-RBCs) (USEPA-III, 2004), Region IX preliminary remediation goals (R9-PRGs) (USEPA-IX, 2004), and Technical and Administrative Guidance Memorandum (TAGM) 4046 - Determination of Soil Cleanup Objectives and Cleanup Levels established by the NYSDEC (NYSDEC, 1994) were used to identify COPCs in the soil, slag, and sediment for the HHRA. COPCs in groundwater were identified based on a comparison to the NYSDOH Maximum Contaminant Levels (MCLs) (NYSDOH, 2004) and tap water from R3-RBCs and R9-PRGs. COPCs in surface water were identified based on a comparison to the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1 (NYSDEC, 1998) and tap water from R3-RBCs and R9-PRGs. For each medium, chemicals with maximum concentrations less than their respective screening value were not identified as COPCs, and were not retained in the HHRA quantitative process. Essential nutrients such as calcium, magnesium, potassium, and sodium were not identified as being Site-related contaminants and, therefore, were disregarded from further evaluation.

Soil and sediment analytical data collected during the Phase I investigation and previous Site investigations were used in the HHRA. Only the surface water and groundwater analytical data collected within the last 2 years were used in the HHRA as these data are considered to be the most representative of current conditions. Analytical data were validated prior to application in the HHRA. Non-detect sample results for a chemical were included in the assessment if the chemical has been positively detected in another sample of the same medium. Estimated results, usually indicated by a qualifier, were included in the evaluation.

The soil data set consists of surface soil, which are all soils less than or equal to 2 inches bgs and subsurface soil which are all soils from greater than 2 inches bgs to a depth of 10 feet bgs.

2.6.1 SURFACE SOIL AND SLAG (0 TO 2 INCHES BGS)

Combined Surface Soil and Slag Data Set (0 to 2 inches bgs)

As presented in Table 2.2, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc, were detected at maximum concentrations greater than the screening criteria for surface soil and slag based on the

ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for surface soil and slag.

Surface Soil Data Set (0 to 2 inches bgs)

As presented in Table 2.3, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, manganese, mercury, nickel, selenium, thallium, and zinc, were detected at maximum concentrations greater than the screening criteria for surface soil based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for surface soil.

Surface Slag Data Set (0 to 2 inches bgs)

As presented in Table 2.4, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc, were detected at maximum concentrations greater than the screening criteria for soil based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for slag.

2.6.2 SUBSURFACE SOIL AND SLAG (0 TO 10 FEET BGS)

Combined Subsurface Soil and Slag Data Set (0 to 10ft bgs)

As presented in Table 2.5, aluminum, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc, were detected at maximum concentrations greater than the screening criteria for soil and slag based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for soil and slag.

Soil Data Set (0 to 10 ft bgs)

As presented in Table 2.6, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, and zinc, were detected at maximum concentrations greater than the screening criteria for soil based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for soil.

Slag Data Set (0 to 10 ft bgs)

As presented in Table 2.7, aluminum, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc, were detected at maximum concentrations greater than the screening criteria for slag based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for slag.

2.6.3 GROUNDWATER

As presented in Table 2.8, antimony (dissolved), arsenic (dissolved), chromium (dissolved), iron (dissolved), manganese (dissolved), selenium (dissolved), zinc (dissolved), aluminum (total), antimony (total), arsenic (total), chromium (total), hexavalent chromium (total), iron (total), lead (total), manganese (total), selenium (total), thallium (total), vanadium (total), and zinc (total), were detected at maximum concentrations greater than the screening criteria for groundwater based on the ingestion and dermal exposure pathways. As a result, these metals were identified as COPCs for groundwater.

2.6.4 SURFACE WATER

As presented in Table 2.9, aluminum, antimony, arsenic, barium, beryllium, chromium, hexavalent chromium, copper, iron, lead, manganese, mercury, nickel, selenium, thallium, vanadium, and zinc, were detected at maximum concentrations greater than the screening criteria for surface water based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for surface water.

2.6.5 SEDIMENT

As presented in Table 2.10, arsenic, barium, beryllium, cadmium, chromium, copper, iron, mercury, nickel, selenium, and zinc, were detected at maximum concentrations greater than the screening criteria for sediment based on the ingestion and dermal exposure pathways. As a result, these chemicals were identified as COPCs for sediment.

3.0 EXPOSURE ASSESSMENT

Exposure is defined as the contact of a receptor (i.e., person) with a chemical or physical agent. The exposure assessment is the estimation of the magnitude, frequency, duration, and routes of exposure. An exposure assessment provides a systematic analysis of the potential exposure mechanism by which a receptor may be exposed to chemical or physical agents at or originating from a study area. The objectives of an exposure assessment are as follows:

1. Characterization of exposure setting.
2. Identification of potential exposure pathways.
3. Quantification of exposure.

3.1 CHARACTERIZATION OF EXPOSURE SETTING

As part of the HHRA process, potential exposure pathways are determined through an evaluation of the physical setting of the Site and the potentially exposed populations. A brief description of the physical setting of the Site is presented in Section 2.0. The consideration of Site-specific factors related to land usage is important in the development of realistic exposure scenarios and quantification of risks and hazards. The current and future potential land uses that are reasonably expected for the Site determine what populations may potentially be exposed. The Site land uses are discussed in the following subsections.

3.1.1 CURRENT LAND USE

The Site is currently owned by NYPA and NiMo and is classified by NYSDEC as an inactive Class 2 waste disposal site. Portions of the site were reportedly used for the disposal of ferromanganese slag, calcium hydroxide, and ferrochromium silicon dust. The Site is currently used as a hydroelectric utility corridor with restricted access. The current potentially exposed population includes persons who may trespass on the Site and occasional maintenance workers.

3.1.2 FUTURE LAND USE

It is reasonable to assume that the Site will remain under the current land use for the foreseeable future. Future maintenance or construction activities on the Site may necessitate some below-grade excavation.

The future potentially exposed population includes persons who may trespass on the Site, industrial/commercial workers, and construction/utility workers.

3.2 IDENTIFICATION OF POTENTIAL EXPOSURE PATHWAYS

An exposure pathway describes a mechanism by which humans may come into contact with site-related COPCs. An exposure pathway is complete (i.e., it could result in a receptor contacting a COPC) if the following four elements are present:

1. A source or a release from a source (e.g., COPCs released to soil due to historical releases during plant operations).
2. A probable environmental migration route of a site-related COPC (e.g., leaching or partitioning from one medium to another).
3. An exposure point where a receptor may come in contact with a site-related COPC (e.g., surface and subsurface soil).
4. A route by which a site-related COPC may enter a potential receptor's body (e.g., ingestion, dermal contact, or inhalation).

If any of these four elements are not present, the exposure pathway is considered incomplete and does not contribute to the total exposure from the Site.

The first element is satisfied at the Site, as previously indicated in Section 2.0.

3.2.1 FATE AND TRANSPORT IN RECEIVING MEDIA

Many complex factors control the partitioning of a COPC in the environment; thus measured concentrations at the Site only represent Site conditions at a discrete point in time. An understanding of the general fate and transport characteristics of the COPCs is important when predicting future exposure, linking sources with currently contaminated media, and identifying potentially complete pathways to Site media. Therefore, the fate and transport analysis conducted at this stage of the exposure

assessment is not intended to provide a quantitative evaluation of media-specific COPC concentrations; it is meant to identify media that are likely to receive Site-related COPCs.

The following sections provide a fate and transport evaluation to determine the relative significance of the release sources and mechanisms. The concentration and distribution of COPCs in the environment are constantly subject to change due to dispersal by wind and water, and chemical and biological degradation by microorganisms. Once released to the environment, COPCs can partition between air, water, sediment, soil, and biota, and be subsequently subjected to one or more of the following processes:

1. Transportation (e.g., convection by wind or water).
2. Physical transformation (e.g., volatilization, precipitation).
3. Chemical transformation (e.g., photolysis, hydrolysis, oxidation, reduction).
4. Biological transformation (e.g., biodegradation, metabolization by plants or animals).
5. Accumulation in one or more media.

Several transport mechanisms, such as advection and dispersion, are controlled primarily by the physical characteristics of the Site, and thus are essentially the same for all COPCs. However, other transport and transformation processes, such as volatilization, sorption, and biodegradation, depend on certain physical and chemical properties and, therefore, vary for each COPC.

3.2.2 POTENTIAL EXPOSURE ROUTES

An exposure route is the fourth element of an exposure pathway. Exposure routes are identified by: i) determining the COPC sources and receiving media, ii) analyzing the movement of the COPCs from the source (Section 3.2.1), and iii) determining the possible exposure points (Section 3.2.2).

Humans can be exposed to a variety of contaminated media, including soil, groundwater, surface water, sediment, air, and biota that has contact with other contaminated media. Based on the physical conditions of the Site, potential exposure routes associated with Site soil and slag include incidental ingestion, direct dermal contact, and inhalation (airborne particulate and/or vapors). Potential exposure routes associated with Site surface water, sediment and groundwater include incidental ingestion and direct dermal contact.

3.2.3 EXPOSURE SCENARIOS AND COMPLETED EXPOSURE PATHWAYS

Based on an understanding of the four components of an exposure pathway and the current/future conditions of the Site, human exposure pathways were identified in the HHRA. The potential human populations considered relevant to the HHRA included trespassers (outdoors), a general industrial/commercial worker (outdoor), and a worker involved in general construction activities or utility excavations. Trespassers use the Site for off-roading with ATVs. Therefore, an on-Site trespasser exposure to Site media was evaluated in the HHRA.

Based on these assumptions and the results of the media-specific screening presented in Section 2.6, the exposure scenarios and pathways quantified in the HHRA are summarized in Table 2.1 and Figure 2.8. The Conceptual Site Model shown on Figure 2.8 presents a summary of the exposure media, exposure pathways, exposure routes, and exposed receptors considered in this HHRA. The following media and potential human exposures (i.e., complete pathways) have been identified for quantitative evaluation in the HHRA:

1. On-Site Soil and Slag– Current Condition:
   - dermal contact with surface soil and slag by maintenance workers;
   - incidental ingestion of surface soil and slag by maintenance workers; and
   - inhalation of surface soil and slag particulate by maintenance workers.
2. On-Site Soil and Slag– Current/Future Condition:
   - dermal contact with surface soil and slag by trespassers;
   - incidental ingestion of surface soil and slag by trespassers; and
   - inhalation of surface soil and slag particulate by trespassers.
3. On-Site Soil and Slag – Future Condition:
   - dermal contact with soil and slag by industrial/commercial workers and construction/utility workers;
   - incidental ingestion of soil and slag by industrial/commercial workers and construction/utility workers; and
   - inhalation of soil and slag particulate by industrial/commercial workers and construction/utility workers.
4. On-Site Groundwater – Future Condition:
   - dermal contact with groundwater by construction/utility workers; and

- incidental ingestion of groundwater by construction/utility workers.

5. Surface Water - Current:
   - dermal contact with surface water by maintenance workers; and
   - incidental ingestion of surface water by maintenance workers.
6. Surface Water - Current/Future:
   - dermal contact with surface water by trespassers; and
   - incidental ingestion of surface water by trespassers.
7. Surface Water - Future:
   - dermal contact with surface water by industrial/commercial workers and construction/utility workers; and
   - incidental ingestion of surface water by industrial/commercial workers and construction/utility workers.
8. Sediment – Current:
   - dermal contact with sediment by maintenance workers; and
   - incidental ingestion of sediment by maintenance workers.
9. Sediment – Current/Future:
   - dermal contact with sediment by trespassers; and
   - incidental ingestion of sediment by trespassers.
10. Sediment –Future:
    - dermal contact with sediment by industrial/commercial workers and construction/utility workers; and
    - incidental ingestion of sediment by industrial/commercial workers and construction/utility workers.

Descriptions of each of these potential exposure scenarios are presented in Section 3.3.2.

3.3 QUANTIFICATION OF EXPOSURE

To quantify exposure, potential exposure scenarios were developed using guidance presented in the following USEPA documents:

- USEPA Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual (Part) A, EPA/540/1-89/002, December 1989 (USEPA, 1989);

- USEPA RAGS Supplemental Guidance, Standard Default Exposure Factors, Interim Final, OSWER Directive 9285.6-03, March 25, 1991(USEPA, 1991a);
- USEPA Exposure Factors Handbook, EPA/600/P-95/002Fa, August 1997 (USEPA, 1997);
- USEPA RAGS Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments, Interim, Publication 9285.7-O1D, January 1998 (USEPA, 1998a); and
- USEPA RAGS Part E, Supplemental Guidance, Dermal Risk Assessment, Final, July 2004 (USEPA, 2004a).

In the absence of USEPA guidance, professional judgment was applied to develop conservative assumptions that are representative of the Reasonable Maximum Exposure (RME) and are protective of human health.

Two levels of exposure scenarios are presented. The Central Tendency (CT) presents the average or mean exposure, and approximates the most probable exposure conditions. The RME presents a conservative exposure scenario that generally utilizes the 90th to 95th percentile assumptions, depending upon available data.

The CT and RME values for the various exposure scenarios were determined based on the observed data distribution and the percentage of censored data points (non-detected results). Duplicate samples were averaged and considered as one sample. Appendix A contains a detailed description of the statistical methods used to determine the CT and RME values.

The arithmetic mean, maximum, and 95% UCL concentrations for the COPCs identified in the various media are summarized in the following:

- Table 3.1 - Surface Soil and Slag;
- Table 3.2 - Surface Soil;
- Table 3.3 - Surface Slag;
- Table 3.4 - Soil and Slag (0 to 10 feet bgs);
- Table 3.5 - Soil (0 to 10 feet bgs);
- Table 3.6 - Slag (0 to 10 feet bgs);
- Table 3.7 - Groundwater;
- Table 3.8 - Surface Water; and
- Table 3.9 - Sediment.

3.3.1 GENERIC ESTIMATION OF INTAKE

In the HHRA, exposure estimates reflect chemical concentration, contact rate, exposure time, and body weight in a term called "intake" or "dose". A generic equation for calculating chemical intake (USEPA, 1989) is:

$$CDI = \frac{CS \times IR \times ABS \times CF \times EF \times ED}{BW \times AT}$$

Where:

CDI = Chronic Daily intake (mg/kg body weight/day)
CS = Chemical concentration (e.g., mg/kg for soil)
IR = Ingestion Rate of Soil (e.g., mg soil/day)
ABS = Absorption Factor (%/100)
CF = Conversion factors as appropriate (e.g., kg/mg)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged, e.g., days)

Carcinogens

A lifetime average daily dose of the chemical is estimated for carcinogens. This prorates the total cumulative intake over a lifetime. An averaging time (AT) of 70 years is used for carcinogens.

Non-carcinogens

The chemical intake of non-carcinogens is estimated over the appropriate exposure period or averaging time. The averaging time selected depends on the toxic endpoint being assessed.

3.3.2 EXPOSURE SCENARIO ASSUMPTIONS

Different exposure scenarios were developed for each receptor population evaluated in the HHRA. Descriptions of each exposure scenario and associated exposure assumptions are presented in the following subsections.

Receptor characteristics had values assigned for CT and RME scenarios. In some cases these values differed between scenarios (e.g., exposure concentration, exposure frequency, etc.) and in other cases these values were the same for both CT and RME scenarios (e.g., body weight, skin surface area, soil ingestion rate, etc.). The assignment of receptor characteristics by scenarios followed standard practices used by the USEPA and risk assessment professionals. Where default values were used, the value presented by USEPA was selected. The specific values used are presented in the following sections.

Based on the generic screening criteria, COPCs have been identified in surface soil and slag, subsurface soil and slag, groundwater, surface water, and sediment.

3.3.2.1 SURFACE SOIL AND SLAG EXPOSURE

Current Maintenance Worker Exposure to Surface Soil and Slag

Under the current Site conditions, a maintenance worker may be exposed to surface soil and slag at the Site. The maintenance worker exposure scenario involving surface soil and slag was developed to reflect exposure patterns typical of a maintenance worker who occasionally works at the Site. It was assumed that the maintenance worker would be exposed to surface soil and slag through combined incidental ingestion, dermal contact, and inhalation. As the USEPA has not developed exposure scenarios specific to maintenance workers, professional judgment was largely used in the development of the maintenance worker exposure scenario. Table 3.10 presents a summary of the conservative and health-protective assumptions used to calculate the maintenance worker surface soil and slag exposure. The exposure assumptions are as follows:

i) the exposure point concentration was the mean concentration for the CT (most likely) exposure scenario and the 95% UCL or the maximum detected concentration, whichever was lower, for the RME exposure scenario;

ii) the inadvertent surface soil and slag ingestion rate for the maintenance worker was 100 mg/day for both the CT and RME (USEPA, 2002a);

iii) the maintenance worker receptors were assumed to be adults;

iv) the exposed skin surface area for the adult maintenance worker was 3,300 cm^2 for the CT and RME based on USEPA (2004a);

v) the soil-to-skin adherence factor was 0.02 mg/cm^2 for CT and 0.2 mg/cm^2 for RME based on USEPA (2004a);

vi) the relative absorption factor (RAF) for the ingestion route was 1;

vii) the exposure frequency was assumed to be 8 days/year for CT and 16 days/year for RME. These frequencies were based on the assumption that a maintenance worker will do maintenance (e.g., cut grass) for 1 day/month from April to November (CT) and 2 days/month from April to November (RME);

viii) the exposure duration (ED) for the maintenance worker was assumed to be 9 years for CT and 25 years for RME based on USEPA (2004a);

ix) the body weight for the maintenance worker was 70 kg based on USEPA (2002a); and

x) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 days per year times the exposure duration (ED).

Current/Future Trespasser Exposure to Surface Soil and Slag

Under the current and future Site conditions, a trespasser may be exposed to surface soil and slag at the Site. The trespasser exposure scenario involving surface soil and slag was developed to reflect relatively frequent trespasser exposure patterns typical of an adolescent who could potentially gain access to the Site via trespassing. It was assumed that the trespasser would be exposed to surface soil and slag through combined incidental ingestion, dermal contact, and inhalation. As the USEPA has not developed exposure scenarios specific to trespassers, professional judgment was largely used in the development of the trespasser exposure scenario. Table 3.11 presents a summary of the conservative and health-protective assumptions used to calculate the trespasser surface soil and slag exposure. The exposure assumptions are as follows:

i) the exposure point concentration was the mean concentration for the CT (most likely) exposure scenario and the 95% UCL or the maximum detected concentration, whichever was lower, for the RME exposure scenario;

ii) the inadvertent surface soil and slag ingestion rate for the trespasser was 100 mg/day for both the CT and RME (USEPA, 1997);

iii) the trespasser receptors were assumed to be adolescents aged 7 to 18 years old;

iv) the exposed skin surface area for the adolescent trespasser was 4,400 cm^2 for the CT and RME based on USEPA (1997);

v) the soil-to-skin adherence factor was 0.04 mg/cm^2 for CT and 0.2 mg/cm^2 for RME based on USEPA (2004a);

vi) the relative absorption factor (RAF) for the ingestion route was 1;

vii) the exposure frequency was assumed to be 64 days/year for CT and 128 days/year for RME. These frequencies were based on the assumption that an adolescent would trespass for 8 days/month from April to November (CT) and 16 days/month from April to November (RME);

viii) the exposure duration (ED) for the trespasser was assumed to be 12 years (CT and RME), based on professional judgment;

ix) the age-adjusted body weight for the trespasser was 50 kg. This value represents the average of 13 year old mean body weights (USEPA, 1997); and

x) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 days per year times the exposure duration (ED).

3.3.2.2 SOIL AND SLAG EXPOSURE

Future Industrial/Commercial Worker Exposure to Soil and Slag

Under future Site land use conditions, excavation and construction activities could hypothetically lead to a mixing of the upper 10 feet of soil. Thus a future industrial/ commercial worker on Site may be exposed to soil and slag derived from both surface and subsurface soil, and this potential exposure pathway was evaluated in the HHRA. The assumptions regarding industrial/commercial worker exposure to soil and slag on Site are summarized in Table 3.12. The exposure assumptions corresponded to those of the current maintenance worker exposure to surface soil and slag (see above), with the exception of the following:

i) the exposure frequency for the future industrial/commercial worker was assumed to be 219 days/year (CT) and 250 days/year (RME) based on USEPA (2004a).

Future Construction/Utility Worker Exposure to Soil and Slag

Under future Site land use conditions, excavation and construction activities could hypothetically lead to a mixing of the upper 10 feet of soil and slag. Thus a future

construction/utility worker on Site may be exposed to soil and slag derived from both surface and subsurface soil, and this potential exposure pathway was evaluated in the HHRA. The assumptions regarding construction/utility worker exposure to soil and slag are summarized in Table 3.13. The exposure assumptions corresponded to those of the current maintenance worker exposure to surface soil and slag (see above), with the exception of the following:

i) the ingestion rate of soil was assumed to be 330 mg/day for CT and RME (USEPA, 2002a);

ii) the exposure frequency for the future construction/utility worker was assumed to be 10 days/year (CT) based on professional judgment and 20 days/year (RME), based on professional judgment;

iii) the exposure duration (ED) for the future construction/utility worker was assumed to be 1 year for CT and RME, based on professional judgment;

iv) the averaging time for non-carcinogens was 365 days for CT and RME based on USEPA (1989); and

v) the soil-to-skin adherence factor was 0.1 mg/cm^2 for CT and 0.3 mg/cm^2 for RME based on USEPA (2004a).

3.3.2.3 GROUNDWATER EXPOSURE

Future Construction/Utility Worker Exposure to Groundwater

Excavation activities may occur during possible future Site construction activities. Excavation activities were assumed to involve excavations or trenching, that could involve exposure to groundwater. Thus a hypothetical future construction/utility worker exposure to groundwater was evaluated in the HHRA. It was assumed that the construction/utility worker would be exposed to groundwater through incidental ingestion and dermal contact while excavating and working within the excavation areas. As the USEPA has not developed an exposure frequency specific for construction worker, professional judgment was used in the development of the construction/utility worker exposure frequency and duration. The assumptions regarding construction/ utility exposure to groundwater are summarized in Table 3.15. The exposure assumptions are as follows:

i) the exposure point concentration was the mean concentration for the CT (most likely) exposure scenario and the 95% UCL or the maximum detected concentration, whichever was lower, for the RME exposure scenario;

ii) the inadvertent groundwater ingestion rate for the future construction/utility worker was 0.005 L/hour for both the CT and RME. This ingestion rate was derived from the incidental ingestion rate of 50 mL/hour for an adult while swimming (USEPA, 1989). Because the workers are not swimming in the exposed groundwater, but instead may have only occasional limited contact, a factor of 10 was applied to arrive at the reasonable incidental ingestion rate of 0.005 L/hr;

iii) the exposed skin surface area for the future construction/utility worker was 3,300 cm^2 for the CT and RME, per USEPA, 2004a;

iv) the permeability constants are chemical-specific and were taken from the USEPA (2004a);

v) the exposure time for the construction/utility worker was assumed to be 1 hour/day (CT) and 2 hours/day (RME), based on professional judgment;

vi) the exposure frequency for the future construction/utility worker was 10 days/year (CT) and 20 days/year (RME), based on professional judgment;

vii) the exposure duration (ED) for the future construction/utility worker was assumed to be 1.0 year (CT and RME), based on professional judgment;

viii) the body weight for the adult worker was 70 kg based USEPA (2002a); and

ix) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 times the exposure duration (ED) based on USEPA (1989).

3.3.2.4 SURFACE WATER

Current Maintenance Worker Exposure to Surface Water

It was assumed that the current maintenance worker would be exposed to surface water through incidental ingestion and dermal contact. As the USEPA has not developed exposure time and frequency specific for maintenance workers, professional judgment was used in the development of the maintenance worker exposure time and frequency. The assumptions regarding current maintenance worker exposure to surface water are summarized in Table 3.16. The exposure assumptions corresponded to those of the future construction/utility worker exposure to groundwater (see above), with the exception of the following:

i) the exposure time for the current maintenance worker was assumed to be 0.5 hour/day (CT) and 1 hour/day (RME), based on professional judgment;

ii) the exposure frequency for the current maintenance worker was 8 days/year (CT) and 16 days/year (RME) based on professional judgment. These frequencies were based on the assumption that a maintenance worker will do maintenance for 1 day/month from April to November (CT) and 2 days/month from April to November (RME);

iii) the exposure duration (ED) for the current maintenance worker was 9 years CT and 25 years RME based on USEPA (2004a);

iv) the body weight for the maintenance worker was 70 kg based on USEPA (2002a); and

v) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 times the exposure duration (ED) based on USEPA (1989).

Current/Future Trespasser Exposure to Surface Water

It was assumed that the current/future trespasser would be exposed to surface water through incidental ingestion and dermal contact while trespassing. As the USEPA has not developed exposure frequency and duration specific for trespassers, professional judgment was used in the development of the trespasser exposure frequency and duration. The assumptions regarding current/future trespasser exposure to surface water are summarized in Table 3.17. The exposure assumptions corresponded to those of the future construction/utility worker exposure to groundwater (see above), with the exception of the following:

i) the exposed skin surface area for the current/future trespasser was 4,400 cm^2 for the CT and RME, per USEPA (1997);

ii) the exposure time for the current/future trespasser was assumed to be 2 hours/day (CT) and 4 hours/day (RME), based on professional judgment;

iii) the exposure frequency for the current/future trespasser was 64 days/year (CT) and 128 days/year (RME) based on professional judgment. These frequencies were based on the assumption that an adolescent will trespass for 8 days/month from April to November (CT) and 16 days/month from April to November (RME);

iv) the exposure duration (ED) for the current/future trespasser was assumed to be 12 years (CT and RME), based on professional judgment;

vi) the age-adjusted body weight for the trespasser was 50 kg. This value represents the average of 13 year old mean body weights (USEPA, 1997); and

vii) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 times the exposure duration (ED) based on USEPA (1989).

Future Industrial/Commercial Worker Exposure to Surface Water

It was assumed that the future industrial/commercial worker would be exposed to surface water through incidental ingestion and dermal contact. The assumptions regarding the future industrial/commercial worker exposure to surface water are summarized in Table 3.18. The exposure assumptions corresponded to those of the future construction/utility worker exposure to groundwater (see above), with the exception of the following:

i) the exposure time for the future industrial/commercial worker was assumed to be 0.5 hour/day (CT) and 1 hour/day (RME), based on professional judgment;

ii) the exposure frequency for the future industrial/commercial worker was 219 days/year (CT) and 250 days/year (RME) based on USEPA (2004a); and

iii) the exposure duration (ED) for the future industrial/commercial worker was assumed to be 9 years (CT) and 25 years (RME) based on USEPA (2004a).

Future Construction/Utility Worker Exposure to Surface Water

It was assumed that the future construction/utility worker would be exposed to surface water through incidental ingestion and dermal contact while conducting short-term work. The assumptions regarding the future construction/utility worker exposure to surface water are summarized in Table 3.19. The exposure assumptions corresponded to those of the future construction/utility worker exposure to groundwater (see Section 3.3.2.3).

3.3.2.5 SEDIMENT EXPOSURE

Current Maintenance Worker Exposure to Sediment

Under current conditions, a maintenance worker on Site may be exposed to sediment. It was assumed that the maintenance worker would be exposed to sediment through incidental ingestion and dermal contact while doing maintenance. As the USEPA has not developed exposure scenarios specific to maintenance workers for exposure frequency and ingestion absorption factors, professional judgment was used in the development of the maintenance worker exposure frequency and ingestion absorption

factors. Table 3.20 presents a summary of the assumptions used to calculate the maintenance worker exposure to sediment. The exposure assumptions are as follows:

i) the exposure point concentration was the mean concentrations for the CT (most likely) exposure scenario and the 95% UCL or the maximum detected concentration in sediment, whichever was lower, for the RME exposure scenario;

ii) the inadvertent ingestion rate for the maintenance worker was 100 mg/day for both the CT and RME (USEPA, 2002a);

iii) the exposed skin surface area for the maintenance worker was 3,300 cm^2 for the CT and RME, as per USEPA (2004a);

iv) the soil-to-skin adherence factor was 0.02 mg/cm^2 for CT and 0.2 mg/cm^2 for RME (USEPA, 2004a);

v) the dermal absorption factors are chemical-specific and were taken from USEPA (2004a);

vi) the exposure frequency was assumed to be 8 days/year for CT and 16 days/year for RME. These frequencies were based on the assumption that a maintenance worker will do maintenance for 1 day/month from April to November (CT) or 2 days/month from April to November (RME), based on professional judgment;

vii) the exposure duration (ED) for the current maintenance worker was 9 years for CT and 25 years for RME based on USEPA (2004a);

viii) the body weight for the maintenance worker was 70 kg based on USEPA (2002a); and

ix) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 times the exposure duration (ED) based on USEPA (1989).

- Current/Future Trespasser Exposure to Sediment

Under current and future conditions, a trespasser on Site may be exposed to sediment. It was assumed that the trespasser would be exposed to sediment through incidental ingestion and dermal contact while trespassing. As the USEPA has not developed exposure scenarios specific to trespassers, professional judgment was used in the development of the trespasser exposure scenario. Table 3.21 presents a summary of the assumptions used to calculate the trespasser exposure to sediment. The exposure assumptions corresponded to those of the current maintenance worker exposure to sediment (see above), with the exception of the following:

i) the exposed skin surface area for the trespasser was 4,400 cm^2 for the CT and RME, as per USEPA (1997);

ii) the soil-to-skin adherence factor was 0.04 mg/cm^2 for CT and 0.2 mg/cm^2 for RME (USEPA, 2004a);

iii) the exposure frequency was assumed to be 64 days/year for CT and 128 days/year for RME. These frequencies were based on the assumption that an adolescent will trespass for 8 days/month from April to November (CT) or 16 days/month from April to November (RME), based on professional judgment;

iv) the exposure duration (ED) for the current/future trespasser was 12 years for both CT and RME, based on professional judgment; and

v) the age-adjusted body weight for the trespasser was 50 kg. This value represents the average of 13 year old mean body weights (USEPA, 1997).

Future Industrial/Commercial Worker Exposure to Sediment

Under future conditions, an industrial/commercial worker may be exposed to sediments. It was assumed that the industrial/commercial worker would be exposed to sediment through incidental ingestion and dermal contact while conducting work on Site. Table 3.22 presents a summary of the conservative and health-protective assumptions used to calculate the industrial/commercial worker exposure to sediment. The exposure assumptions corresponded to those of the current maintenance worker exposure to sediment (see above), with the exception of the following:

i) the exposure frequency for the industrial/commercial worker was 219 days/year for (CT) and 250 days/year for (RME), by USEPA (2004a).

Future Construction/Utility Worker Exposure to Sediment

Under future conditions, a construction/utility worker on Site may be exposed to sediments. It was assumed that the construction/utility worker would be exposed to sediment through incidental ingestion and dermal contact while conducting short-term work on Site. Table 3.23 presents a summary of the conservative and health-protective assumptions used to calculate the construction/utility worker exposure to sediment. The exposure assumptions corresponded to those of the current maintenance exposure to sediment (see above), with the exception of the following:

i) the exposure frequency for the construction/utility worker was 10 days/year for (CT) and 20 days/year for (RME), based on professional judgment;

ii) the exposure duration (ED) for the construction/utility worker was assumed to be 1 year for CT and for RME, based on professional judgment; and

iii) the soil-to-skin adherence factor was 0.1 mg/cm^2 for CT and 0.3 mg/cm^2 for RME (USEPA, 2004a).

3.3.3 AMBIENT AIR EXPOSURE

Current Maintenance Worker Exposure to Ambient Air

The soil-to-ambient air exposure pathway is potentially complete for maintenance workers under current conditions, and therefore was evaluated in the HHRA. Exposure to ambient air occurs through inhalation of particulates. Soil chemical data were used to model potential air emission concentrations on Site for the current maintenance worker. As the USEPA has not developed exposure time and frequency scenarios specific to maintenance workers, professional judgment was used in the development of the maintenance worker exposure time and frequency scenarios. Table 3.10 presents the conservative and health-protective assumptions used to calculate maintenance worker inhalation exposure. The exposure assumptions are as follows:

i) the exposure point concentration was the mean concentration for the CT (most likely) exposure scenario and the 95% UCL or the maximum detected concentration, whichever was lower, for the RME exposure scenario;

ii) the inhalation rate for the maintenance worker was 0.83 m^3/hour for both the CT and RME (USEPA, 2002a);

iii) The maintenance worker receptors were assumed to be adults;

iv) The exposure frequency was assumed to be 8 days/year for CT and 16 days/year for RME. These frequencies were based on the assumption that a maintenance worker will do maintenance for 1 day/month from April to November (CT) and 2 days/month from April to November (RME);

v) The exposure duration (ED) for the maintenance worker was assumed to be 9 years for CT and 25 years for RME based on USEPA (2004);

vi) the exposure time for the maintenance worker was assumed to be 8 hours/day for CT and RME, based on professional judgment;

vii) The particulate emission factor was assumed to be 1.36E+09 m^3/kg for CT and RME (USEPA, 2002a);

viii) The body weight of the maintenance worker was 70 kg based on USEPA (2002a); and

ix) the carcinogenic averaging time was 365 days per year for 70 years (25,550 days). The averaging time for non-carcinogens was 365 days per year times the exposure duration (ED) based on USEPA (1989).

Current/Future Trespasser Exposure to Ambient Air

The soil-to-ambient air exposure pathway is potentially complete for trespassers under current/future conditions, and therefore was evaluated in the HHRA. Exposure to ambient air occurs through inhalation of particulates. Soil chemical data were used to model potential air emission concentrations on Site for the current/future trespasser. As the USEPA has not developed exposure scenarios specific to trespassers, professional judgment was used in the development of the trespasser exposure scenario. Table 3.11 presents the conservative and health-protective assumptions used to calculate trespasser inhalation exposure. The exposure assumptions corresponded to those of the current maintenance worker exposure to ambient air on Site (see above), with the exception of the following:

i) the inhalation rate for the trespasser was 1.2 m^3/hour for both the CT and RME based on the short-term exposure inhalation rate for children performing moderate activities (USEPA, 1997);

ii) The trespasser receptors were assumed to be adolescents aged 7 to 18 years old;

iii) The exposure frequency was assumed to be 64 days/year for CT and 128 days/year for RME. These frequencies were based on the assumption that an adolescent will trespass for 8 days/month from April to November (CT) and 16 days/month from April to November (RME);

iv) The exposure duration (ED) for the trespasser was assumed to be 12 years (CT and RME), based on professional judgment;

v) the exposure time for the trespasser was assumed to be 2 hours/day for CT and 4 hours/day for RME, based on professional judgment; and

vi) The age-adjusted body weight for the trespasser was 50 kg. This value represents the average of 13 year old mean body weights (USEPA, 1997).

Future Industrial/Commercial Worker Exposure to Ambient Air

The soil-to-ambient air exposure pathway is potentially complete for the industrial/commercial worker under future on-Site conditions, and therefore was evaluated in the HHRA. Exposure to ambient air occurs through inhalation of particulates. Soil chemical data were used to model potential air emission concentrations on Site. Table 3.12 includes the conservative and health-protective assumptions used to calculate the

industrial/commercial worker exposure to ambient air. The exposure assumptions corresponded to those of the current maintenance worker exposure to ambient air on Site (see above), with the exception of the following:

i) the exposure frequency for the industrial/commercial worker was 219 days/year for (CT) and 250 days/year for (RME), by USEPA (2004a).

Future Construction/Utility Worker Exposure to Ambient Air

The soil-to-ambient air exposure pathways are potentially complete for the construction/utility worker exposure scenario evaluated under future Site conditions, and therefore were evaluated in the HHRA. Exposure to ambient air occurs through inhalation of particulates. Soil chemical data were used to model potential air emission concentrations on Site. Table 3.13 provides the conservative and health-protective assumptions used to calculate the construction/utility worker exposure to ambient air. The exposure assumptions corresponded to those of the current maintenance worker exposure to ambient air (see above), with the exception of the following:

i) the exposure frequency for the construction/utility worker was assumed to be 10 days/year (CT) and 20 days/year (RME), based on professional judgment;

ii) the exposure duration (ED) for the construction/utility worker was assumed to be 1.0 year, based on professional judgment; and

iii) the particulate emission factor was calculated to be 4.72E+07 m^3/kg for CT and RME following the methodology presented in USEPA (2002a) and shown on Table 3.14.

3.4 EVALUATION OF ADULT EXPOSURES TO LEAD IN SOIL AND WATER

The best available method for determining hazards associated with adult exposures to lead-impacted soil and water is based on the adult lead exposure equation as presented in the USEPA document "Recommendations of the Technical Review Workgroup (TRW) for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil" (USEPA, 2003).

The hazard associated with adult lead exposure stems from the relationship between the lead concentration in site media and the blood lead concentration in the developing fetus of a pregnant woman exposed to site media. Current Office of Solid Waste and

Emergency Response (OSWER) guidance (USEPA, 1998b) calls for the establishment of cleanup goals to limit childhood risk of exceeding 10 micrograms per deciliter (μg/dL) to 5 percent of the population.

Lead was identified as a COPC in soil, slag, groundwater, and surface water associated with the Site. As such, it is reasonably anticipated that a maintenance worker on Site, a trespasser in this area, a construction/utility worker performing excavations and an industrial/commercial worker on Site would contact lead. Therefore, the fetal 95th percentile blood lead level was conservatively estimated for an adolescent female trespasser and adult women maintenance worker, construction/utility worker, and industrial/commercial worker with Site exposure.

3.4.1 ADULT EXPOSURE EQUATION

The TRW has indicated that the Adult Exposure Equation is a suitable and appropriate model for assessing adult exposures to lead under an industrial setting. The Adult Exposure Equation recommended for use by the TRW is as follows:

$$PbB_{fetal,0.95} = \left(PbB_{adult,0} + PbB_{adult,site}\right) \bullet GSD_{i,adult}^{1.645} \bullet R_{fetal/maternal}$$

Where:

$PbB_{fetal,\ 0.95}$ = 95th percentile target blood lead (PbB) concentration in the fetus (μg/dL)

$PbB_{adult,0}$ = typical lead concentration (μg/g) (appropriate average concentration for individual)

$R_{fetal/maternal}$ = mean ratio of fetal to maternal PbB

$GSD_{i,adult}$ = individual Geometric Standard Deviation, an exponent of 1.645 represents the standard normal deviate used to calculate the 95th percentile from a lognormal distribution of blood lead concentration

$PbB_{adult,\ site}$ = adult blood lead concentration (μg/dL) contributed by exposure to lead containing media on Site as shown below

$$PbB_{adult,site} = \frac{BKSF \bullet [(PbS \bullet IR_S \bullet AF_S \bullet EF_S) + (PbW \bullet IR_W \bullet AF_W \bullet EF_W)]}{AT}$$

Where:

BKSF = BioKinetic Slope Factor (μg/dL blood lead increase per μg/day lead uptake)

PbS = Soil Lead Concentration (μg/g)

PbW = Water Lead Concentration (μg/L)

IR_S = Ingestion Rate of soil (g/day)

IR_W = Ingestion Rate of water (L/day)

EF_S = Exposure Frequency for contact with assessed soils (days/yr)

EF_W = Exposure Frequency for contact with assessed water (days/yr)

AF_S = absolute Absorption Fraction of lead in soil

AF_W = absolute Absorption Fraction of lead in water

AT = Averaging Time; 365 days/year for non-carcinogen exposures

3.4.2 ADULT EXPOSURE EQUATION INPUT PARAMETERS

The basis for selection of input parameters for the above model is discussed below and shown in Tables 3.24, 3.25, 3.26, and 3.27.

i) Media Lead Concentrations (PbS, PbW):

The exposure unit specific RME concentrations of lead in the media were used. Lead was identified in surface soil and slag, surface soil and slag, surface water and groundwater as follows:

Maintenance Worker:

Surface Soil and Slag (μg/g)	*Surface Soil (μg/g)*	*Slag (μg/g)*	*Surface Water (μg/L)*
309	-	1,221	184

Adolescent Trespasser:

Surface Soil and Slag (μg/g)	*Surface Soil (μg/g)*	*Slag (μg/g)*	*Surface Water (μg/L)*
309	-	1,221	184

Industrial/Commercial Worker:

Soil and Slag (0 to 10 feet bgs) (μg/g)	*Soil (0 to 10 feet bgs) (μg/g)*	*Slag (0 to 10 feet bgs) (μg/g)*	*Surface Water (μg/L)*
81.6	226	133	184

Construction/Utility Worker:

Soil and Slag (0 to 10 feet bgs) (µg/g)	*Soil (0 to 10 feet bgs) (µg/g)*	*Slag (0 to 10 feet bgs) (µg/g)*	*Groundwater (µg/L)*
81.6	226	133	61.4

ii) Mean Ratio of Fetal to Maternal PbB (Rfetal/maternal):

Various studies have estimated an average fetal-to-maternal PbB ratio of 0.9 based on a weight of evidence approach. This value has also been used by USEPA in applying the Adult Exposure Model. The value of 0.9 for was used in the modeling.

iii) Individual Geometric Standard Deviation ($GSD_{i,adult}$):

This parameter is used to assess variability in blood lead concentrations among different individuals. Few data are available regarding GSD values reflecting individual variability. Instead, GSD values reflecting community variability (which would be expected to be greater than individual variability) are frequently applied to estimate individual variability. Various studies have indicated that community GSDs may range from approximately 1.8 to 2.1 depending on the demographics. A value for GSD of 2.0 was selected from the NHANES III survey (USEPA, 2002b) of the adult female in the Northeast region (Table 3a of USEPA 2002b).

iv) Baseline PbB Value (PbBadult,0):

This parameter is specific to the population in the area of interest. At this time, no source of data describing blood lead levels for the population in the vicinity of the Site has been identified. Therefore, published reference data were used to determine a representative value. Various studies have indicated that Baseline PbB values range from approximately 1.7 to 2.2 depending on the demographics. A value of 1.98 µg/dL was chosen for this input parameter based on the NHANES III survey (USEPA, 2002b) of the adult female in the Northeast region (Table 3a of USEPA 2002b).

v) Biokinetic Slope Factor (BKSF in µg/dL per µg/day):

The TRW adopted a BKSF of 0.4, derived from USEPA (2003). The default value of 0.4 for the parameter BKSF was used in the modeling.

vi) Soil Absolute Absorption Fraction of Lead (AFs):

The TRW uses 12 percent as the absorbed fraction of lead from soil for adults, based on an absorption factor for soluble lead of 0.20 (soil/soluble) (USEPA, 2003).

vii) Water Absolute Absorption Fraction of Lead (AFW):

The TRW uses 20 percent as the absorbed fraction of lead from water for adults, based on an absorption factor for soluble lead of 0.20 (USEPA, 2003).

viii) Soil Ingestion Rate (IRS in g/day):

Soil ingestion rates of 0.1 g/day for a maintenance worker, 0.1 g/day, 0.1 g/day for an adolescent trespassers, 0.1 g/day for an industrial/commercial worker, and 0.33 g/day for a construction/utility worker were applied at the Site (USEPA, 2002a).

ix) Water Ingestion Rate (IRW in L/day):

Water ingestion rates were calculated based on an incidental ingestion rate of 0.005 L/h, for exposure duration of 1 hour/day for the maintenance worker, adolescent trespasser, industrial/commercial worker, and construction/utility worker.

x) Exposure Frequency (EFS and EFW in days/yr):

For the maintenance worker an exposure frequency of 16 days/year was used as a realistic maximum exposure in the modeling. For the adolescent trespasser, an exposure frequency of 128 days/year was determined(scenario specific). For the industrial/commercial worker, an exposure frequency of 250 days/year (5 days per week for 50 weeks, based on 2 weeks holidays) was used as a realistic maximum exposure in the modeling. For the construction/utility worker scenario, an exposure frequency of 20 days/year was used as a realistic maximum exposure in the modeling.

4.0 TOXICITY ASSESSMENT

The toxicity assessment weighs the available evidence regarding the potential for a particular COPC to cause adverse effects in exposed individuals and estimates the extent of exposure and possible severity of adverse effects. To develop toxicity values, two steps are taken: hazard identification and dose-response assessment. The hazard identification determines the potential adverse effects associated with exposure to a COPC. In the dose-response assessment, numerical toxicity values are determined or selected from the available toxicity data.

In the selection of toxicity values, preference has been given to the most recently developed values because these would incorporate the most recent toxicological information and would provide the best basis upon which to assess potential health hazards/risks. Toxicity values were primarily obtained from the IRIS (Integrated Risk Information System) database (USEPA 2004b), Health Effects Assessment Summary Table (HEAST, 1997), and the USEPA-NCEA provisional values as presented in the USEPA Region IX PRGs (USEPA-IX, 2004) and USEPA Region III RBCs (USEPA-III, 2004).

4.1 NON-CARCINOGENIC HAZARDS

4.1.1 TOXICITY INFORMATION FOR NON-CARCINOGENIC EFFECTS

For substances suspected to cause non-carcinogenic chronic effects, the health criteria are usually expressed as chronic intake levels or reference dose (RfDs) [in units of mg/(kg day^{-1})] below which, no adverse effects are expected. In other words, there is a level of exposure to a chemical below which no toxic effects are expected. In contrast to the toxicological model used to assess carcinogenic risk, which assumes no concentration threshold, the non-carcinogenic dose-response model postulates a "threshold".

In this risk assessment, chronic RfDs are used as the toxicity values for non-carcinogenic health effects. A chronic RfD is defined as an estimate (with an uncertainty spanning an order of magnitude or greater) of a daily exposure level for the human population, including sensitive sub-populations, which poses no appreciable risk of deleterious effects over a lifetime of exposure. Uncertainty factors are incorporated into the RfDs to account for extrapolations from animal toxicity data, data quality, and to protect sensitive sub-populations. The basis of an RfD is usually the highest dose level administered to laboratory animals that did not cause observable adverse effects after

chronic (usually lifetime) exposure. This is called the No-Observed Adverse Effect Level (NOAEL). The NOAEL is then divided by an uncertainty (safety) factor, and sometimes an additional modifying factor, to obtain the RfD. In general, an uncertainty factor of 10 is used to account for interspecies variation and another factor of 10 to account for sensitive human populations. Additional factors of 10 are included in the uncertainty factor if the RfD is based on the Lowest-Observed Adverse Effect Level (LOAEL) instead of the NOAEL, or if data inadequacies are present (e.g., the experiment for which the RfD was derived had less than lifetime exposure). The LOAEL is the dose level administered to laboratory animals that causes the lowest adverse effect (i.e., liver toxicity - although this is species and chemical-specific) after chronic exposure.

Table 4.1 presents the non-cancer toxicity data (RfDs) used to estimate human health effects for oral and dermal exposure routes. Table 4.2 presents RfDs used for the inhalation exposure route.

4.2 CARCINOGENIC RISKS

4.2.1 TOXICITY INFORMATION FOR CARCINOGENIC EFFECTS

Cancer Slope Factors (CSFs) are quantitative risk estimates of carcinogenic potency. Slope factors relate the lifetime probability of excess cancers to the lifetime average exposure dose of a substance. CSFs are estimated using mathematical extrapolation models, most commonly the linearized multistage (LMS) model, and are presented as risk per mg/(kg-day^{-1}) (i.e., mg carcinogen per kg body weight per day). These models assume low dose-response linearity and thus may not be appropriate for some suspect carcinogens, in particular those that function as promoters. As well, the body's natural repair processes and defense mechanisms may decrease cancer risk at low exposure levels. Thus, the risks at lower exposure levels are likely overestimated using the LMS model. When adequate human epidemiology data are available, maximum likelihood estimates (MLEs) of model parameters are used to generate a CSF. When only animal data are available, the CSF is derived from the largest possible linear slope that is consistent with the data (within the upper 95 percent confidence limit). In other words, the true risk to humans, while not identifiable, is not likely to exceed the upper-bound estimate. This is a conservative estimate, and in some cases a linear slope of zero may be as appropriate for the data (i.e., no carcinogenic risk).

Known or suspect human carcinogens have been evaluated and identified by the Carcinogen Assessment Group using the USEPA Weight-of-Evidence approach for carcinogenicity classification (HEAST, 1997). The USEPA classification is based on an

evaluation of the likelihood that the agent is a human carcinogen. The evidence is characterized separately for human and animal studies as follows:

Group A - Known Human Carcinogen (sufficient evidence of carcinogenicity in humans);

Group B - Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans);

Group C - Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data);

Group D - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence); and

Group E - Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in animal studies).

The COPCs were classified utilizing the USEPA system. Table 4.3 presents the cancer toxicity data (CSFs) used in the HHRA to estimate the risk of cancer for the oral and dermal exposure routes. Table 4.4 presents CSFs for the inhalation exposure route.

4.3 POTENTIAL RISK FROM CARCINOGENS

A CSF is applied to estimate the potential risk of cancer from exposure to carcinogenic chemicals. The CSF, when multiplied by the lifetime average daily intake, provides an estimate of the probability that the intake will cause cancer during the lifetime of the exposed individual. This increased cancer risk is expressed, for example, as 1×10^{-6} or 1.0E-06 (1 in 1 million increased cancer risk). This is an upper limit estimate of the risk, based on very conservative health-protective assumptions and conservative statistical evaluations of data from animal experiments or epidemiological studies. To state that a chemical exposure causes a 1E-06 added upper limit risk of cancer means that if 1,000,000 people are exposed to this concentration of the chemical for their lifetimes, a maximum of one additional incident of cancer may occur. This is a very conservative estimate, and, in fact, there may be no additional cases of cancer due to the chemical exposure.

5.0 RISK CHARACTERIZATION

The objective of this risk characterization is to integrate information developed in the exposure assessment (Section 3.0) and the toxicity assessment (Section 4.0) into a complete evaluation of the potential human health risks associated with exposure to potentially contaminated surface soil and slag, subsurface soil and slag, groundwater, surface water, and sediment at the Site. The methods used in this risk characterization are based on USEPA RA guidance for human exposures (USEPA, 1989, 1991a, 1991b, 1997, 1998a, 2002a, 2004a).

5.1 HAZARD ESTIMATES

The potential for non-cancer health effects from exposure to a COPC is evaluated by comparing an exposure level over a specified time period to a reference dose (RfD) for a similar time period. This ratio, termed the hazard quotient, is calculated according to the following general equation:

$$HQ = \frac{CDI}{RfD}$$

Where:

HQ = The Hazard Quotient (unitless) is the ratio of the exposure dose of a chemical to a reference dose not expected to cause adverse effects from a lifetime exposure. A hazard quotient equal to or below 1.0 is considered protective of human health.

CDI = The Chronic Daily Intake is the chemical dose calculated by applying the exposure scenario assumptions and expressed as mg/(kg day^{-1}). The intake represents the average daily chemical dose over the expected period of exposure.

RfD = The Reference Dose is a daily dose believed not to cause an adverse effect from even a lifetime exposure [mg/(kg day^{-1})]. The RfD is based on experimental data and/or epidemiological studies.

The Hazard Index (HI) is the sum of Hazard Quotients for individual COPCs for a specific exposure scenario.

The summation of non-carcinogenic effects is only additive if they pertain to similar target organs. The HIs presented in Section 5.3 conservatively sum the non-carcinogenic effects without regard to target organs. HIs summed across similar target organs are presented on the hazard quotient calculation tables for the Site.

5.2 CANCER RISK ESTIMATES

Exposure scenarios may involve potential exposure to more than one carcinogen. To represent the potential carcinogenic effects posed by exposure to multiple carcinogens, it is assumed, in the absence of information on synergistic or antagonistic effects, that these risks are additive. Cancer risks are calculated utilizing the following general equation:

$$\text{Cancer Risk} = \text{LADD} \times \text{CSF}$$

Where:

Cancer Risk = Estimated upper bound on additional risk of cancer over a lifetime in a population exposed to the carcinogen for a specified exposure period (unitless).

LADD = The Lifetime Average Daily Dose of the chemical calculated using exposure scenario assumptions and expressed in mg/(kg-day^{-1}). The intake represents the total lifetime chemical dose averaged over an individual expected lifetime of 70 years.

CSF = The Cancer Slope Factor models the potential carcinogenic response and is expressed as [mg/(kg-day^{-1})]$^{-1}$.

For estimating cancer risks from exposure to multiple carcinogens from a single exposure route, the following equation is used:

$$\text{Risk}_T = \sum_{i=1}^{N} \text{Risk}_i$$

Where:

Risk_T = Total cancer risk from route of exposure

Risk_i = Cancer risk for the chemical

N = Number of chemicals

The cumulative carcinogenic risks are presented and discussed in Section 5.3.

5.3 RISK QUANTIFICATION SUMMARY

The hazard indices and excess lifetime cancer risks for the various exposure scenarios for on-Site media are presented below.

5.3.1 CALCULATION OF NON-CANCER HAZARDS AND CALCULATED LIFETIME CANCER RISKS FOR RECEPTORS

The non-cancer hazard calculations and calculated lifetime cancer risks for potential receptors at the Site are presented in Appendix B and summarized below.

Receptor	Medium	Route	Exposure	Non-Carcinogenic Hazard Index	Appendix Table Reference	Carcinogenic Risk	Appendix Table Reference
Maintenance Worker (Current)	Surface Soil and Slag	Ingestion Dermal Inhalation	CT	1.1E-02	B.1.1.CT	4.0E-08	B.2.1.CT
			RME	7.7E-02	B.1.1.RME	7.3E-07	B.2.1.RME
Maintenance Worker (Current)	Surface Soil	Ingestion Dermal Inhalation	CT	5.9E-03	B.1.2.CT	3.9E-08	B.2.2.CT
			RME	4.9E-02	B.1.2.RME	3.2E-07	B.2.2.RME
Maintenance Worker (Current)	Surface Slag	Ingestion Dermal Inhalation	CT	2.4E-02	B.1.3.CT	2.9E-08	B.2.3.CT
			RME	2.2E-01	B.1.3.RME	5.6E-07	B.2.3.RME
Trespasser (Current/ Future)	Surface Soil and Slag	Ingestion Dermal Inhalation	CT	1.4E-01	B.1.4.CT	6.1E-07	B.2.4.CT
			RME	9.8E-01	B.1.4.RME	4.1E-06	B.2.4.RME
Trespasser (Current/ Future)	Surface Soil	Ingestion Dermal Inhalation	CT	6.9E-02	B.1.5.CT	6.0E-07	B.2.5.CT
			RME	6.2E-01	B.1.5.RME	1.8E-06	B.2.5.RME
Trespasser (Current/ Future)	Surface Slag	Ingestion Dermal Inhalation	CT	3.0E-01	B.1.6.CT	4.4E-07	B.2.6.CT
			RME	2.8E+00	B.1.6.RME	3.2E-06	B.2.6.RME
Industrial/ Commercial Worker (Future)	Soil and Slag	Ingestion Dermal Inhalation	CT	2.7E-01	B.1.7.CT	1.2E-06	B.2.7.CT
			RME	7.8E-01	B.1.7.RME	6.1E-06	B.2.7.RME
Industrial/ Commercial Worker (Future)	Soil	Ingestion Dermal Inhalation	CT	1.2E-01	B.1.8.CT	1.0E-06	B.2.8.CT
			RME	4.5E-01	B.1.8.RME	4.5E-06	B.2.8.RME

Receptor	Medium	Route	Exposure	Non-Carcinogenic Hazard Index	Appendix Table Reference	Carcinogenic Risk	Appendix Table Reference
Industrial/ Commercial Worker (Future)	Slag	Ingestion Dermal Inhalation	CT	3.6E-01	B.1.9.CT	1.1E-06	B.2.9.CT
			RME	2.0E+00	B.1.9.RME	6.9E-06	B.2.9.RME
Construction/ Utility Worker (Future)	Soil and Slag	Ingestion Dermal Inhalation	CT	4.8E-02	B.1.10.CT	2.1E-08	B.2.10.CT
			RME	1.7E-01	B.1.10.RME	6.3E-08	B.2.10.RME
Construction/ Utility Worker (Future)	Soil	Ingestion Dermal Inhalation	CT	2.3E-02	B.1.11.CT	1.8E-08	B.2.11.CT
			RME	1.3E-01	B.1.11.RME	4.4E-08	B.2.11.RME
Construction/ Utility Worker (Future)	Slag	Ingestion Dermal Inhalation	CT	6.9-02	B.1.12.CT	1.9E-08	B.2.12.CT
			RME	5.1E-01	B.1.12.RME	7.3E-08	B.2.12.RME
Construction/ Utility Worker (Future)	Ground water	Ingestion Dermal	CT	3.8E-03	B.1.13.CT	1.5E-09	B.2.13.CT
			RME	2.7E-02	B.1.13.RME	7.2E-09	B.2.13.RME
Maintenance Worker (Current)	Surface Water	Ingestion Dermal	CT	2.5E-03	B.1.14.CT	4.9E-09	B.2.14.CT
			RME	1.5E-02	B.1.14.RME	6.3E-08	B.2.14.RME
Trespasser (Current/ Future)	Surface Water	Ingestion Dermal	CT	1.4E-01	B.1.15.CT	3.3E-07	B.2.15.CT
			RME	8.8E-01	B.1.15.RME	1.5E-06	B.2.15.RME
Industrial/ Commercial (Future)	Surface Water	Ingestion Dermal	CT	6.8E-02	B.1.16.CT	1.3E-07	B.2.16.CT
			RME	2.4E-01	B.1.16.RME	9.8E-07	B.2.16.RME
Construction/ Utility Worker (Future)	Surface Water	Ingestion Dermal	CT	6.2E-03	B.1.17.CT	1.4E-09	B.2.17.CT
			RME	3.9E-02	B.1.17.RME	6.3E-09	B.2.17.RME
Maintenance Worker (Current)	Sediment	Ingestion Dermal	CT	3.2E-03	B.1.18.CT	4.9E-08	B.2.18.CT
			RME	1.2E-02	B.1.18.RME	5.4E-07	B.2.18.RME
Trespasser (Current/ Future)	Sediment	Ingestion Dermal	CT	7.3E-02	B.1.19.CT	7.5E-07	B.2.19.CT
			RME	5.3E-01	B.1.19.RME	3.0E-06	B.2.19.RME
Industrial/ Commercial (Future)	Sediment	Ingestion Dermal	CT	8.9E-02	B.1.20.CT	1.3E-06	B.2.20.CT
			RME	1.8E-01	B.1.20.RME	8.4E-06	B.2.20.RME
Construction/ Utility Worker (Future)	Sediment	Ingestion Dermal	CT	1.3E-02	B.1.21.CT	2.3E-08	B.2.21.CT
			RME	4.3E-02	B.1.21.RME	8.1E-08	B.2.21.RME

5.4 SUMMATION OF RISKS

A given human population may be exposed to a chemical by several exposure routes and through more than one medium. The purpose of this section is to identify the risks associated with a population that may be exposed to Site COPCs through a combination of exposure pathways.

USEPA (1989) states that risks should be combined across exposure pathways only where the following situation occurs:

a) reasonable exposure pathway combinations are identified; and

b) it appears likely that the same individuals would consistently face the "reasonable maximum exposure" (RME) through more than one pathway.

Instead of encouraging the calculation of combined risks from across exposure pathways, USEPA (1989) cautions that each RME estimate includes many conservative assumptions and that combining estimates is not appropriate unless the combination itself is a RME:

> *"For real world situations in which contaminant concentrations vary over time and space, the same individual may or may not experience the RME for more than one pathway over the same period of time. One individual might face the RME through one pathway, and a different individual face the RME through a different pathway. Only if you can explain why the key RME assumptions for more than one pathway apply to the same individual or sub-population should the RME risks for more than one pathway be combined.*
>
> *In some situations, it may be appropriate to combine one pathway's RME risks with other pathways' risk estimates that have been derived from more typical exposure parameter values". [Emphasis added].*

It is improbable that the same person would experience all potential exposures associated with the study area or even over the periods of years specified in the individual RME scenarios. As a result, it is considered inappropriate to add together the estimated risks and hazards for the different exposure routes and pathways, because this would result in the exaggeration of an appropriate RME for the summed exposures. The summation of the CT estimates is likely the more appropriate representation of a cumulative maximum exposure. However, where appropriate and for completeness, both cumulative CT and RME risks and hazards from separate exposure routes and media were combined to estimate total CT and RME exposures.

The cumulative HIs and lifetime cancer risks across all applicable exposure routes for receptors on Site are presented in Appendix B and summarized below.

Receptor	Media	Exposure	Cumulative Non-Carcinogenic Hazard Index	Cumulative Carcinogenic Risk	Appendix Table Reference
Maintenance Worker (Current)	Surface Soil and Slag, Surface Water, Sediment	CT	1.7E-02	9.4E-08	B.3.1.CT
		RME	1.0E-01	1.3E-06	B.3.1.RME
Maintenance Worker (Current)	Surface Soil, Surface Water, Sediment	CT	1.2E-02	9.2E-08	B.3.1.CT
		RME	7.6E-02	9.2E-07	B.3.1.RME
Maintenance Worker (Current)	Surface Slag, Surface Water, Sediment	CT	3.0E-02	8.2E-08	B.3.1.CT
		RME	2.5E-01	1.2E-06	B.3.1.RME
Trespasser (Current/Future)	Surface Soil and Slag, Surface Water, Sediment	CT	3.2E-01	1.7E-06	B.3.2.CT
		RME	2.0E+00	8.7E-06	B.3.2.RME
Trespasser (Current/Future)	Surface Soil, Surface Water, Sediment	CT	2.5E-01	1.7E-06	B.3.2.CT
		RME	1.6E+00	6.4E-06	B.3.2.RME
Trespasser (Current/Future)	Surface Slag, Surface Water, Sediment	CT	4.8E-01	1.5E-06	B.3.2.CT
		RME	3.9E+00	7.8E-06	B.3.2.RME
Industrial/ Commercial Worker (Future)	Soil and Slag	CT	4.2E-01	2.6E-06	B.3.3.CT
		RME	1.2E+00	1.6E-05	B.3.3.RME
Industrial/ Commercial Worker (Future)	Soil	CT	2.8E-01	2.5E-06	B.3.3.CT
		RME	8.8E-01	1.4E-05	B.3.3.RME
Industrial/ Commercial Worker (Future)	Slag	CT	5.1E-01	2.6E-06	B.3.3.CT
		RME	2.4E+00	1.6E-05	B.3.3.RME
Construction/Utility Worker (Future)	Soil and Slag	CT	7.1E-02	4.5E-08	B.3.4.CT
		RME	2.8E-01	1.5E-07	B.3.4.RME
Construction/Utility Worker (Future)	Soil	CT	4.6E-02	4.2E-08	B.3.4.CT
		RME	2.3E-01	1.3E-07	B.3.4.RME
Construction/Utility Worker (Future)	Slag	CT	9.3-02	4.3E-08	B.3.4.CT
		RME	6.1E-01	1.6E-07	B.3.4.RME

5.5 RISK AND HAZARD COPC CONTRIBUTIONS

The contribution to total risk and hazard of each COPC for a specific combined exposure scenario varies, depending on the COPC exposure point concentration and relative toxicity. Frequently, most of the risk estimated for an exposure scenario can be attributed to a few COPCs. The following sub-sections present a summary of the COPCs contributing the majority of risk and/or hazard at the Site.

Current/Future Trespasser

Table 5.1 presents the COPCs contributing the majority of the combined hazard for the RME current/future trespasser exposure to surface soil and slag, surface soil, and slag, through ingestion, dermal contact, and inhalation at the Site. The RME cumulative HI for surface soil and slag, surface soil, and slag, were 2.0, 1.6, and 3.9, respectively. No single compound accounts for more than 10 percent of the cumulative HI.

Future Industrial/Commercial Worker

Table 5.2 presents the COPCs contributing the majority of the combined hazard for the RME future industrial/commercial worker exposure to surface soil and slag, surface soil, and slag, through ingestion, dermal contact, and inhalation. The RME cumulative HI for surface soil and slag, surface soil, and slag, was 1.21, 0.88, and 2.43, respectively. No single compound accounts for more than 10 percent of the cumulative HI.

5.6 HAZARD ASSESSMENT FOR LEAD EXPOSURES

5.6.1 ADULT LEAD RESULTS

Lead was identified as a COPC in surface soil and slag, slag and surface water in current/future receptors; soil and slag, soil, slag and groundwater in future receptors. Pathways considered for exposure to lead were maintenance worker incidental ingestion and dermal contact of surface soil and slag, maintenance worker incidental ingestion and dermal contact of surface slag, and maintenance worker incidental ingestion and dermal contact of surface water; trespasser incidental ingestion and dermal contact of surface soil and slag, trespasser incidental ingestion and dermal contact of surface slag, and trespasser incidental ingestion and dermal contact of surface water; industrial/commercial worker incidental ingestion and dermal contact of soil and slag, industrial/commercial worker incidental ingestion and dermal contact of soil, industrial/commercial worker incidental ingestion and dermal contact of slag, and industrial/commercial worker incidental ingestion and dermal contact of surface water; construction/utility worker incidental ingestion and dermal contact of soil and slag, construction/utility worker incidental ingestion and dermal contact of soil, construction/utility worker incidental ingestion and dermal contact of slag, and construction/utility worker incidental ingestion and dermal contact of groundwater. The RME surface soil and slag lead concentration for maintenance workers was 309 µg/g. The slag lead RME concentration for maintenance workers was 1,221 µg/g and the surface water lead RME concentration was 184 µg/L. The RME surface soil and

slag lead concentration for trespassers was 309 μg/g. The slag lead RME concentration for trespassers was 1,221 μg/g and the surface water lead RME concentration was 184 μg/L. The RME soil and slag, soil, and slag lead concentration for industrial/commercial workers were 81.6 μg/g, 226 μg/g, and 133 μg/g, respectively. The RME surface water lead concentration for industrial/commercial workers was 184 μg/L. The RME soil and slag, soil, and slag lead concentration for construction/utility workers were 81.6 μg/g, 226 μg/g, and 133 μg/g, respectively. Groundwater lead concentration was 61.2 μg/L for the construction/utility workers.

The estimated 95th percentile for fetal blood lead levels for female for maintenance worker exposure to lead in surface soil, slag, and surface water; surface water; and slag and surface water, presented in Table 3.24, were 5.77, 5.58, and 6.31 μg/dL, respectively. Based on the TRW recommended fetal blood lead of 10 μg/dL, the hazard indices (HI) for maintenance workers are 0.58, 0.56, and 0.63, respectively.

The estimated 95th percentile for fetal blood lead levels for female adolescent trespasser exposure to lead in surface soil, slag, and surface water; surface water; and slag and surface water, presented in Table 3.25, were 7.11, 5.65, and 11.43 μg/dL, respectively. Based on the TRW recommended fetal blood lead of 10 μg/dL, the hazard indices (HI) for trespassers are 0.71, 0.57, and 1.1, respectively.

The estimated 95th percentile for fetal blood levels for female adult industrial/ commercial worker exposure to lead in soil and slag, soil, and slag, (combined with lead exposure in surface water), presented in Table 3.26 were 6.47, 7.81, and 6.95 μg/dL, respectively. Based on the TRW recommended fetal blood lead of 10 μg/dL, the hazard indices (HI) for industrial/commercial workers are 0.65, 0.78, and 0.7, respectively.

The 95th percentile for fetal blood lead levels estimated for female adult construction/ utility worker exposure to lead in soil and slag, soil, and slag (combined with lead exposure in groundwater) presented in Table 3.27 were 5.79, 6.14, and 5.91 μg/dL, respectively. Based on the TRW recommended fetal blood lead level of 10 μg/dL, the hazard indices (HI) for future construction/utility workers were 0.58, 0.61, and 0.59, respectively.

5.7 UNCERTAINTY ANALYSIS

The purpose of this section is to provide a summary and discussion regarding the uncertainties associated with the HHRA evaluation. The various uncertainties are discussed below in the following sections.

5.7.1 SAMPLING PROCEDURE BIAS

The sampling strategy is a factor that impacts the health evaluation for chemicals at the Site. Often in the sampling procedures, samples are taken from locations that are visibly contaminated or where contamination would be expected and not from areas of the Site that are potentially uncontaminated. This creates a sampling bias toward worst-case (higher) exposure point concentrations in the media sampled. The utilization of such biased data in the HHRA increases the conservative or health-protective nature of the health risk and hazard assessment.

The data used to estimate CT and RME scenarios for the Site were, primarily, collected in such a biased manner. The groundwater and soil samples were collected from known historic areas of known contamination, and should represent the highest COPC concentrations. Sampling rounds usually focussed on additional characterization of the more heavily contaminated areas, thus introducing a high bias in both CT and RME scenarios.

5.7.2 EXPOSURE SCENARIO ASSUMPTIONS

This section evaluates the uncertainty associated with the primary exposure scenario assumptions such as land use and frequency of exposure. Because the assumptions used in the scenarios are often not objectively based but rather are subjective estimates based on judgment, conservatism, and experience applied to available data, the tendency is to select conservative, health-protective values to guard against under-estimating exposure (and associated risks). This leads to a general over-estimation of exposure. When each individual exposure is over-estimated, the net effect is compounded. That is, the total exposure is over-estimated to an even greater degree than the individual exposures. Exposure scenarios are, therefore, conservative in nature, and thereby provide the necessary safety factor for protection of human health. It is very likely that the calculated exposure concentrations are greater than the actual exposure concentrations.

The intent of the HHRA was to estimate the potential point exposures for both the "average" [Central Tendency (CT) or Mean] and the reasonable maximum exposure (RME) exposure scenarios. In order to accomplish this goal, a series of standardized USEPA exposure assumptions were utilized, where available and applicable. In the absence of available or applicable exposure assumptions, professional judgment was used to establish necessary assumptions protective of human health. The CT exposure

scenario represents an "average" exposure scenario that is reasonably expected to occur. The RME scenario represents the reasonable maximum exposure expected to occur. The exposure scenarios (CT and RME) were developed to evaluate possible risk under both current and future land use conditions.

The major uncertainties regarding the physical exposure scenarios used in the HHRA are summarized as follows:

i) Because of limited data for most chemicals in the surface soil, the mean values (for CT) and the maximum reported values (for RME) have been used as point concentrations to estimate exposures to the trespasser population. Although the use of maximum values is generally recognized as an appropriate conservative screening approach, it should be recognized that this procedure will likely overestimate actual exposure by orders of magnitude. Use of maximum detected COPC concentrations in other exposure scenarios will lead to similar overestimates.

ii) The actual frequency of trespassing entry to the Site is unknown. As a result, USEPA default values and professional judgment were used to conservatively estimate media exposure on Site.

iii) Long-term exposure point concentrations are inherently uncertain because COPC concentrations are assumed to remain constant over time. The assumptions that the measured concentrations are equivalent during sampling and exposure over the duration of exposure will overestimate the intake and resulting risk.

iv) For most COPCs, the HHRA assumed that 100 percent absorption occurs after oral ingestion. Actual absorption rates from ingested contaminants may vary from 5 to 100 percent due to the tendency for strong adsorption of the COPCs to the ingested soil and sediment, which would reduce or prevent uptake into the body. Thus, assumption of 100 percent absorption of ingested COPCs overestimates the associated risks.

5.7.3 DOSE RESPONSE

One of the major uncertainties in estimating Site-specific risk is the application of published toxicity information. Factors introducing uncertainty associated with toxicity value application are as follows:

i) Applicability of animal toxicity data - chemicals may be assumed to be human carcinogens based on animal studies even when there is limited or no available evidence that the chemical is a human carcinogen.

ii) Differences in chemical concentrations - CSFs are derived from high concentration animal studies and therefore may not be applicable to low concentration exposures.

iii) Assumptions in toxicity values - CSFs are developed in a conservative manner.

iv) Assumptions in toxicity values (Non-carcinogenic Hazard) - RfDs are also established with conservative safety factors compared to actual studies.

5.7.4 THEORETICAL NATURE OF RISK ESTIMATES

A human health risk assessment assigns a numerical value to the excess probability (above background cancer rates) of a case of cancer developing in a population exposed to a specified amount of chemical that is a known or suspect carcinogen. This numerical value is presented as an upper limit excess cancer risk such as 1.0E-05, or one additional cancer case in a one hundred thousand people exposed to the chemical and at the specific chemical concentration for their entire lifetime, which is assumed to be 70 years. The model that is applied to calculate this numerical risk value is intentionally biased to give a high value so the true value would be lower. The Cancer Risk Model and the assumptions used to estimate exposure are protective of the most sensitive populations. The true risk is expected to be lower than that calculated, and may quite reasonably be zero. Thus risk estimates are overestimated by the HHRA methodology itself.

5.7.5 SYNERGISTIC, ADDITIVE, AND ANTAGONISTIC EFFECTS

Receptor exposure to a mixture of chemicals can in some cases lead to synergistic, additive, or antagonistic health effects. Synergistic effects occur when chemicals interact in the receptor and cause an effect significantly greater than the sum of effects of the individual chemicals. There is no apparent scientific basis to suspect that the COPCs identified at the Site will have synergistic effects. Potential synergistic effects were not evaluated in the HHRA, and thus if these are occurring, then the calculated risks and hazards may be underestimated. Alternatively, chemicals may interact in the receptor in such a way as to cause an overall effect that is less than the sum of effects of the individual chemicals. These potential antagonistic effects were not evaluated in the HHRA, and thus, if they are occurring, the calculated risks and hazards may be overestimated.

It was assumed in the HHRA that carcinogenic and non-carcinogenic effects were additive, such that individual chemical cancer risks and non-carcinogenic hazards were added to obtain a total risk and hazard estimate. All compounds were treated as if they all affect the receptor in a similar manner although if each COPC had a different mode of action, then the resulting risks would presumably be non-additive. For a conservative assessment, the potential carcinogenic risk and non-carcinogenic hazard ratios for each COPC were added to yield a total risk or hazard. Although the carcinogenic risks and non-carcinogenic hazards for individual chemicals were summed, there is no basis to suspect the toxic effects are additive. This suggests that the total calculated risks and hazards estimated for the potential Site receptors may be higher than will actually occur.

6.0 REFERENCES

Conestoga-Rovers & Associates (CRA), 2003. *Phase I Work Plan, Operable Unit 3.* Vanadium Corporation of America, Niagara Falls, New York. Dated September 2003.

Conestoga-Rovers & Associates (CRA), 2004a. *Phase II Work Plan, Operable Unit 3.* Vanadium Corporation of America, Niagara Falls, New York. Dated November 2004.

Conestoga-Rovers & Associates (CRA), 2004b. *Phase I Letter Report.* Vanadium Corporation of America, Niagara Falls, New York. Dated August 6, 2004.

Golder Associates, Inc. (Golder), 2001. *Delineation of Surface Water Bodies, Wetlands, and Ecological Receptors at the Former Vanadium Corporation of America Site.* Town of Niagara, New York. New York Hazardous Waste Disposal Site No. 932001. Operable Unit #3. Dated December 2001.

Health Effects Assessment Summary Tables (HEAST), 1997. United States Environmental Protection Agency. Dated July 1, 1997.

New York State Department of Environmental Conservation (NYSDEC), 2002. *Draft DER-10, Technical Guidance for Site Investigation and Remediation.* Dated December 25, 2002.

New York State Department of Environmental Conservation (NYSDEC), 2001. *IIWA Report.* Niagara Mohawk Right of Way Site. Town of Niagara, Niagara County. Dated February 2001.

New York State Department of Environmental Conservation (NYSDEC), 1997. *Immediate Investigative Work Assignment (IIWA).* Vanadium Corporation of America Site #932001. Operable Unit No. 3. Dated August 1997.

New York State Department of Environmental Conservation (NYSDEC), 1994. *Determination of Soil Cleanup Objectives and Cleanup Levels.* Technical and Administrative Guidance Memorandum #4046. Dated January 24, 1994.

New York State Department of Environmental Conservation (NYSDEC), 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. Dated June 1998.

New York State Department of Health (NYSDOH), 2004. *NYCRR Title 10, Part 5 – Drinking Water Supplies, Subpart 5-1 – Public Water Systems, Maximum Contaminant Levels (MCLs).* Dated May 26, 2004.

United States Environmental Protection Agency (USEPA), 1989. *Risk Assessment Guidance for Superfund (RAGS) Interim Final, Part (A).* Dated December 1989.

United States Environmental Protection Agency (USEPA), 1991a. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Supplemental Guidance, "Standard Default Exposure Factors", Interim Final.* OSWER Directive 9285.6-03. Dated March 25, 1991.

United States Environmental Protection Agency (USEPA), 1991b. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals), Interim.* Publication 9285.7-01D. Dated December 1991.

United States Environmental Protection Agency (USEPA), 1997. *Exposure Factors Handbook.* EPA/600/P-95/002F. Dated August 1997.

United States Environmental Protection Agency (USEPA), 1998a. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments), Interim.* Publication 9285.7-01D. Dated January 1998.

United States Environmental Protection Agency (USEPA), 1998b. *Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.* Office of Solid Waste and Emergency Response. OSWER Directive No. 9200.4-27P. Dated August 1998.

United States Environmental Protection Agency (USEPA), 2002a. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites.* OSWER 9355.4-24. Dated December 2002.

United States Environmental Protection Agency (USEPA), 2002b. *Blood Lead Concentrations of US Adult Females: Summary Statistics from Phase I and 2 of the National Health and Nutrition Evaluation Survey (NHANES III).* Office of Solid Waste and Emergency Response. OSWER 9285.7-52. Dated March 2002.

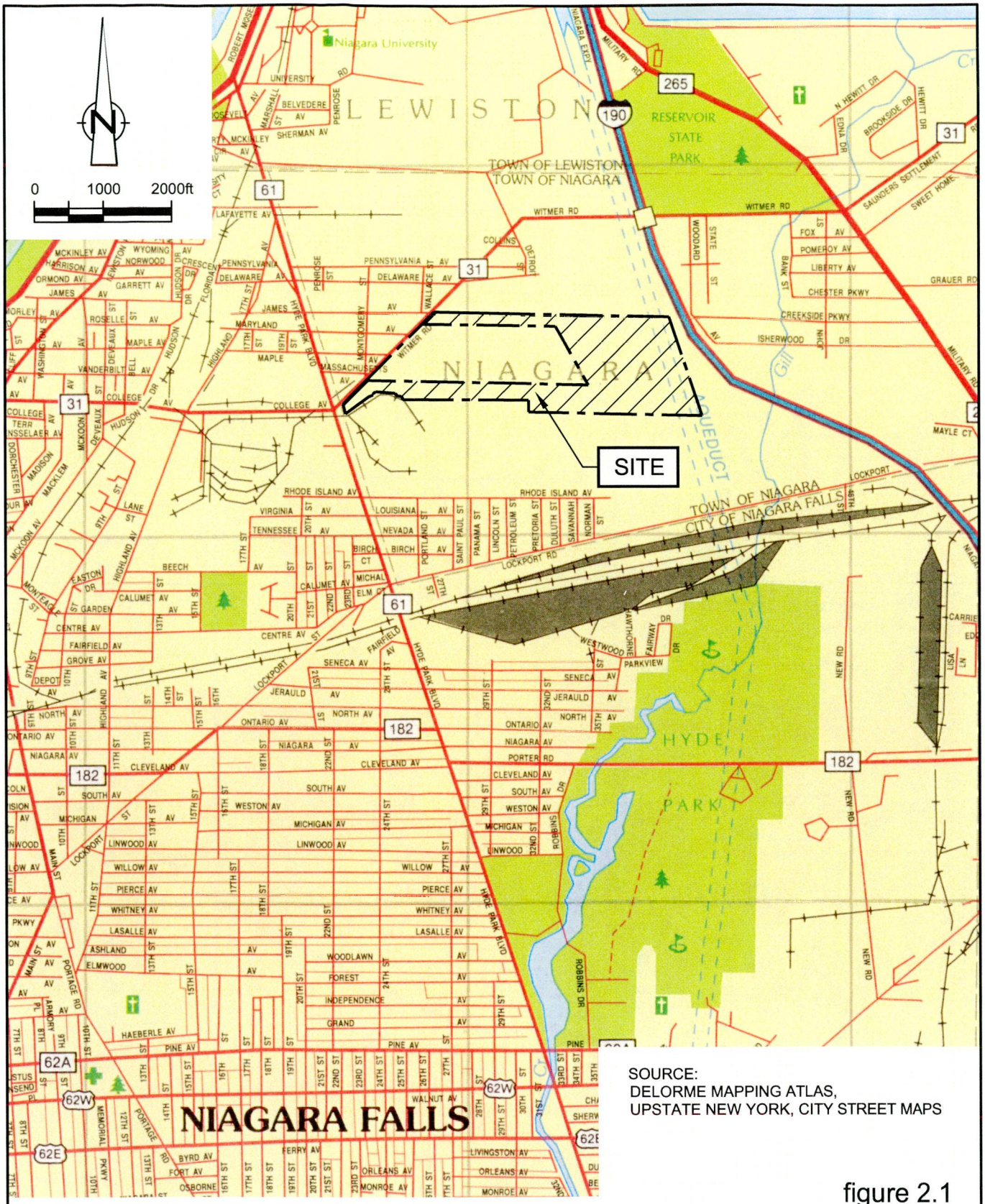
United States Environmental Protection Agency (USEPA), 2003. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. Dated January 2003.

United States Environmental Protection Agency (USEPA), 2004a. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).* Dated July 2004.

United States Environmental Protection Agency (USEPA), 2004b. *Integrated Risk Information System.* Available at: www.epa.gov/iris. Dated November 10, 2004.

United States Environmental Protection Agency – Region III (USEPA-III), 2004. *Risk-Based Concentrations (R3-RBC) Tables.* Available at: http://www.epa.gov/reg3hwmd/risk/human/index.htm. Dated October 2004.

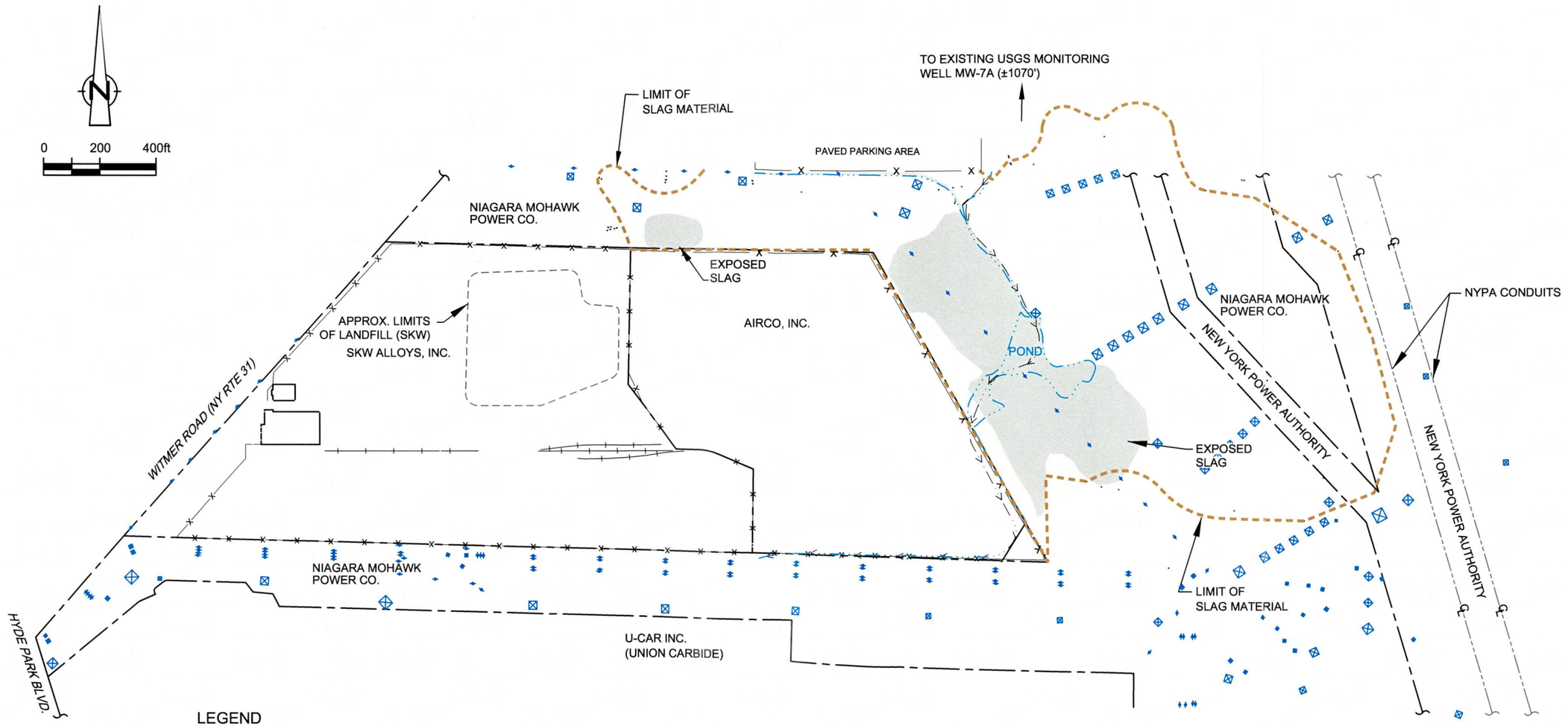
United States Environmental Protection Agency – Region IX (USEPA-IX), 2004. *Preliminary Remediation Goals (R9-PRGs) Tables.* Available at: . http://www.epa.gov/Region9/waste/sfund/prg/files/04prgtable.pdf. Dated October 2004.



SOURCE:
DELORME MAPPING ATLAS,
UPSTATE NEW YORK, CITY STREET MAPS

figure 2.1

SITE LOCATION
HUMAN HEALTH RISK ASSESSMENT
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY



NOTES:

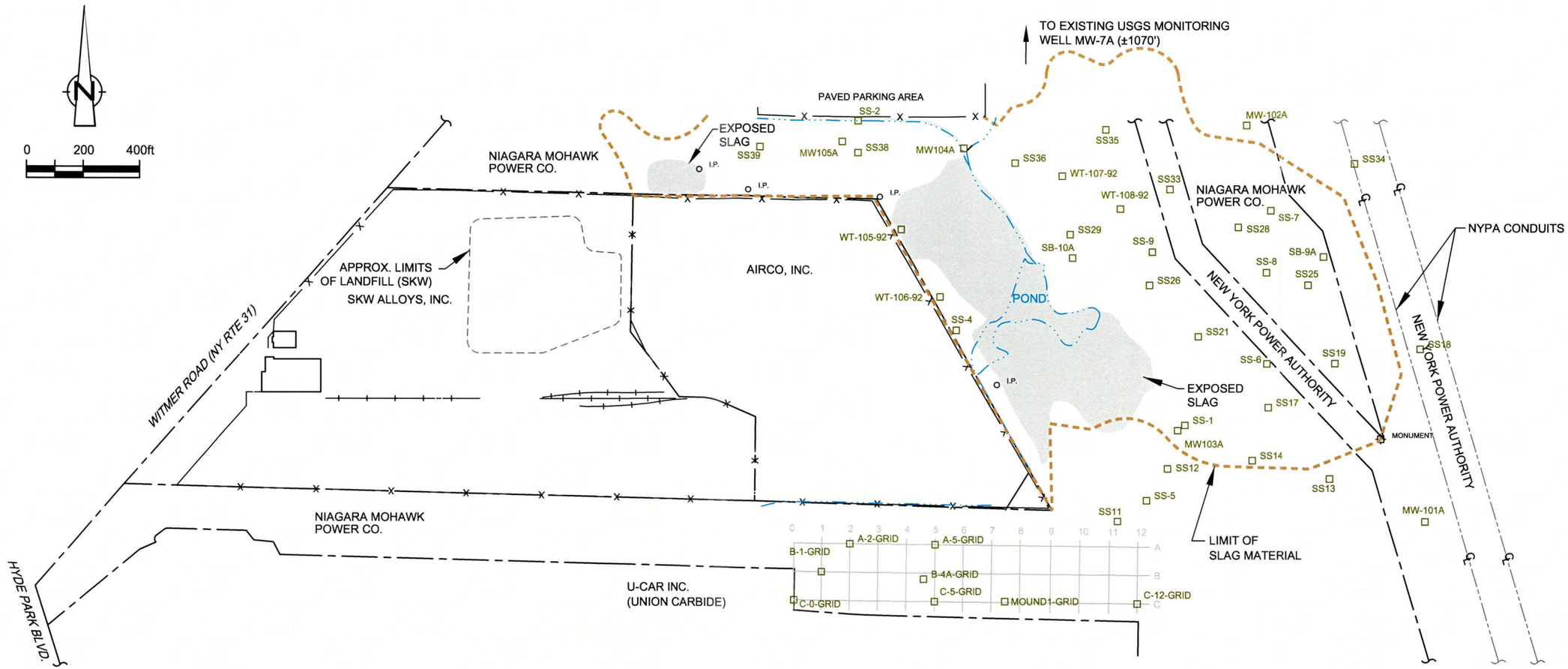
1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

SOURCE:

NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

figure 2.2

SITE PLAN
HUMAN HEALTH RISK ASSESSMENT
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY



LEGEND

- PROPERTY LINE
- FENCE
- RAILROAD
- NYPA — NEW YORK POWER AUTHORITY
- LIMIT OF SLAG MATERIAL (CRA, 2003/04)
- GRID FOR PUSH PROBE SOIL BORING LOCATIONS (TOTAL OF 43 PUSH PROBE SOIL BORING LOCATIONS)
- MW-7B — SURFACE SOIL SAMPLING LOCATION

SOURCE:

NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

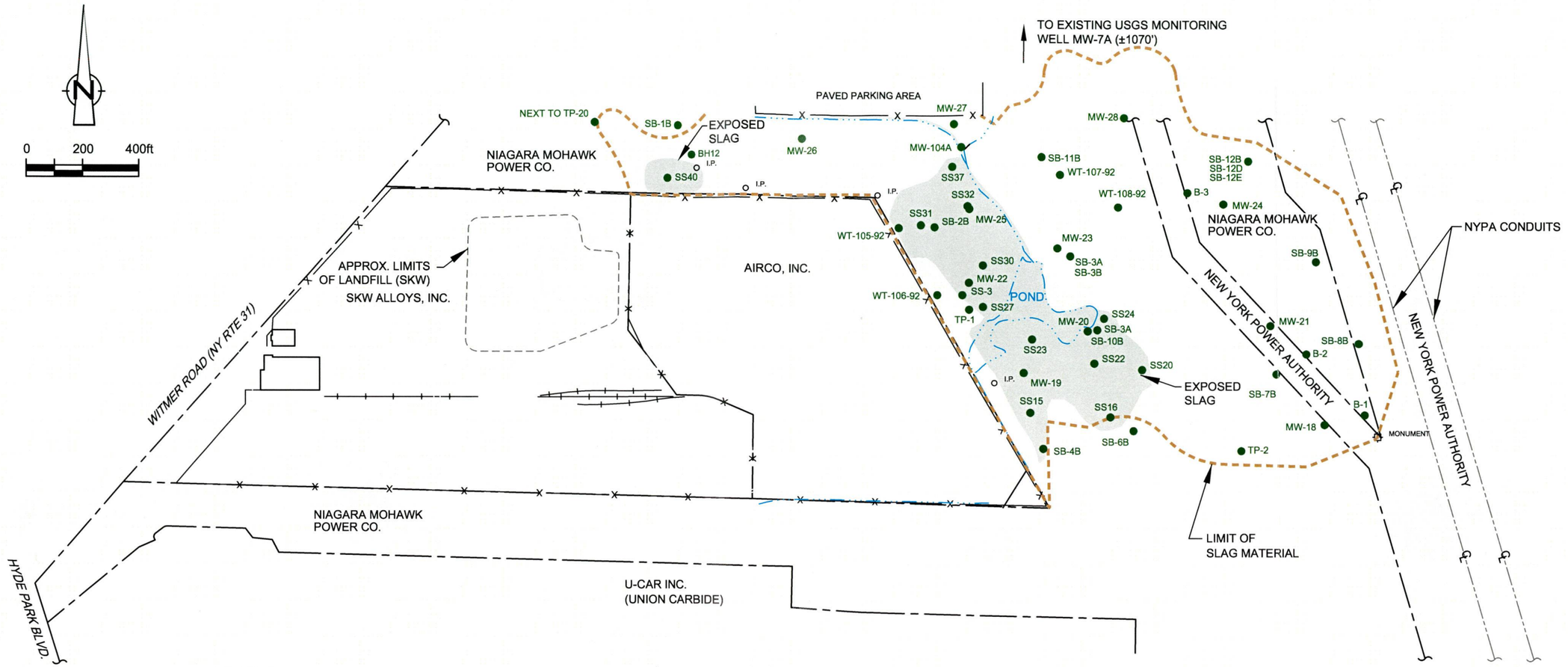
NOTES:

1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

figure 2.3

SURFACE SOIL SAMPLE LOCATIONS HUMAN HEALTH RISK ASSESSMENT VANADIUM CORPORATION OF AMERICA SITE

Niagara Falls, NY



LEGEND

- PROPERTY LINE
- FENCE
- RAILROAD
- NYPA — NEW YORK POWER AUTHORITY
- LIMIT OF SLAG MATERIAL (CRA, 2003/04)
- MW-7B — SLAG SAMPLING LOCATION

SOURCE:

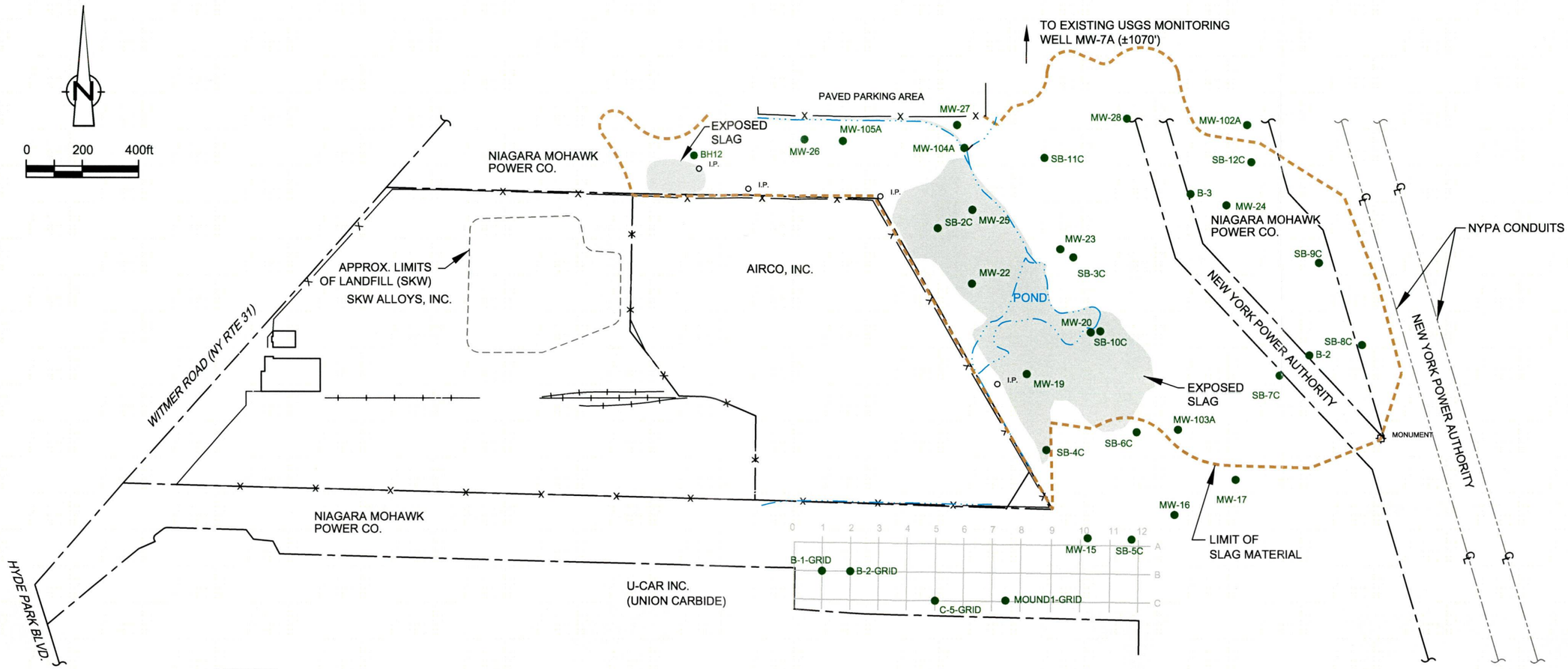
NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

NOTES:

1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

figure 2.4

SLAG MATERIAL SAMPLE LOCATIONS
HUMAN HEALTH RISK ASSESSMENT
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY



LEGEND

- PROPERTY LINE
- FENCE
- RAILROAD
- NYPA — NEW YORK POWER AUTHORITY
- LIMIT OF SLAG MATERIAL (CRA, 2003/04)
- GRID FOR PUSH PROBE SOIL BORING LOCATIONS (TOTAL OF 43 PUSH PROBE SOIL BORING LOCATIONS)
- MW-7B — SUBSURFACE SOIL SAMPLING LOCATION

SOURCE:

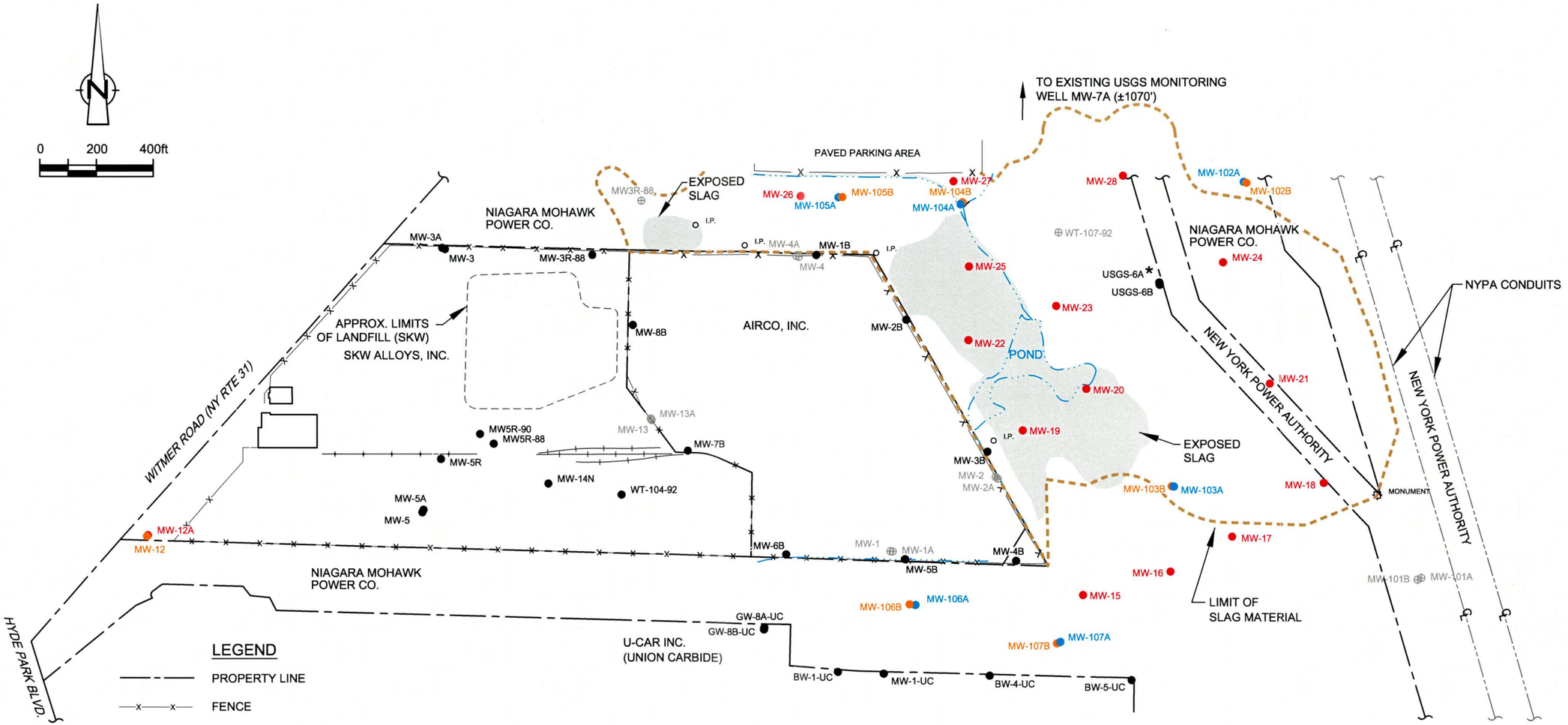
NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

NOTES:

1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

figure 2.5

SUBSURFACE SOIL SAMPLE LOCATIONS
HUMAN HEALTH RISK ASSESSMENT
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY



NOTES:

1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

SOURCE:

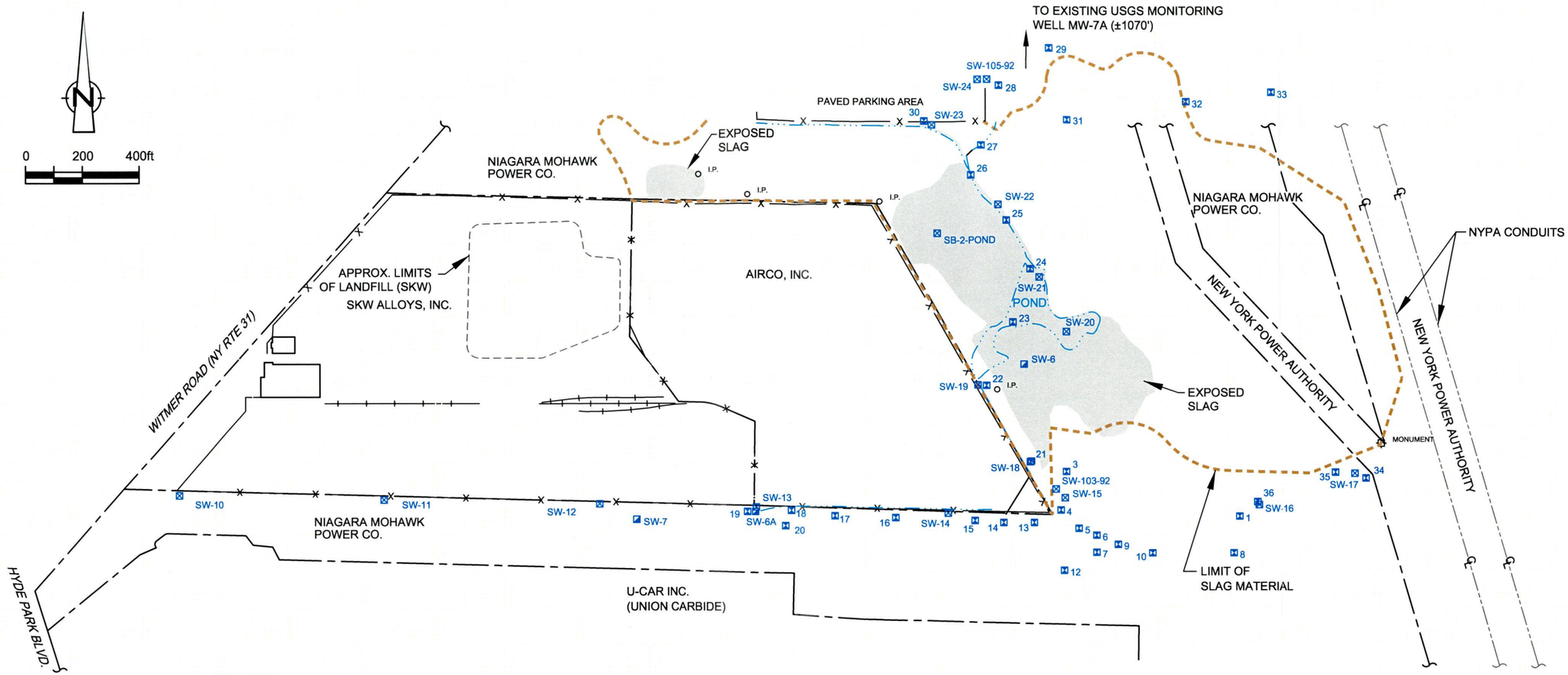
NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

figure 2.6

GROUNDWATER SAMPLE LOCATIONS HUMAN HEALTH RISK ASSESSMENT VANADIUM CORPORATION OF AMERICA SITE

Niagara Falls, NY

19867-00(005)GN-WA008 JAN 11/2005



LEGEND

- PROPERTY LINE
- FENCE
- RAILROAD
- NYPA — NEW YORK POWER AUTHORITY
- LIMIT OF SLAG MATERIAL (CRA, 2003/04)
- SW-15 — SURFACE WATER/SEDIMENT SAMPLING LOCATION
- 19 — SURFACE WATER SAMPLING FOR PH ONLY (1998)
- SW-7 — SURFACE WATER SAMPLING LOCATION ONLY

SOURCE:

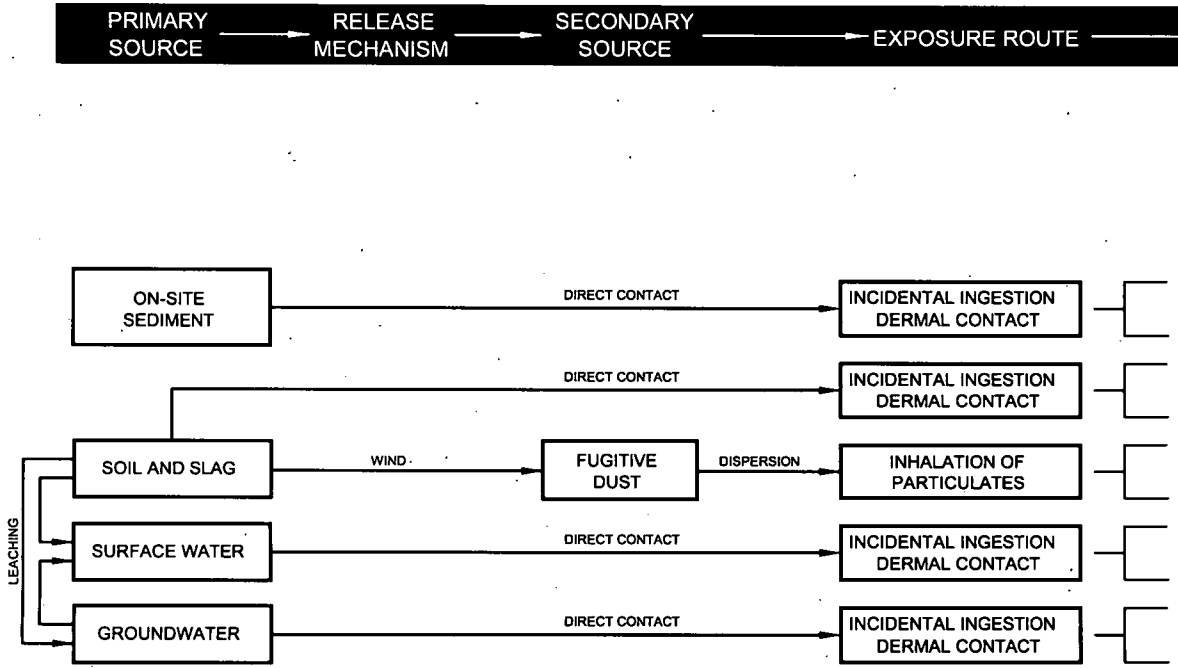
NIAGARA MOHAWK POWER CORPORATION, VANADIUM CORPORATION OF AMERICA SITE, NIAGARA FALLS, NY. FIGURES 1, 2 AND 3, BBL ENGINEERS & SCIENTISTS. 12/8/2000

NOTES:

1. BASE MAP DIGITIZED FROM 'VANADIUM SITE NO. 932001' PROVIDED BY LU ENGINEERS, 2230 PENFIELD RD., PENFIELD, NY, (716) 377-1450. MAP DATA DIGITIZED FROM 'SITE PLAN AND SAMPLING LOCATION' PREPARED BY ABB ENVIRONMENTAL.
2. SITE FEATURES AND SAMPLE LOCATIONS ARE APPROXIMATE.

figure 2.7

SURFACE WATER/SEDIMENT SAMPLE LOCATIONS
HUMAN HEALTH RISK ASSESSMENT
VANADIUM CORPORATION OF AMERICA SITE
Niagara Falls, NY



POTENTIALLY EXPOSED RECEPTORS			
ON - SITE			
TRESPASSERS	WORKERS		
	MAINTENANCE	INDUSTRIAL/COMMERCIAL	CONSTRUCTION/UTILITY
●	●	●	●
●	●	●	●
●	●	●	●
●	●	●	●
–	–	–	●

LEGEND

● POTENTIALLY COMPLETE EXPOSURE PATHWAY

– INCOMPLETE EXPOSURE PATHWAY

figure 2.8

CONCEPTUAL SITE MODEL
HUMAN HEALTH RISK ASSESSMENT
VANADIUM CORPORATION OF AMERICA
Niagara Falls, New York

TABLE 2.1

SELECTION OF EXPOSURE PATHWAY SCENARIOS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe	*Medium*	*Exposure Medium*	*Exposure Point*	*Receptor Population*	*Receptor Age*	*Exposure Route*	*Type of Analysis*	*Rationale for Selection or Exclusion of Exposure Pathway*
Current	Surface Soil and Slag	Surface Soil	Direct Contact	Maintenance Worker	Adult	Ingestion Dermal Inhalation	Quant	Potential exposure to contaminated surface soil and slag while doing maintenance work.
	Surface Soil	Surface Soil	Direct Contact	Maintenance Worker	Adult	Ingestion Dermal Inhalation	Quant	Potential exposure to contaminated surface soil while doing maintenance work.
	Slag	Surface Soil	Direct Contact	Maintenance Worker	Adult	Ingestion Dermal Inhalation	Quant	Potential exposure to contaminated slag while doing maintenance work.
	Surface Water	Surface Water	Direct Contact	Maintenance Worker	Adult	Ingestion Dermal	Quant	Potential exposure to contaminated surface water while doing maintenance work.
	Sediment	Sediment	Direct Contact	Maintenance Worker	Adult	Ingestion Dermal	Quant	Potential exposure to contaminated sediment while doing maintenance work.

TABLE 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL AND SLAG - CURRENT/FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal and inhalation

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	5030	*	113000		mg/kg	SS-3 (slag; 11/07/96)	57/57	–	113000	–	78000	76000	76000	N	N/A	N/A	X	ASC
7440-36-0	Antimony	1.7	N	339		mg/kg	SB-3A (slag; 11/07/96)	18/38	0.893 - 7.2	339	–	31	31	31	N	N/A	N/A	X	ASC
7440-38-2	Arsenic	0.67	B	45.3		mg/kg	SS-16 (0-0.167 ftbgs; slag; 07/18/03)	45/57	0.47 - 2.06	45.3	7.5	0.43	0.39	0.39	C	N/A	N/A	X	ASC
7440-39-3	Barium	27.8		1410	*	mg/kg	Green Surface Waste (11/07/96)	57/57	–	1410	300	5500	5400	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.09	B	3.5		mg/kg	Green Surface Waste (11/07/96)	48/57	0.05 - 1.0	3.5	0.16	160	150	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.0696	J	141		mg/kg	SS-3 (slag; 11/07/96)	37/57	0.17 - 1.67	141	1.0	3900	37	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	2450	*	217000		mg/kg	WT-108-92 (slag; 01/01/89)	39/39	–	217000	–	–	–	–	N	N/A	N/A		NUT
7440-47-3	Chromium	9.0	E	11800		mg/kg	SB-3A (slag; 11/07/96)	55/55	–	11800	10	120000	210	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.15	BN	91.6		mg/kg	WT-108-92 (slag; 01/01/89)	26/54	0.003 - 6.7	91.6	–	230	30	30	N	N/A	N/A	X	ASC
7440-48-4	Cobalt	2.9		536	B	mg/kg	SS-4 (surface soil; 11/07/96)	56/57	0.83	536	30	1600	900	30	C	N/A	N/A	X	ASC
7440-50-8	Copper	3.7	B	5420	E	mg/kg	SS-3 (slag; 11/07/96)	57/57	–	5420	25	3100	3100	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.176	J	0.421	J	mg/kg	SS-17 (0-0.167 ftbgs; surface soil; 07/21/03)	21/31	0.509 - 0.635	0.421	–	1600	1200	1200	N	N/A	N/A		BSC
7439-89-6	Iron	1890		51300		mg/kg	SB-3A (slag; 11/07/96)	57/57	–	51300	2000	23000	23000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	3.6	J	1760		mg/kg	SS-3 (slag; 11/07/96)	57/57	–	1760	–	–	400 (8)	400	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	354		99200		mg/kg	WT-108-92 (slag; 01/01/89)	57/57	–	99200	–	–	–	–	N	N/A	N/A		NUT
7439-96-5	Manganese	134		24400	E*	mg/kg	Green Surface Waste (11/07/96)	57/57	–	24400	–	1600	1800	1600	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0115	J	11.8		mg/kg	B-1-GRID (0-0.25 ftbgs; surface soil; 03/01/00)	34/57	0.04 - 0.14	11.8	0.1	7.8	6.1	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	1.6	B	5160		mg/kg	SB-3A (slag; 11/07/96)	56/57	1.2	5160	13	1600	1600	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	336		8240		mg/kg	Green Surface Waste (11/07/96)	48/57	36.1 - 1000	8240	–	–	–	–	N	N/A	N/A		NUT
7782-49-2	Selenium	0.95	J	26.3		mg/kg	SS-15 (0-0.167 ftbgs; slag; 07/18/03)	32/55	0.943 - 23.4	26.3	2.0	390	390	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.147	J	7.6	N	mg/kg	Green Surface Waste (11/07/96)	33/56	0.23 - 2.0	7.6	–	390	390	390	N	N/A	N/A		BSC
7440-23-5	Sodium	129	B	1090	B	mg/kg	B-1-GRID (0-0.25 ftbgs; surface soil; 03/01/00)	13/57	28.8 - 1000	1090	–	–	–	–	N	N/A	N/A		NUT
7440-28-0	Thallium	0.486	J	31.2		mg/kg	SS-22 (0-0.167 ftbgs; slag; 07/18/03)	24/52	0.27 - 2.3	31.2	–	5.5	5.2	5.2	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	3.9	B	263		mg/kg	SS-20 (0-0.167 ftbgs; slag; 07/18/03)	57/57	–	263	150	78	78	78	N	N/A	N/A	X	ASC
7440-66-6	Zinc	9.7	J	1400		mg/kg	SS-3 (slag; 11/07/96)	55/55	–	1400	20	23000	23000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected from surface soil and slag sampling locations: A-2-GRID, A-5-GRID, B-1-GRID, B-4A-GRID, C-0-GRID, C-5-GRID, C-12-GRID, Green Surface Waste, MOUND1-GRID, MW-101A, MW-102A, MW-103A, MW-104A, MW-105A, SB-3A, SB-9A, SB-10A, SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, SS-7, SS-8, SS-9, SS-10, SS-11, SS-12, SS-13, SS-14, SS-15, SS-16, SS-17, SS-18, SS-19, SS-20, SS-21, SS-22, SS-23, SS-24, SS-25, SS-26, SS-27, SS-28, SS-29 SS-30, SS-31, SS-32, SS-33, SS-34, SS-35, SS-36, SS-37, SS-38, SS-39, SS-40, WT-105-92, WT-106-92, WT-107-92, WT-108-92.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Residential, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Residential, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Residential or R9-PRG Soil Residential value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
– = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
N = Spike sample recovery not within control limits.
* = Duplicate analysis not within control limits.
B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

TABLE 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL - CURRENT/FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal and Inhalation

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	5030	*	49600		mg/kg	Green Surface Waste (11/07/96)	39/39	–	49600	–	78000	76000	76000	N	N/A	N/A		BSC
7440-36-0	Antimony	1.7	BJ, N	64.9		mg/kg	SS-4 (11/07/96)	12/30	0.893 - 7.2	64.9	–	31	31	31	N	N/A	N/A	X	ASC
7440-38-2	Arsenic	0.67	B	21.9	*	mg/kg	SB-10A (11/07/96)	35/39	0.51 - 0.59	21.9	7.5	0.43	0.39	0.39	C	N/A	N/A	X	ASC
7440-39-3	Barium	35.3	B	1410	*	mg/kg	Green Surface Waste (11/07/96)	39/39	–	1410	300	5500	5400	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.09	B	3.5		mg/kg	Green Surface Waste (11/07/96)	36/39	0.05 - 0.28	3.5	0.16	160	150	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.0696	J	4.0		mg/kg	SS-5 (11/07/96)	32/39	0.17 - 0.631	4.0	1.0	3900	37	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	2450	*	74200		mg/kg	SS-26 (0-0.167 ftbgs; 07/18/03)	23/23	–	74200	–	–	–	–	N	N/A	N/A		NUT
7440-47-3	Chromium	9.0	E	2260		mg/kg	SS-4 (11/07/96)	39/39	–	2260	10	120000	210	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.15	BN	24.6		mg/kg	SS-2 (11/07/96)	13/37	1.0 - 6.7	24.6	–	230	30	30	N	N/A	N/A		BSC
7440-48-4	Cobalt	3.4	B	536	B	mg/kg	SS-4 (11/07/96)	38/39	0.83	536	30	1600	900	30	C	N/A	N/A	X	ASC
7440-50-8	Copper	3.7	B	104		mg/kg	B-1-GRID (0-0.25 ftbgs; 03/01/00)	39/39	–	104	25	3100	3100	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.193	J	0.421	J	mg/kg	SS-17 (0-0.167 ftbgs; 07/21/03)	13/19	0.532 - 0.635	0.421	–	1600	1200	1200	N	N/A	N/A		BSC
7439-89-6	Iron	1890		48200	E*	mg/kg	C-5-GRID (0-0.25 ftbgs; 03/01/00)	39/39	–	48200	2000	23000	23000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	6.5	N*	187	*	mg/kg	MW-105A (11/07/96)	39/39	–	187	–	–	400 (8)	400	C	N/A	N/A		BSC
7439-95-4	Magnesium	2780		73100		mg/kg	SS-7 (11/07/96)	39/39	–	73100	–	–	–	–	N	N/A	N/A		NUT
7439-96-5	Manganese	134		24400	E*	mg/kg	Green Surface Waste (11/07/96)	39/39	–	24400	–	1600	1800	1600	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0298	J	11.8		mg/kg	B-1-GRID (0-0.25 ftbgs; 03/01/00)	22/39	0.05 - 0.14	11.8	0.1	7.8	6.1	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	1.6	B	54.1	B	mg/kg	C-5-GRID (0-0.25 ftbgs; 03/01/00)	38/39	1.2	54.1	13	1600	1600	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	558	BE	8240		mg/kg	Green Surface Waste (11/07/96)	34/39	43.3 - 45	8240	–	–	–	–	N	N/A	N/A		NUT
7782-49-2	Selenium	0.95	J	15.9		mg/kg	Green Surface Waste (11/07/96)	18/39	0.943 - 23.1	15.9	2.0	390	390	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.147	J	7.6	N	mg/kg	Green Surface Waste (11/07/96)	20/39	0.24 - 0.943	7.6	–	390	390	390	N	N/A	N/A		BSC
7440-23-5	Sodium	190	B	1090	B	mg/kg	B-1-GRID (0-0.25 ftbgs; 03/01/00)	8/39	28.8 - 150	1090	–	–	–	–	N	N/A	N/A		NUT
7440-28-0	Thallium	0.486	J	18.8		mg/kg	Green Surface Waste (11/07/96)	18/39	0.27 - 2.3	18.8	–	5.5	5.2	5.2	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	3.9	B	71.2		mg/kg	SS-4 (11/07/96)	39/39	–	71.2	150	78	78	78	N	N/A	N/A		BSC
7440-66-6	Zinc	12.7		633	E	mg/kg	C-5-GRID (0-0.25 ftbgs; 03/01/00)	39/39	–	633	20	23000	23000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected from surface soil sampling locations: A-2-GRID, A-5-GRID, B-1-GRID, B-4A-GRID, C-0-GRID, C-5-GRID, C-12-GRID, Green Surface Waste, MOUND1-GRID, MW-101A, MW-102A, MW-103A, MW-104A, MW-105A, SB-9A, SB-10A, SS-1, SS-2, SS-4, SS-5, SS-6, SS-7, SS-8, SS-9, SS-10, SS-11, SS-12, SS-13, SS-14, SS-17, SS-18, SS-19, SS-21, SS-25, SS-26, SS-28, SS-29, SS-33, SS-34, SS-35, SS-36, SS-38, SS-39.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Residential, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Residential, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Residential or R9-PRG Soil Residential value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
– = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
N = Spike sample recovery not within control limits.
* = Duplicate analysis not within control limits.
B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

TABLE 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SLAG - CURRENT/FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal and Inhalation

CAS Number	Chemical	Mininum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	5960		113000		mg/kg	SS-3 (11/07/96)	18/18	--	113000	--	78000	76000	76000	N	N/A	N/A	X	ASC
7440-36-0	Antimony	22.3		339		mg/kg	SB-3A (11/07/96)	6/8	0.98 - 2.2	339	--	31	31	31	N	N/A	N/A	X	ASC
7440-38-2	Arsenic	2.46		45.3		mg/kg	SS-16 (0-0.167 ftbgs; 07/18/03)	10/18	0.47 - 2.06	45.3	7.5	0.43	0.39	0.39	C	N/A	N/A	X	ASC
7440-39-3	Barium	27.8		675		mg/kg	SS-24 (0-0.167 ftbgs; 07/18/03)	18/18	--	675	300	5500	5400	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.186	J	1.1		mg/kg	WT-105-92 (01/01/89)	12/18	0.05 - 1.0	1.1	0.16	160	150	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.191	J	141		mg/kg	SS-3 (11/07/96)	5/18	0.49 - 1.67	141	1.0	3900	37	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	5370		217000		mg/kg	WT-108-92 (01/01/89)	16/16	--	217000	--	--	--	--	N	N/A	N/A		NUT
7440-47-3	Chromium	278		11800		mg/kg	SB-3A (11/07/96)	16/16	--	11800	10	120000	210	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.5		91.6		mg/kg	WT-108-92 (01/01/89)	13/17	0.003 - 5.6	91.6	--	230	30	30	N	N/A	N/A	X	ASC
7440-48-4	Cobalt	2.9		72.3		mg/kg	SB-3A (11/07/96)	18/18	--	72.3	30	1600	900	30	C	N/A	N/A	X	ASC
7440-50-8	Copper	7.0		5420	E	mg/kg	SS-3 (11/07/96)	18/18	--	5420	25	3100	3100	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.176	J	0.309	J	mg/kg	SS-32 (0-0.167 ftbgs; 07/18/03)	8/12	0.509 - 0.587	0.309	--	1600	1200	1200	N	N/A	N/A		BSC
7439-89-6	Iron	2390		51300		mg/kg	SB-3A (11/07/96)	18/18	--	51300	2000	23000	23000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	3.6	J	1760		mg/kg	SS-3 (11/07/96)	18/18	--	1760	--	--	400 (8)	400	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	354		99200		mg/kg	WT-108-92 (01/01/89)	18/18	--	99200	--	--	--	--	N	N/A	N/A		NUT
7439-96-5	Manganese	288		8990		mg/kg	SS-15 (0-0.167 ftbgs; 07/18/03)	18/18	--	8990	--	1600	1800	1600	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0115	J	0.375		mg/kg	SS-40 (0-0.167 ftbgs; 07/18/03)	12/18	0.04 - 0.05	0.375	0.1	7.8	6.1	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	8.6	J	5160		mg/kg	SB-3A (11/07/96)	18/18	--	5160	13	1600	1600	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	336		2730		mg/kg	SS-32 (0-0.167 ftbgs; 07/18/03)	14/18	36.1 - 1000	2730	--	--	--	--	N	N/A	N/A		NUT
7782-49-2	Selenium	2.0		26.3		mg/kg	SS-15 (0-0.167 ftbgs; 07/18/03)	14/16	1	26.3	2.0	390	390	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.215	J	4.38		mg/kg	SS-15 (0-0.167 ftbgs; 07/18/03)	13/17	0.23 - 2.0	4.38	--	390	390	390	N	N/A	N/A		BSC
7440-23-5	Sodium	129	B	836		mg/kg	WT-105-92 (01/01/89)	5/18	29.1 - 1000	836	--	--	--	--	N	N/A	N/A		NUT
7440-28-0	Thallium	0.82	B	31.2		mg/kg	SS-22 (0-0.167 ftbgs; 07/18/03)	6/13	0.64 - 1.26	31.2	--	5.5	5.2	5.2	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	5.4		263		mg/kg	SS-20 (0-0.167 ftbgs; 07/18/03)	18/18	--	263	150	78	78	78	N	N/A	N/A	X	ASC
7440-66-6	Zinc	9.7	J	1400		mg/kg	SS-3 (11/07/96)	16/16	--	1400	20	23000	23000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected from slag sampling locations: SB-3A, SS-3, SS-15, SS-16, SS-20, SS-22, SS-23, SS-24, SS-27, SS-30, SS-32, SS-32, SS-37, SS-40, WT-105-92, WT-106-92, WT-107-92, WT-108-92.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Residential, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Residential, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Residential or R9-PRG Soil Residential value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
-- = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

TABLE 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SOIL AND SLAG - FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal and Inhalation

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	1500		113000		mg/kg	SS-3 (surface slag; 11/07/96)	105/105	–	113000	–	1000000	100000	100000	N	N/A	N/A	X	ASC
7440-36-0	Antimony	1.7	N	339		mg/kg	SB-3A (surface slag; 11/07/96)	44/86	0.893 - 24.2	339	–	410	410	410	N	N/A	N/A		BSC
7440-38-2	Arsenic	0.34	B	70		mg/kg	MW-20 (4.5-6.0 ftbgs; slag; 07/25/03)	85/105	0.47 - 2.06	70	7.5	1.9	1.6	1.6	C	N/A	N/A	X	ASC
7440-39-3	Barium	11.3	J	1410	*	mg/kg	Green Surface Waste (surface soil; 11/07/96)	105/105	–	1410	300	72000	67000	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.06	B	3.5		mg/kg	Green Surface Waste (surface soil; 11/07/96)	86/105	0.05 - 1.0	3.5	0.16	2000	1900	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.0609	J	141		mg/kg	SS-3 (surface slag; 11/07/96)	57/105	0.17 - 1.67	141	1.0	510	450	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	2100	*	249000		mg/kg	MW-18 (2-4 ftbgs; slag; 07/28/03)	68/68	–	249000	–	–	–	–	N	N/A	N/A		NUT
7440-47-3	Chromium	4.9		11800		mg/kg	SB-3A (surface slag; 11/07/96)	103/103	–	11800	10	1500000	450	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.15	BN	430		mg/kg	MW-21 (8-10 ftbgs; slag; 07/28/03)	52/98	0.003 - 6.7	430	–	3100	64	64	N	N/A	N/A	X	ASC
7440-48-4	Cobalt	0.265	J	536	B	mg/kg	SS-4 (surface soil; 11/07/96)	101/105	0.83 - 3.3	536	30	20000	1900	30	C	N/A	N/A	X	ASC
7440-50-8	Copper	2.31	J	5420	E	mg/kg	SS-3 (surface slag; 11/07/96)	104/105	2.47	5420	25	41000	41000	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.176	J	1.4		mg/kg	MW-20 (4.5-6.0 ftbgs; slag; 07/25/03)	26/52	0.495 - 0.826	1.4	–	20000	12000	12000	N	N/A	N/A		BSC
7439-89-6	Iron	533		123000	E*	mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	105/105	–	123000	2000	310000	100000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	1.25		1870		mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	102/105	0.63 - 0.75	1870	–	–	800 (8)	800	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	354		118000		mg/kg	MW-21 (8-10 ftbgs; slag; 07/28/03)	105/105	–	118000	–	–	–	–	N	N/A	N/A		NUT
7439-96-5	Manganese	134		78300	E*	mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	105/105	–	78300	–	20000	19000	19000	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0108	J	16.8		mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	53/105	0.0284 - 0.16	16.8	0.1	100	62	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	1.6	B	5160		mg/kg	SB-3A (surface slag; 11/07/96)	101/105	0.31 - 5.6	5160	13	20000	20000	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	42		8240		mg/kg	Green Surface Waste (surface soil; 11/07/96)	86/105	24.1 - 1000	8240	–	–	–	–	N	N/A	N/A		NUT
7782-49-2	Selenium	0.95	J	40.4		mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	49/103	0.943 - 24.2	40.4	2.0	5100	5100	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.147	J	11.9	N	mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	48/104	0.23 - 2.0	11.9	–	5100	5100	5100	N	N/A	N/A		BSC
7440-23-5	Sodium	83.7	J	1750		mg/kg	C-5-GRID (soil; 03/01/00)	47/105	28.8 - 2420	1750	–	–	–	–	N	N/A	N/A		NUT
7440-28-0	Thallium	0.486	J	89.6		mg/kg	MW-20 (4.5-6.0 ftbgs; slag; 07/25/03)	29/101	0.24 - 10.6	89.6	–	72	67	67	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	3.9	B	278		mg/kg	SB-6B (7-8 ftbgs; slag; 11/07/96)	105/105	–	278	150	1000	1000	150	N	N/A	N/A	X	ASC
7440-66-6	Zinc	9.7	J	1400		mg/kg	SS-3 (surface slag; 11/07/96)	102/103	1.86	1400	20	310000	100000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected from soil and slag sampling locations: A-2-GRID, A-5-GRID, B-1-GRID, B-4A-GRID, C-0-GRID, C-5-GRID, C-12-GRID, Green Surface Waste, MOUND1-GRID, MW-101A, MW-102A, MW-103A, MW-104A, MW-105A, SB-3A, SB-9A, SB-10A, SS-1, SS-2, SS-3, SS-4, SS-5, SS-6, SS-7, SS-8, SS-9, SS-10, SS-11, SS-12, SS-13, SS-14, SS-15, SS-16, SS-17, SS-18, SS-19, SS-20, SS-21, SS-22, SS-23, SS-24, SS-25, SS-26, SS-27, SS-28, SS-29, SS-30, SS-31, SS-31, SS-33, SS-34, SS-35, SS-36, SS-37, SS-38, SS-39, SS-40, WT-105-92, WT-106-92, WT-107-92, WT-108-92, B-1A, B-2, B-2-GRID, B-3, BH-12, B1/B2COMP-GRID, MW-15, MW-16, MW-18, MW-20, MW-21, MW-22, MW-23, MW-25, MW-25, MW-26, MW-27, MW-28, TP-1, TP-2, SB-1B, SB-2B, SB-2C, SB-3B, SB-4B, SB-4C, SB-5C, SB-6B, SB-6C, SB-12E.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Industrial, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Industrial, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Industrial or R9-PRG Soil Industrial value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
– = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
N = Spike sample recovery not within control limits.
* = Duplicate analysis not within control limits.
B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

TABLE 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SOIL - FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal and Inhalation

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	1500		49600		mg/kg	Green Surface Waste (surface soil; 11/07/96)	81/81	–	49600	–	1000000	100000	100000	N	N/A	N/A		BSC
7440-36-0	Antimony	1.6	B	64.9		mg/kg	SS-4 (surface soil; 11/07/96)	19/72	0.736 - 7.2	64.9	–	410	410	410	N	N/A	N/A		BSC
7440-38-2	Arsenic	0.67	B	21.9	*	mg/kg	SB-10A (surface soil; 11/07/96)	76/81	0.51 - 1.1	21.9	7.5	1.9	1.6	1.6	C	N/A	N/A	X	ASC
7440-39-3	Barium	11.3	J	1410	*	mg/kg	Green Surface Waste (surface soil; 11/07/96)	81/81	–	1410	300	72000	67000	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.09	B	3.5		mg/kg	Green Surface Waste (surface soil; 11/07/96)	76/81	0.05 - 0.28	3.5	0.16	2000	1900	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.0609	J	5.4		mg/kg	SB-6C (8-9 ftbgs; soil; 11/07/96)	53/81	0.17 - 0.631	5.4	1.0	510	450	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	2100	*	163000		mg/kg	BH-12 (8-10 ftbgs; soil; 07/23/03)	47/47	–	163000	–	–	–	–	N	N/A	N/A		NUT
7440-47-3	Chromium	4.9		2260		mg/kg	SS-4 (surface soil; 11/07/96)	81/81	–	2260	10	1500000	450	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.15	BN	24.6		mg/kg	SS-2 (surface soil; 11/07/96)	20/70	1.0 - 6.7	24.6	–	3100	64	64	N	N/A	N/A		BSC
7440-48-4	Cobalt	1.47	J	536	B	mg/kg	SS-4 (surface soil; 11/07/96)	80/81	0.83	536	30	20000	1900	30	C	N/A	N/A	X	ASC
7440-50-8	Copper	3.7	B	257		mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	81/81	–	257	25	41000	41000	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.193	J	0.937		mg/kg	MW-16 (2-4 ftbgs; soil; 07/27/03)	14/35	0.495 - 0.635	0.937	–	20000	12000	12000	N	N/A	N/A		BSC
7439-89-6	Iron	1890		123000	E*	mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	81/81	–	123000	2000	310000	100000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	5.1	*	1870	*	mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	81/81	–	1870	–	–	800 (8)	800	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	2600	*	101000		mg/kg	BH-12 (8-10 ftbgs; soil; 07/23/03)	81/81	–	101000	–	–	–	–	N	N/A	N/A		NUT
7439-96-5	Manganese	134		24400	E*	mg/kg	Green Surface Waste (surface soil; 11/07/96)	81/81	–	24400	–	20000	19000	19000	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0108	J	16.8		mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	36/81	0.0284 - 0.14	16.8	0.1	100	62	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	1.6	B	54.1	*	mg/kg	C-5-GRID (0-0.25 ftbgs; surface soil; 03/01/00)	80/81	1.2	54.1	13	20000	20000	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	101	BE	8240		mg/kg	Green Surface Waste (surface soil; 11/07/96)	76/81	43.3 - 45	8240	–	–	–	–	N	N/A	N/A		NUT
7782-49-2	Selenium	0.95	J	15.9		mg/kg	Green Surface Waste (surface soil; 11/07/96)	39/81	0.943 - 23.1	15.9	2.0	5100	5100	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.147	J	7.6	N	mg/kg	Green Surface Waste (surface soil; 11/07/96)	27/81	0.23 - 1.22	7.6	–	5100	5100	5100	N	N/A	N/A		BSC
7440-23-5	Sodium	105	B	1750		mg/kg	C-5-GRID (soil; 03/01/00)	42/81	28.8 - 150	1750	–	–	–	–	N	N/A	N/A		NUT
7440-28-0	Thallium	0.486	J	18.8		mg/kg	Green Surface Waste (surface soil; 11/07/96)	18/81	0.24 - 3.72	18.8	–	72	67	67	N	N/A	N/A		BSC
7440-62-2	Vanadium	3.9	B	71.2		mg/kg	SS-4 (surface soil; 11/07/96)	81/81	–	71.2	150	1000	1000	150	N	N/A	N/A		BSC
7440-66-6	Zinc	12.7		1090	E	mg/kg	B1/B2COMP-GRID (0.25-1.0 ftbgs; soil; 03/01/00)	81/81	–	1090	20	310000	100000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected from soil sampling locations: A-2-GRID, A-5-GRID, B-1-GRID, B-4A-GRID, C-0-GRID, C-5-GRID, C-12-GRID, Green Surface Waste, MOUND1-GRID, MW-101A, MW-102A, MW-103A, MW-104A, MW-105A, SB-9A, SB-10A, SS-1, SS-2, SS-4, SS-5, SS-6, SS-7, SS-8, SS-9, SS-10, SS-11, SS-12, SS-13, SS-14, SS-17, SS-18, SS-19, SS-21, SS-25, SS-26, SS-28, SS-29, SS-33, SS-34, SS-35, SS-36, SS-38, SS-39, B-2, B-2-GRID, B-3, BH-12, B1/B2COMP-GRID, MW-15, MW-16, MW-17, MW-19, MW-20, MW-22, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, SB-2C, SB-3C, SB-4C, SB-5C, SB-6C, SB-7C, SB-8C, SB-9C, SB-10C, SB-11C, SB-12C.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Industrial, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Industrial, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Industrial or R9-PRG Soil Industrial value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
– = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
N = Spike sample recovery not within control limits.
* = Duplicate analysis not within control limits.
B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

TABLE 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SLAG - FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal and Inhalation

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	5100		113000		mg/kg	SS-3 (surface slag; 11/07/96)	56/56	--	113000	--	1000000	100000	100000	N	N/A	N/A	X	ASC
7440-36-0	Antimony	1.77	J	339		mg/kg	SB-3A (surface slag; 11/07/96)	37/46	0.98 - 24.2	339	--	410	410	410	N	N/A	N/A		BSC
7440-38-2	Arsenic	0.34	B	70		mg/kg	MW-20 (4.5-6.0 ftbgs; slag; 07/25/03)	34/56	0.47 - 2.06	70	7.5	1.9	1.6	1.6	C	N/A	N/A	X	ASC
7440-39-3	Barium	16	B	675		mg/kg	SS-24 (0-0.167 ftbgs; surface slag; 07/18/03)	56/56	--	675	300	72000	67000	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.06	B	3.04		mg/kg	BH-12 (4.0-6.5 ftbgs; slag; 07/23/03)	36/56	0.05 - 1.0	3.04	0.16	2000	1900	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.191	J	141		mg/kg	SS-3 (surface slag; 11/07/96)	17/56	0.24 - 1.67	141	1.0	510	450	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	5370		249000		mg/kg	MW-18 (2-4 ftbgs; slag; 07/28/03)	31/31	--	249000	--	--	--	--	N	N/A	N/A		NUT
7440-47-3	Chromium	17.6	E	11800		mg/kg	SB-3A (surface slag; 11/07/96)	54/54	--	11800	10	1500000	450	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.08	BN	430		mg/kg	MW-21 (8-10 ftbgs; slag; 07/28/03)	44/54	0.003 - 5.6	430	--	3100	64	64	N	N/A	N/A	X	ASC
7440-48-4	Cobalt	0.265	J	132		mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	52/56	2.4 - 3.3	132	30	20000	1900	30	C	N/A	N/A	X	ASC
7440-50-8	Copper	1.8	B*	5420	E	mg/kg	SS-3 (surface slag; 11/07/96)	55/56	2.47	5420	25	41000	41000	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.176	J	1.4		mg/kg	MW-20 (4.5-6.0 ftbgs; slag; 07/25/03)	12/27	0.509 - 0.826	1.4	--	20000	12000	12000	N	N/A	N/A		BSC
7439-89-6	Iron	533		65500		mg/kg	MW-25 (2-3 ftbgs; slag; 07/23/03)	56/56	--	65500	2000	310000	100000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	1.25		1760		mg/kg	SS-3 (surface slag; 11/07/96)	48/56	0.63 - 0.98	1760	--	--	800 (8)	800	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	354		118000		mg/kg	MW-21 (8-10 ftbgs; slag; 07/28/03)	56/56	--	118000	--	--	--	--	N	N/A	N/A		NUT
7439-96-5	Manganese	131		78300	E*	mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	56/56	--	78300	--	20000	19000	19000	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0115	J	0.375		mg/kg	SS-40 (0-0.167 ftbgs; surface slag; 07/18/03)	20/56	0.0358 - 0.16	0.375	0.1	100	62	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	3.2	B	5160		mg/kg	SB-3A (surface slag; 11/07/96)	47/56	0.31 - 5.6	5160	13	20000	20000	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	42		3730		mg/kg	MW-18 (12-14 ftbgs; slag; 07/28/03)	34/56	24.1 - 1000	3730	--	--	--	--	N	N/A	N/A		NUT
7782-49-2	Selenium	1.6		40.4		mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	28/54	0.429 - 24.2	40.4	2.0	5100	5100	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.215	J	11.9	N	mg/kg	SB-4B (2-4 ftbgs; slag; 11/07/96)	24/55	0.23 - 2.0	11.9	--	5100	5100	5100	N	N/A	N/A		BSC
7440-23-5	Sodium	83.7	J	836		mg/kg	WT-105-92 (surface slag; 01/01/89)	21/56	29.1 - 2420	836	--	--	--	--	N	N/A	N/A		NUT
7440-28-0	Thallium	0.792	J	89.6		mg/kg	MW-20 (4.5-6.0 ftbgs; slag; 07/25/03)	11/52	0.24 - 10.6	89.6	--	72	67	67	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	5.4		278		mg/kg	SB-6B (7-8 ftbgs; slag; 11/07/96)	56/56	--	278	150	1000	1000	150	N	N/A	N/A	X	ASC
7440-66-6	Zinc	4.7	B	1400		mg/kg	SS-3 (surface slag; 11/07/96)	53/54	1.86	1400	20	310000	100000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collection from slag sampling locations: SS-3, SS-15, SS-16, SS-20, SS-22, SS-23, SS-24, SS-27, SS-30, SS-31, SS-32, SS-37, SS-40, WT-105-92, WT-106-92, WT-107-92, WT-108-92, MW-18, MW-19, MW-20, MW-21, MW-22, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, MW-104A, B-1A, B-2, B-3, BH-12, SB-1B, SB-2B, SB-3A, SB-3B, SB-4B, SB-6B, SB-7B, SB-8B, SB-9B, SB-10B, SB-11B, SB-12B, SB-12D, SB-12E, TP-1, TP-2, Next to TP-20.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Industrial, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Industrial, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Industrial or R9-PRG Soil Industrial value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
-- = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
N = Spike sample recovery not within control limits.
* = Duplicate analysis not within control limits.
B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

TABLE 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER - FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDOH MCLs (3)	R3-RBC Tap Water (4)	R9-PRG Tap Water (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Dissolved Metals																		
7429-90-5	Aluminum	0.0384		1.82		mg/L	MW-20 (Shallow; 10/01/03)	9/14	0.2	1.82	--	37	36	36	N	N/A	N/A		BSC
7440-36-0	Antimony	0.00817	J	0.00915	J	mg/L	MW-27 (Shallow; 10/03/03)	2/14	0.01	0.00915	0.006	0.015	0.015	0.006	N	N/A	N/A	X	ASC
7440-38-2	Arsenic	0.0112	J	0.0232	J	mg/L	MW-20 (Shallow; 08/18/03)	8/14	0.025	0.0232	0.05	0.000045	0.000045	0.000045	C	N/A	N/A	X	ASC
7440-39-3	Barium	0.06		0.208		mg/L	MW-23 (Shallow; 08/20/03)	14/14	--	0.208	2.0	2.6	2.6	2.0	N	N/A	N/A		BSC
7440-70-2	Calcium	66.8		732		mg/L	MW-23 (Shallow; 08/20/03)	14/14	--	732	--	--	--	--	N	N/A	N/A		NUT
7440-47-3	Chromium	0.000817		0.106		mg/L	MW-23 (Shallow; 08/20/03)	10/14	0.01	0.106	0.1	55	55	0.1	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.008	J	0.09		mg/L	MW-23 (Shallow; 08/20/03)	3/14	0.01	0.09	--	0.11	0.11	0.11	N	N/A	N/A		BSC
7440-48-4	Cobalt	0.000855	J	0.00135	J	mg/L	MW-15 (Shallow; 08/15/03)	4/14	0.02	0.00135	--	0.73	0.73	0.73	C	N/A	N/A		BSC
7440-50-8	Copper	0.00344		0.0102	J	mg/L	MW-15 (Shallow; 08/15/03)	2/14	0.02	0.0102	1.3	1.5	1.5	1.3	N	N/A	N/A		BSC
57-12-5	Cyanide	0.00219		0.00436	J	mg/L	MW-27 (Shallow; 10/03/03)	3/11	0.01	0.00436	0.2	0.73	0.73	0.2	N	N/A	N/A		BSC
7439-89-6	Iron	0.495		3.92		mg/L	MW-104A (Deep; 10/03/03)	8/14	0.2	3.92	0.3	11	11	0.3	N	N/A	N/A	X	ASC
7439-92-1	Lead	0.00467	J	0.00751		mg/L	MW-15 (Shallow; 08/15/03)	3/14	0.005	0.00751	0.015	--	--	0.015	C	N/A	N/A		BSC
7439-95-4	Magnesium	13		81.7		mg/L	MW-103A (Deep; 10/06/03)	7/14	1.5	81.7	--	--	--	--	N	N/A	N/A		NUT
7439-96-5	Manganese	0.00316	J	0.858		mg/L	MW-104A (Deep; 08/25/03)	9/14	0.01	0.858	0.3	0.73	0.88	0.3	N	N/A	N/A	X	ASC
7440-02-0	Nickel	0.00176	J	0.00714	J	mg/L	MW-20 (Shallow; 10/01/03)	6/14	0.02	0.00714	--	0.73	0.73	0.73	N	N/A	N/A		BSC
7440-09-7	Potassium	0.852	J	8.38		mg/L	MW-27 (Shallow; 08/18/03)	14/14	--	8.38	--	--	--	--	N	N/A	N/A		NUT
7782-49-2	Selenium	0.00725	J	0.0547		mg/L	MW-103A (Deep; 10/06/03)	9/14	0.02	0.0547	0.05	0.18	0.18	0.05	N	N/A	N/A	X	ASC
7440-23-5	Sodium	30.1		192		mg/L	MW-27 (Shallow; 08/18/03)	14/14	--	192	--	--	--	--	N	N/A	N/A		NUT
7440-62-2	Vanadium	0.00378	J	0.0131	J	mg/L	MW-103A (Deep; 10/06/03)	4/14	0.02	0.0131	--	0.037	0.036	0.036	N	N/A	N/A		BSC
7440-66-6	Zinc	0.00494	J	0.0263		mg/L	MW-104A (Deep; 08/25/03)	4/14	0.01	0.0263	5.0	0.011	0.011	0.011	N	N/A	N/A	X	ASC
	Total Metals																		
7429-90-5	Aluminum	0.0601		64.3		mg/L	MW-19 (Shallow; 08/15/03)	32/37	0.2	64.3	--	37	36	36	N	N/A	N/A	X	ASC
7440-36-0	Antimony	0.00683	J	0.0194		mg/L	MW-23 (Shallow; 10/22/03)	11/37	0.01	0.0194	0.006	0.015	0.015	0.006	N	N/A	N/A	X	ASC
7440-38-2	Arsenic	0.0104	J	0.0437		mg/L	MW-19 (Shallow; 08/15/03)	24/37	0.025	0.0437	0.05	0.000045	0.000045	0.000045	C	N/A	N/A	X	ASC
7440-39-3	Barium	0.0226		1.12		mg/L	MW-24 (Shallow; 10/22/03)	37/37	--	1.12	2.0	2.6	2.6	2.0	N	N/A	N/A		BSC
7440-41-7	Beryllium	0.000467	J	0.00219	J	mg/L	MW-17 (Shallow; 08/28/03)	7/37	0.005	0.00219	0.004	0.073	0.073	0.004	C	N/A	N/A		BSC
7440-43-9	Cadmium	0.000891	J	0.00395	J	mg/L	MW-17 (Shallow; 10/06/03)	4/37	0.005	0.00395	0.005	0.018	0.018	0.005	N	N/A	N/A		BSC
7440-70-2	Calcium	57.2		751		mg/L	MW-23 (Shallow; 08/20/03)	37/37	--	751	--	--	--	--	N	N/A	N/A		NUT
7440-47-3	Chromium	0.00106	J	0.655		mg/L	MW-19 (Shallow; 08/15/03)	31/37	0.01	0.655	0.1	55	55	0.1	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.005	J	0.181		mg/L	MW-18 (Shallow; 08/28/03)	15/37	0.01	0.181	--	0.11	0.11	0.11	N	N/A	N/A	X	ASC
7440-48-4	Cobalt	0.00122	J	0.0303		mg/L	MW-17 (Shallow; 08/28/03)	15/37	0.02	0.0303	--	0.73	0.73	0.73	C	N/A	N/A		BSC
7440-50-8	Copper	0.00628		0.105		mg/L	MW-19 (Shallow; 08/15/03)	18/37	0.02	0.105	1.3	1.5	1.5	1.3	N	N/A	N/A		BSC
57-12-5	Cyanide	0.00195		0.00385	J	mg/L	MW-27 (Shallow; 10/03/03)	5/37	0.01	0.00385	0.2	0.73	0.73	0.2	N	N/A	N/A		BSC
7439-89-6	Iron	0.128	J	85.5		mg/L	MW-19 (Shallow; 08/15/03)	29/37	0.2	85.5	0.3	11	11	0.3	N	N/A	N/A	X	ASC
7439-92-1	Lead	0.00539		0.379		mg/L	MW-17 (Shallow; 10/06/03)	18/37	0.005	0.379	0.015	--	--	0.015	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	0.0382	J	157		mg/L	MW-107A (Deep; 08/28/03)	35/37	1.5	157	--	--	--	--	N	N/A	N/A		NUT
7439-96-5	Manganese	0.00203	J	2.47		mg/L	MW-17 (Shallow; 10/06/03)	36/37	0.01	2.47	0.3	0.73	0.88	0.3	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0000718	J	0.000291	J	mg/L	MW-17 (Shallow; 08/28/03)	5/37	0.0004	0.000291	0.002	0.0037	0.0036	0.002	N	N/A	N/A		BSC
7440-02-0	Nickel	0.00172	J	0.0769		mg/L	MW-19 (Shallow; 08/15/03)	23/37	0.02	0.0769	--	0.73	0.73	0.73	N	N/A	N/A		BSC
7440-09-7	Potassium	0.896	J	22.8		mg/L	MW-21 (Shallow; 08/28/03)	37/37	--	22.8	--	--	--	--	N	N/A	N/A		NUT
7782-49-2	Selenium	0.00669	J	0.0739		mg/L	MW-17 (Shallow; 10/06/03)	31/37	0.02	0.0739	0.05	0.18	0.18	0.05	N	N/A	N/A	X	ASC
7440-23-5	Sodium	7.18		191		mg/L	MW-27 (Shallow; 08/18/03)	37/37	--	191	--	--	--	--	N	N/A	N/A		NUT
7440-28-0	Thallium	0.00941	J	0.0158	J	mg/L	MW-23 (Shallow; 10/22/03)	2/37	0.02 - 0.04	0.0158	0.002	0.0026	0.0024	0.002	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	0.00312	J	0.161		mg/L	MW-19 (Shallow; 08/15/03)	30/37	0.02	0.161	--	0.037	0.036	0.036	N	N/A	N/A	X	ASC
7440-66-6	Zinc	0.00315	J	1.79		mg/L	MW-17 (Shallow; 10/06/03)	30/37	0.01 - 0.02	1.79	5.0	0.011	0.011	0.011	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected during 2003 - 2004 from sampling locations: MW-15, MW-16, MW-17, MW-18, MW-19, MW-20, MW-21, MW-22, MW-23, MW-24, MW-25, MW-26, MW-27, MW-28, MW-103A, MW-104A, MW-105A, MW-106A, MW-107A.

(3) NYCRR Title 10, Part 5-Drinking Water Supplies, Subpart 5-1 Public Water Systems; Maximum Contaminant Levels (MCLs), NYSDOH, May 26, 2004.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Tap Water, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Tap Water, October 20, 2004.

(6) Screening criterion is the lower of the NYSDOH MCLs, R3-RBC Tap Water or T9-PRG Tap Water value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
-- = Not Available
N/A = Not Applicable
J = Associated value is estimated

TABLE 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER - CURRENT/FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TOGS 1.1.1 (3)	R3-RBC Tap Water (4)	R9-PRG Tap Water (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	0.0258	J	66.7		mg/L	SW-11 (10/07/03)	42/46	0.2	66.7	--	37	36	36	N	N/A	N/A	X	ASC
7440-36-0	Antimony	0.00744	J	0.0169		mg/L	SW-13 (08/21/03)	4/46	0.01 - 0.05	0.0169	--	0.015	0.015	0.015	N	N/A	N/A	X	ASC
7440-38-2	Arsenic	0.00722	J	0.0648		mg/L	SW-11 (10/07/03)	41/46	0.025	0.0648	0.05	0.000045	0.000045	0.000045	C	N/A	N/A	X	ASC
7440-39-3	Barium	0.0236		2.53		mg/L	SW-11 (10/07/03)	46/46	--	2.53	1.0	2.6	2.6	1.0	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.000156	J	0.00304	J	mg/L	SW-11 (10/07/03)	4/46	0.005	0.00304	0.003	0.073	0.073	0.003	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.00463	J	0.00463	J	mg/L	SW-11 (10/07/03)	1/46	0.005	0.00463	0.005	0.018	0.018	0.005	N	N/A	N/A		BSC
7440-70-2	Calcium	22.2		675		mg/L	SW-13 (08/21/03)	46/46	--	675	--	--	--	--	N	N/A	N/A		NUT
7440-47-3	Chromium	0.000768	J	6.39		mg/L	SW-11 (10/07/03)	46/46	--	6.39	0.05	55	55	0.05	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.004	J	0.571		mg/L	SW-14 (10/07/03)	27/46	0.01	0.571	--	0.11	0.11	0.11	N	N/A	N/A	X	ASC
7440-48-4	Cobalt	0.000612	J	0.0753		mg/L	SW-11 (10/07/03)	16/46	0.02	0.0753	--	0.73	0.73	0.73	C	N/A	N/A		BSC
7440-50-8	Copper	0.00343	J	1.09		mg/L	SW-11 (10/07/03)	28/46	0.02	1.09	0.2	1.5	1.5	0.2	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.00216	J	0.00869	J	mg/L	SW-14 (08/21/03)	10/46	0.01	0.00869	0.2	0.73	0.73	0.2	N	N/A	N/A		BSC
7439-89-6	Iron	0.0533	J	151		mg/L	SW-11 (10/07/03)	35/46	0.2	151	0.3	11	11	0.3	N	N/A	N/A	X	ASC
7439-92-1	Lead	0.0051		0.865		mg/L	SW-11 (10/07/03)	25/46	0.005	0.865	0.05	--	--	0.05	C	N/A	N/A	X	ASC
7439-95-4	Magnesium	0.0581	J	103		mg/L	SW-11 (10/07/03)	45/46	1.5	103	35	--	--	35	N	N/A	N/A		NUT
7439-96-5	Manganese	0.00165	J	19.2		mg/L	SW-11 (10/07/03)	44/46	0.01	19.2	0.3	0.73	0.88	0.3	N	N/A	N/A	X	ASC
7439-97-6	Mercury	0.0013		0.0013		mg/L	SW-11 (10/07/03)	1/46	0.0002 - 0.0004	0.0013	0.0007	0.0037	0.0036	0.0007	N	N/A	N/A	X	ASC
7440-02-0	Nickel	0.00177	J	0.544		mg/L	SW-11 (10/07/03)	26/46	0.02	0.544	0.1	0.73	0.73	0.1	N	N/A	N/A	X	ASC
7440-09-7	Potassium	0.327	J	72.3		mg/L	SW-13 (10/07/03)	46/46	--	72.3	--	--	--	--	N	N/A	N/A		NUT
7782-49-2	Selenium	0.00775	J	0.0957		mg/L	SW-11 (10/07/03)	14/46	0.02 - 0.04	0.0957	0.01	0.18	0.18	0.01	N	N/A	N/A	X	ASC
7440-22-4	Silver	0.0016	J	0.00203	J	mg/L	SW-23 (08/21/03)	2/46	0.01	0.00203	0.05	0.18	0.18	0.05	N	N/A	N/A		BSC
7440-23-5	Sodium	1.47	J	112		mg/L	SW-23 (05/12/04)	46/46	--	112	--	--	--	--	N	N/A	N/A		NUT
7440-28-0	Thallium	0.00776	J	0.0936		mg/L	SW-20 (08/21/03)	12/46	0.02 - 0.03	0.0936	0.0005	0.0026	0.0024	0.0005	N	N/A	N/A	X	ASC
7440-62-2	Vanadium	0.00334	J	0.231		mg/L	SW-11 (10/07/03)	19/46	0.02	0.231	--	0.037	0.036	0.036	N	N/A	N/A	X	ASC
7440-66-6	Zinc	0.00218	J	2.84		mg/L	SW-11 (10/07/03)	45/46	0.01	2.84	2.0	0.011	0.011	0.011	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected during 2003 - 2004 from sampling locations: SW-11, SW-12, SW-13, SW-14, SW-15, SW-16, SW-17, SW-18, SW-19, SW-20, SW-21, SW-22, SW-23, SW-24.

(3) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, Division of Water Technical and Operation Guidance Series (1.1.1), NYSDEC, June 1998. Including addenda from 1999, 2000, and 2004.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Tap Water, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Tap Water, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TOGS 1.1.1, R3-RBC Tap Water or T9-PRG Tap Water value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
-- = Not Available
N/A = Not Applicable
J = Associated value is estimated

TABLE 2.10

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT - FUTURE RECEPTORS
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal

CAS Number	Chemical	Minimum (1,2) Concentration	Minimum Qualifier	Maximum (1,2) Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency (2)	Range of Detection Limits (2)	Concentration Used for Screening (2)	NYSDEC TAGM 4046 (3)	R3-RBC Soil Industrial (4)	R9-PRG Soil Industrial (5)	Screening (6) Toxicity Value		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (7) Contaminant Deletion or Selection
	Metals																		
7429-90-5	Aluminum	334		25000		mg/kg	SW-11 (08/21/03)	20/20	--	25000	--	1000000	100000	100000	N	N/A	N/A		BSC
7440-36-0	Antimony	0.971	J	56.5		mg/kg	SB-2 Pond (11/07/96)	10/20	1.08 - 12	56.5	--	410	410	410	N	N/A	N/A		BSC
7440-38-2	Arsenic	4.2	J	27.9		mg/kg	SW-11 (08/21/03)	14/20	1.3 - 17.2	27.9	7.5	1.9	1.6	1.6	C	N/A	N/A	X	ASC
7440-39-3	Barium	98.9		666		mg/kg	SW-11 (08/21/03)	20/20	--	666	300	72000	67000	300	N	N/A	N/A	X	ASC
7440-41-7	Beryllium	0.0558	J	1.09		mg/kg	SW-24 (08/21/03)	17/20	0.623 - 1.0	1.09	0.16	2000	1900	0.16	C	N/A	N/A	X	ASC
7440-43-9	Cadmium	0.0526	J	2.1		mg/kg	SB-2 Pond (11/07/96)	7/20	0.623 - 1.0	2.1	1.0	510	450	1.0	N	N/A	N/A	X	ASC
7440-70-2	Calcium	4870		353000		mg/kg	SW-16 (05/12/04)	19/19	--	353000	--	--	--	--	N	N/A	N/A		NUT
7440-47-3	Chromium	7.17		2380	N*	mg/kg	SB-2 Pond (11/07/96)	20/20	--	2380	10	1500000	450	10	N	N/A	N/A	X	ASC
18540-29-9	Chromium VI (Hexavalent)	0.45	E*	6.83	J	mg/kg	SD-105 (01/01/98)	5/20	5.1 - 15	6.83	--	3100	64	64	N	N/A	N/A		BSC
7440-48-4	Cobalt	0.183		27.8		mg/kg	SW-11 (08/21/03)	18/20	2.49 - 2.75	27.8	30	20000	1900	30	C	N/A	N/A		BSC
7440-50-8	Copper	2.65	J	307		mg/kg	SW-11 (08/21/03)	18/20	2.8 - 4.99	307	25	41000	41000	25	N	N/A	N/A	X	ASC
57-12-5	Cyanide	0.242		1.16		mg/kg	SW-23 (08/21/03)	4/17		1.16	--	20000	12000	12000	N	N/A	N/A		BSC
7439-89-6	Iron	417		42600		mg/kg	SW-11 (08/21/03)	20/20	--	42600	2000	310000	100000	2000	N	N/A	N/A	X	ASC
7439-92-1	Lead	8.55		240		mg/kg	SW-11 (08/21/03)	20/20	--	240	--	--	800 (8)	800	C	N/A	N/A		BSC
7439-95-4	Magnesium	385		46100		mg/kg	SB-2 Pond (11/07/96)	20/20	--	46100	--	--	--	--	N	N/A	N/A		NUT
7439-96-5	Manganese	20.4		6330	J	mg/kg	SW-11 (08/21/03)	20/20	--	6330	--	20000	19000	19000	N	N/A	N/A		BSC
7439-97-6	Mercury	0.00865	J	0.42		mg/kg	SD-103 (01/01/89)	13/20	0.04 - 0.07	0.42	0.1	100	62	0.1	N	N/A	N/A	X	ASC
7440-02-0	Nickel	1.63		216		mg/kg	SB-2 Pond (11/07/96)	18/20	2.75 - 4.99	216	13	20000	20000	13	N	N/A	N/A	X	ASC
7440-09-7	Potassium	73.3	J	4580	J	mg/kg	SW-19 (08/21/03)	19/20	45.6	4580	--	--	--	--	N	N/A	N/A		NUT
7782-49-2	Selenium	2.2		25.1		mg/kg	SW-11 (08/21/03)	15/18	2.66 - 5.49	25.1	2.0	5100	5100	2.0	N	N/A	N/A	X	ASC
7440-22-4	Silver	1.8	J	3.36	J	mg/kg	SW-11 (08/21/03)	3/18	0.31 - 2.09	3.36	--	5100	5100	5100	N	N/A	N/A		BSC
7440-23-5	Sodium	22.5		399		mg/kg	SW-20 (08/21/03)	17/20	36.8 - 1000	399	--	--	--	--	N	N/A	N/A		NUT
7440-28-0	Thallium	1.42	J	3.26		mg/kg	SW-16 (08/14/03)	3/18	0.88 - 13.7	3.26	--	72	67	67	N	N/A	N/A		BSC
7440-62-2	Vanadium	1.72	J	88.6		mg/kg	SW-11 (08/21/03)	20/20	--	88.6	150	1000	1000	150	N	N/A	N/A		BSC
7440-66-6	Zinc	16.5	J	798		mg/kg	SW-11 (08/21/03)	20/20	--	798	20	310000	100000	20	N	N/A	N/A	X	ASC

Notes:

(1) Minimum/maximum detected concentration.

(2) Based on data collected from sampling locations: SB-02 Pond, SD-103, SD-104, SW-10, SW-11, SW-12, SW-13, SW-14, SW-15, SW-16, SW-17, SW-18, SW-19, SW-20, SW-21, SW-22, SW-23, SW-24.

(3) Technical and Administrative Guidance Memorandum #4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994.

(4) Region III Risk-Based Concentration (R3-RBC) Table, Soil Industrial, October 8, 2004.

(5) Region IX Preliminary Remediation Goals (R9-PRG) Table, Soil Industrial, October 20, 2004.

(6) Screening criterion is the lower of the NYSDEC TAGM 4046, R3-RBC Soil Industrial or R9-PRG Soil Industrial value.

(7) Rationale Codes
Selection Reason: Maximum detected above Screening Criterion (ASC)
Deletion Reason: Maximum detected below Screening Criterion (BSC)
Essential Nutrient (NUT)

(8) Value derived using USEPA IUEBK pharmacokinetic model.

Definitions:
C = Carcinogenic
N = Non-Carcinogenic
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
-- = Not Available
N/A = Not Applicable
J = Associated value is estimated.
E = Estimated above quantification limit.
N = Spike sample recovery not within control limits.
* = Duplicate analysis not within control limits.

TABLE 3.1

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL AND SLAG

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Metals												
Aluminum	mg/kg	1.88E+04	(1)	1.13E+05		mg/kg	3.69E+04	95% UCL-NP	W-Test (2)	1.87E+04	Mean-NP	W-Test (2)
Antimony	mg/kg	2.29E+01	(1)	3.39E+02		mg/kg	3.82E+01	95% UCL-NP	W-Test (2)	2.32E+01	Mean-NP	W-Test (2)
Arsenic	mg/kg	6.33E+00	(1)	4.53E+01		mg/kg	1.81E+01	95% UCL-NP	W-Test (2)	6.43E+00	Mean-NP	W-Test (2)
Barium	mg/kg	1.67E+02	(1)	1.41E+03	*	mg/kg	3.77E+02	95% UCL-NP	W-Test (2)	1.66E+02	Mean-NP	W-Test (2)
Beryllium	mg/kg	5.54E-01	(1)	3.50E+00		mg/kg	1.21E+00	95% UCL-NP	W-Test (2)	5.85E-01	Mean-NP	W-Test (2)
Cadmium	mg/kg	3.33E+00	(1)	1.41E+02		mg/kg	2.62E+01	95% UCL-NP	W-Test (2)	3.35E+00	Mean-NP	W-Test (2)
Chromium Total	mg/kg	1.26E+03	(1)	1.18E+04		mg/kg	1.97E+03	95% UCL-NP	W-Test (2)	1.24E+03	Mean-NP	W-Test (2)
Chromium VI (Hexavalent)	mg/kg	5.88E+00	(1)	9.16E+01		mg/kg	9.95E+00	95% UCL-NP	W-Test (2)	6.80E+00	Mean-NP	W-Test (2)
Cobalt	mg/kg	2.28E+01	(1)	5.36E+02	B	mg/kg	9.15E+01	95% UCL-NP	W-Test (2)	2.24E+01	Mean-NP	W-Test (2)
Copper	mg/kg	1.69E+02	(1)	5.42E+03	E	mg/kg	1.27E+03	95% UCL-NP	W-Test (2)	1.65E+02	Mean-NP	W-Test (2)
Iron	mg/kg	1.92E+04	(1)	5.13E+04		mg/kg	2.16E+04	95% UCL-NP	W-Test (2)	1.92E+04	Mean-NP	W-Test (2)
Lead	mg/kg	7.36E+01	(1)	1.76E+03		mg/kg	3.09E+02	95% UCL-NP	W-Test (2)	7.23E+01	Mean-NP	W-Test (2)
Manganese	mg/kg	1.78E+03	(1)	2.44E+04	E*	mg/kg	5.39E+03	95% UCL-NP	W-Test (2)	1.76E+03	Mean-NP	W-Test (2)
Mercury	mg/kg	2.99E-01	(1)	1.18E+01		mg/kg	2.49E+00	95% UCL-NP	W-Test (2)	3.00E-01	Mean-NP	W-Test (2)
Nickel	mg/kg	2.58E+02	(1)	5.16E+03		mg/kg	1.04E+03	95% UCL-NP	W-Test (2)	2.54E+02	Mean-NP	W-Test (2)
Selenium	mg/kg	4.38E+00	(1)	2.63E+01		mg/kg	6.61E+00	95% UCL-NP	W-Test (2)	4.87E+00	Mean-NP	W-Test (2)
Thallium	mg/kg	2.35E+00	(1)	3.12E+01		mg/kg	3.89E+00	95% UCL-NP	W-Test (2)	2.62E+00	Mean-NP	W-Test (2)
Vanadium	mg/kg	5.25E+01	(1)	2.63E+02		mg/kg	6.60E+01	95% UCL-NP	W-Test (2)	5.22E+01	Mean-NP	W-Test (2)
Zinc	mg/kg	1.76E+02	(1)	1.40E+03		mg/kg	4.17E+02	95% UCL-NP	W-Test (2)	1.74E+02	Mean-NP	W-Test (2)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Wilk for data sets with under 50 samples.

W-Test : Developed by Shapiro and Francia for data sets with greater than 50 but less than 99 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% UC
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

E = Estimated above quantification limit.

B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

* = Duplicate analysis not within control limits.

(1) Data set is neither normally or lognormally distributed.

(2) Shapiro-Wilk W Test was used for data sets where n<=50. Shapiro-Francia W Test was used for data sets where : 50<n>100.

TABLE 3.2

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SURFACE SOIL

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Antimony	mg/kg	1.01E+01	(1)	6.49E+01		mg/kg	1.54E+01	95% UCL-NP	W-Test (3)	1.06E+01	Mean-NP	W-Test (3)
Arsenic	mg/kg	6.29E+00	(1)	2.19E+01	*	mg/kg	7.90E+00	95% UCL-NP	W-Test (3)	6.27E+00	Mean-NP	W-Test (3)
Barium	mg/kg	1.66E+02	(1)	1.41E+03	*	mg/kg	5.40E+02	95% UCL-NP	W-Test (3)	1.65E+02	Mean-NP	W-Test (3)
Beryllium	mg/kg	6.09E-01	(1)	3.50E+00		mg/kg	8.12E-01	95% UCL-NP	W-Test (3)	6.07E-01	Mean-NP	W-Test (3)
Cadmium	mg/kg	9.09E-01	(1)	4.00E+00		mg/kg	1.29E+00	95% UCL-NP	W-Test (3)	9.43E-01	Mean-NP	W-Test (3)
Chromium Total	mg/kg	2.93E+02	(1)	2.26E+03		mg/kg	4.66E+02	95% UCL-NP	W-Test (3)	2.90E+02	Mean-NP	W-Test (3)
Cobalt	mg/kg	2.45E+01	(1)	5.36E+02	B	mg/kg	1.75E+02	95% UCL-NP	W-Test (3)	2.43E+01	Mean-NP	W-Test (3)
Copper	mg/kg	3.08E+01	(2)	1.04E+02		mg/kg	3.86E+01	95% UCL-T	W-Test (3)	3.10E+01	Mean-T	W-Test (3)
Iron	mg/kg	1.92E+04	2.16E+04	4.82E+04	E*	mg/kg	2.16E+04	95% UCL-N	W-Test (3)	1.92E+04	Mean-N	W-Test (3)
Manganese	mg/kg	1.47E+03	(1)	2.44E+04	E*	mg/kg	8.82E+03	95% UCL-NP	W-Test (3)	1.45E+03	Mean-NP	W-Test (3)
Mercury	mg/kg	4.07E-01	(1)	1.18E+01		mg/kg	4.86E+00	95% UCL-NP	W-Test (3)	4.20E-01	Mean-NP	W-Test (3)
Nickel	mg/kg	2.46E+01	2.78E+01	5.41E+01	*	mg/kg	2.78E+01	95% UCL-N	W-Test (3)	2.46E+01	Mean-N	W-Test (3)
Selenium	mg/kg	2.07E+00	(1)	1.59E+01		mg/kg	3.85E+00	95% UCL-NP	W-Test (3)	2.76E+00	Mean-NP	W-Test (3)
Thallium	mg/kg	1.26E+00	(1)	1.88E+01		mg/kg	2.28E+00	95% UCL-NP	W-Test (3)	1.54E+00	Mean-NP	W-Test (3)
Zinc	mg/kg	1.56E+02	(1)	6.33E+02	E	mg/kg	2.03E+02	95% UCL-NP	W-Test (3)	1.55E+02	Mean-NP	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Wilk for data sets with under 50 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% U
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

E = Estimated above quantification limit.

B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

* = Duplicate analysis not within control limits.

(1) Data set is neither normally or lognormally distributed.

(2) Data set is lognormally distributed.

(3) Shapiro-Wilk W Test was used for data sets where n<=50.

TABLE 3.3

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SLAG

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Aluminum	mg/kg	2.07E+04	(1)	1.13E+05		mg/kg	7.70E+04	95% UCL-NP	W-Test (3)	2.07E+04	Mean-NP	W-Test (3)
Antimony	mg/kg	7.11E+01	(2)	3.39E+02		mg/kg	3.39E+02	Max	(4)	9.77E+01	Mean-T	W-Test (3)
Arsenic	mg/kg	6.42E+00	(2)	4.53E+01		mg/kg	1.39E+01	95% UCL-T	W-Test (3)	4.60E+00	Mean-T	W-Test (3)
Barium	mg/kg	1.70E+02	(2)	6.75E+02		mg/kg	2.73E+02	95% UCL-T	W-Test (3)	1.75E+02	Mean-T	W-Test (3)
Beryllium	mg/kg	4.36E-01	5.48E-01	1.10E+00		mg/kg	5.48E-01	95% UCL-N	W-Test (3)	4.36E-01	Mean-N	W-Test (3)
Cadmium	mg/kg	8.59E+00	(1)	1.41E+02		mg/kg	2.11E+01	95% UCL-NP	W-Test (3)	8.90E+00	Mean-NP	W-Test (3)
Chromium Total	mg/kg	3.60E+03	(2)	1.18E+04		mg/kg	8.38E+03	95% UCL-T	W-Test (3)	3.86E+03	Mean-T	W-Test (3)
Chromium VI (Hexavalent)	mg/kg	1.34E+01	(1)	9.16E+01		mg/kg	7.93E+01	95% UCL-NP	W-Test (3)	1.40E+01	Mean-NP	W-Test (3)
Cobalt	mg/kg	1.89E+01	(2)	7.23E+01		mg/kg	3.65E+01	95% UCL-T	W-Test (3)	2.02E+01	Mean-T	W-Test (3)
Copper	mg/kg	4.68E+02	(2)	5.42E+03	E	mg/kg	1.70E+03	95% UCL-T	W-Test (3)	3.44E+02	Mean-T	W-Test (3)
Iron	mg/kg	1.93E+04	2.43E+04	5.13E+04		mg/kg	2.43E+04	95% UCL-N	W-Test (3)	1.93E+04	Mean-N	W-Test (3)
Lead	mg/kg	1.35E+02	(1)	1.76E+03		mg/kg	1.22E+03	95% UCL-NP	W-Test (3)	1.35E+02	Mean-NP	W-Test (3)
Manganese	mg/kg	2.48E+03	(2)	8.99E+03		mg/kg	5.68E+03	95% UCL-T	W-Test (3)	2.68E+03	Mean-T	W-Test (3)
Mercury	mg/kg	6.48E-02	(1)	3.75E-01		mg/kg	3.75E-01	Max	(4)	7.20E-02	Mean-NP	W-Test (3)
Nickel	mg/kg	7.65E+02	(2)	5.16E+03		mg/kg	5.16E+03	Max	(4)	1.41E+03	Mean-T	W-Test (3)
Selenium	mg/kg	1.00E+01	(2)	2.63E+01		mg/kg	2.63E+01	Max	(4)	1.29E+01	Mean-T	W-Test (3)
Thallium	mg/kg	5.65E+00	(1)	3.12E+01		mg/kg	1.01E+01	95% UCL-NP	W-Test (3)	5.88E+00	Mean-NP	W-Test (3)
Vanadium	mg/kg	9.15E+01	(2)	2.63E+02		mg/kg	1.87E+02	95% UCL-T	W-Test (3)	1.00E+02	Mean-T	W-Test (3)
Zinc	mg/kg	2.25E+02	(1)	1.40E+03		mg/kg	9.94E+02	95% UCL-NP	W-Test (3)	2.24E+02	Mean-NP	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Wilk for data sets with under 50 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% UC
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

E = Estimated above quantification limit.

(1) Data set is neither normally or lognormally distributed.

(2) Data set is lognormally distributed.

(3) Shapiro-Wilk W Test was used for data sets where n<=50.

(4) The exposure point concentration (EPC) calculated is greater than maximum detected concentration; therefore maximum detected concentration is the EPC.

TABLE 3.4

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SOIL AND SLAG

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Soil
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Aluminum	mg/kg	1.79E+04	(1)	1.13E+05		mg/kg	2.89E+04	95% UCL-NP	W-Test (3)	1.80E+04	Mean-NP	W-Test (3)
Arsenic	mg/kg	6.85E+00	(1)	7.00E+01		mg/kg	9.68E+00	95% UCL-NP	W-Test (3)	6.94E+00	Mean-NP	W-Test (3)
Barium	mg/kg	1.47E+02	(2)	1.41E+03	*	mg/kg	1.70E+02	95% UCL-T	W-Test (3)	1.45E+02	Mean-T	W-Test (3)
Beryllium	mg/kg	6.39E-01	(2)	3.50E+00		mg/kg	9.71E-01	95% UCL-T	W-Test (3)	7.66E-01	Mean-T	W-Test (3)
Cadmium	mg/kg	2.27E+00	(1)	1.41E+02		mg/kg	1.34E+01	95% UCL-NP	W-Test (3)	2.41E+00	Mean-NP	W-Test (3)
Chromium Total	mg/kg	1.24E+03	1.59E+03	1.18E+04		mg/kg	1.59E+03	95% UCL-N	W-Test (3)	1.24E+03	Mean-N	W-Test (3)
Chromium VI (Hexavalent)	mg/kg	1.69E+01	(1)	4.30E+02		mg/kg	5.82E+01	95% UCL-NP	W-Test (3)	1.70E+01	Mean-NP	W-Test (3)
Cobalt	mg/kg	1.78E+01	(1)	5.36E+02	B	mg/kg	5.70E+01	95% UCL-NP	W-Test (3)	1.78E+01	Mean-NP	W-Test (3)
Copper	mg/kg	1.16E+02	(1)	5.42E+03	E	mg/kg	5.37E+02	95% UCL-NP	W-Test (3)	1.16E+02	Mean-NP	W-Test (3)
Iron	mg/kg	2.01E+04	(2)	1.23E+05	E*	mg/kg	2.83E+04	95% UCL-T	W-Test (3)	2.29E+04	Mean-T	W-Test (3)
Lead	mg/kg	7.00E+01	(2)	1.87E+03		mg/kg	8.16E+01	95% UCL-T	W-Test (3)	5.67E+01	Mean-T	W-Test (3)
Manganese	mg/kg	2.51E+03	(2)	7.83E+04	E*	mg/kg	1.81E+03	95% UCL-T	W-Test (3)	1.43E+03	Mean-T	W-Test (3)
Mercury	mg/kg	3.50E-01	(1)	1.68E+01		mg/kg	3.56E+00	95% UCL-NP	W-Test (3)	3.60E-01	Mean-NP	W-Test (3)
Nickel	mg/kg	1.72E+02	(1)	5.16E+03		mg/kg	6.17E+02	95% UCL-NP	W-Test (3)	1.74E+02	Mean-NP	W-Test (3)
Selenium	mg/kg	3.62E+00	(1)	4.04E+01		mg/kg	5.41E+00	95% UCL-NP	W-Test (3)	4.30E+00	Mean-NP	W-Test (3)
Thallium	mg/kg	3.03E+00	(2)	8.96E+01		mg/kg	5.40E+00	95% UCL-NP	W-Test (3)	3.75E+00	Mean-NP	W-Test (3)
Vanadium	mg/kg	5.07E+01	5.84E+01	2.78E+02		mg/kg	5.84E+01	95% UCL-N	W-Test (3)	5.07E+01	Mean-N	W-Test (3)
Zinc	mg/kg	1.70E+02	2.08E+02	1.40E+03		mg/kg	2.08E+02	95% UCL-N	W-Test (3)	1.70E+02	Mean-N	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Francia for data sets with greater than 50 but less than 99 samples.

W-Test : Studentized Range for data sets with greater than 99 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% UC
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

E = Estimated above quantification limit.

B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

* = Duplicate analysis not within control limits.

(1) Data set is neither normally or lognormally distributed.

(2) Data set is lognormally distributed.

(3) Shapiro-Francia W Test was used for data sets where : 50<n<100 and Studentized Range W Test was used for data sets where : n > 100.

TABLE 3.5

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SOIL

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Arsenic	mg/kg	6.18E+00	(1)	2.19E+01	*	mg/kg	7.06E+00	95% UCL-NP	W-Test (2)	6.16E+00	Mean-NP	W-Test (2)
Barium	mg/kg	1.49E+02	(1)	1.41E+03	*	mg/kg	3.36E+02	95% UCL-NP	W-Test (2)	1.48E+02	Mean-NP	W-Test (2)
Beryllium	mg/kg	6.91E-01	(1)	3.50E+00		mg/kg	7.90E-01	95% UCL-NP	W-Test (2)	6.90E-01	Mean-NP	W-Test (2)
Cadmium	mg/kg	1.15E+00	(1)	5.40E+00		mg/kg	1.52E+00	95% UCL-NP	W-Test (2)	1.22E+00	Mean-NP	W-Test (2)
Chromium Total	mg/kg	1.67E+02	(1)	2.26E+03		mg/kg	2.58E+02	95% UCL-NP	W-Test (2)	1.65E+02	Mean-NP	W-Test (2)
Cobalt	mg/kg	1.81E+01	(1)	5.36E+02	B	mg/kg	8.89E+01	95% UCL-NP	W-Test (2)	1.79E+01	Mean-NP	W-Test (2)
Copper	mg/kg	3.36E+01	(1)	2.57E+02		mg/kg	4.68E+01	95% UCL-NP	W-Test (2)	3.34E+01	Mean-NP	W-Test (2)
Iron	mg/kg	2.43E+04	(1)	1.23E+05	E*	mg/kg	3.85E+04	95% UCL-NP	W-Test (2)	2.42E+04	Mean-NP	W-Test (2)
Lead	mg/kg	5.47E+01	(1)	1.87E+03		mg/kg	2.26E+02	95% UCL-NP	W-Test (2)	5.41E+01	Mean-NP	W-Test (2)
Manganese	mg/kg	1.06E+03	(1)	2.44E+04	E*	mg/kg	4.49E+03	95% UCL-NP	W-Test (2)	1.05E+03	Mean-NP	W-Test (2)
Mercury	mg/kg	4.30E-01	(1)	1.68E+01		mg/kg	8.44E-01	95% UCL-NP	W-Test (2)	4.40E-01	Mean-NP	W-Test (2)
Nickel	mg/kg	2.62E+01	(1)	5.41E+01	*	mg/kg	2.82E+01	95% UCL-NP	W-Test (2)	2.62E+01	Mean-NP	W-Test (2)
Selenium	mg/kg	1.84E+00	(1)	1.59E+01		mg/kg	2.88E+00	95% UCL-NP	W-Test (2)	2.35E+00	Mean-NP	W-Test (2)
Zinc	mg/kg	1.65E+02	(1)	1.09E+03	E	mg/kg	2.08E+02	95% UCL-NP	W-Test (2)	1.64E+02	Mean-NP	W-Test (2)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Francia for data sets with greater than 50 but less than 99 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% U
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

E = Estimated above quantification limit.

B = Value greater or equal to the instrument detection limit but less than the contract required detection limit.

* = Duplicate analysis not within control limits.

(1) Data set is neither normally or lognormally distributed.

(2) Shapiro-Francia W Test was used for data sets where : 50<n<100.

TABLE 3.6

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SLAG

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Aluminum	mg/kg	1.82E+04	(1)	1.13E+05		mg/kg	3.45E+04	95% UCL-NP	W-Test (3)	1.81E+04	Mean-NP	W-Test (3)
Arsenic	mg/kg	6.24E+00	(1)	7.00E+01		mg/kg	1.08E+01	95% UCL-NP	W-Test (3)	6.38E+00	Mean-NP	W-Test (3)
Barium	mg/kg	1.23E+02	(2)	6.75E+02		mg/kg	1.72E+02	95% UCL-T	W-Test (3)	1.29E+02	Mean-T	W-Test (3)
Beryllium	mg/kg	5.38E-01	(2)	3.04E+00		mg/kg	8.09E-01	95% UCL-NP	W-Test (3)	6.07E-01	Mean-NP	W-Test (3)
Cadmium	mg/kg	3.27E+00	(1)	1.41E+02		mg/kg	7.37E+00	95% UCL-NP	W-Test (3)	3.40E+00	Mean-NP	W-Test (3)
Chromium Total	mg/kg	2.31E+03	(1)	1.18E+04		mg/kg	3.02E+03	95% UCL-NP	W-Test (3)	2.30E+03	Mean-NP	W-Test (3)
Chromium VI (Hexavalent)	mg/kg	3.15E+01	(1)	4.30E+02		mg/kg	1.07E+02	95% UCL-NP	W-Test (3)	3.15E+01	Mean-NP	W-Test (3)
Cobalt	mg/kg	1.31E+01	(2)	1.32E+02		mg/kg	1.90E+01	95% UCL-T	W-Test (3)	1.29E+01	Mean-T	W-Test (3)
Copper	mg/kg	1.80E+02	(1)	5.42E+03	E	mg/kg	9.75E+02	95% UCL-NP	W-Test (3)	1.76E+02	Mean-NP	W-Test (3)
Iron	mg/kg	1.39E+04	(2)	6.55E+04		mg/kg	2.54E+04	95% UCL-T	W-Test (3)	1.64E+04	Mean-T	W-Test (3)
Lead	mg/kg	5.69E+01	(2)	1.76E+03		mg/kg	1.33E+02	95% UCL-T	W-Test (3)	5.67E+01	Mean-T	W-Test (3)
Manganese	mg/kg	3.52E+03	(1)	7.83E+04	E*	mg/kg	1.85E+04	95% UCL-NP	W-Test (3)	3.45E+03	Mean-NP	W-Test (3)
Mercury	mg/kg	5.71E-02	(1)	3.75E-01		mg/kg	9.32E-02	95% UCL-NP	W-Test (3)	7.90E-02	Mean-NP	W-Test (3)
Nickel	mg/kg	2.97E+02	(2)	5.16E+03		mg/kg	1.10E+03	95% UCL-T	W-Test (3)	4.30E+02	Mean-T	W-Test (3)
Selenium	mg/kg	5.20E+00	(1)	4.04E+01		mg/kg	8.39E+00	95% UCL-NP	W-Test (3)	5.80E+00	Mean-NP	W-Test (3)
Thallium	mg/kg	4.76E+00	(1)	8.96E+01		mg/kg	8.76E+00	95% UCL-NP	W-Test (3)	5.71E+00	Mean-NP	W-Test (3)
Vanadium	mg/kg	6.60E+01	(1)	2.78E+02		mg/kg	8.16E+01	95% UCL-NP	W-Test (3)	6.57E+01	Mean-NP	W-Test (3)
Zinc	mg/kg	1.24E+02	(2)	1.40E+03		mg/kg	2.15E+02	95% UCL-T	W-Test (3)	1.29E+02	Mean-T	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Francia for data sets with greater than 50 but less than 99 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% UC
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

E = Estimated above quantification limit.

* = Duplicate analysis not within control limits.

(1) Data set is neither normally or lognormally distributed.

(2) Data set is lognormally distributed.

(3) Shapiro-Francia W Test was used for data sets where : 50<n<100.

TABLE 3.7

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Dissolved Metals												
Antimony	mg/L	5.52E-03	(1)	9.15E-03	J	mg/L	9.15E-03	Max	(4)	9.15E-03	Max	(4)
Arsenic	mg/L	1.56E-02	(1)	2.32E-02	J	mg/L	2.32E-02	Max	(4)	2.09E-02	Mean-NP	W-Test (3)
Chromium	mg/L	1.88E-02	(1)	1.06E-01		mg/L	3.29E-02	95% UCL-NP	W-Test (3)	2.20E-02	Mean-NP	W-Test (3)
Iron	mg/L	9.29E-01	(1)	3.92E+00		mg/L	1.81E+00	95% UCL-NP	W-Test (3)	9.70E-01	Mean-NP	W-Test (3)
Manganese	mg/L	1.86E-01	(1)	8.58E-01		mg/L	3.38E-01	95% UCL-NP	W-Test (3)	1.90E-01	Mean-NP	W-Test (3)
Selenium	mg/L	1.54E-02	(1)	5.47E-02		mg/L	2.70E-02	95% UCL-NP	W-Test (3)	2.30E-02	Mean-NP	W-Test (3)
Zinc	mg/L	7.29E-03	(1)	2.63E-02		mg/L	1.28E-02	95% UCL-NP	W-Test (3)	1.10E-02	Mean-NP	W-Test (3)
Total Metals												
Aluminum	mg/L	7.12E+00	(2)	6.43E+01		mg/L	2.33E+01	95% UCL-T	W-Test (3)	9.21E+00	Mean-T	W-Test (3)
Antimony	mg/L	6.59E-03	(1)	1.94E-02		mg/L	1.07E-02	95% UCL-NP	W-Test (3)	1.00E-02	Mean-NP	W-Test (3)
Arsenic	mg/L	1.77E-02	(1)	4.37E-02		mg/L	2.57E-02	95% UCL-NP	W-Test (3)	2.21E-02	Mean-NP	W-Test (3)
Chromium	mg/L	6.27E-02	(2)	6.55E-01		mg/L	1.53E-01	95% UCL-T	W-Test (3)	5.10E-02	Mean-T	W-Test (3)
Chromium VI (Hexavalent)	mg/L	2.23E-02	(1)	1.81E-01		mg/L	3.52E-02	95% UCL-NP	W-Test (3)	2.50E-02	Mean-NP	W-Test (3)
Iron	mg/L	9.57E+00	(1)	8.55E+01		mg/L	1.58E+01	95% UCL-NP	W-Test (3)	9.50E+00	Mean-NP	W-Test (3)
Lead	mg/L	3.75E-02	(1)	3.79E-01		mg/L	6.12E-02	95% UCL-NP	W-Test (3)	3.90E-02	Mean-NP	W-Test (3)
Manganese	mg/L	4.79E-01	(1)	2.47E+00		mg/L	7.06E-01	95% UCL-NP	W-Test (3)	4.76E-01	Mean-NP	W-Test (3)
Selenium	mg/L	2.62E-02	(1)	7.39E-02		mg/L	3.33E-02	95% UCL-NP	W-Test (3)	2.77E-02	Mean-NP	W-Test (3)
Thallium	mg/L	1.04E-02	(1)	1.58E-02	J	mg/L	1.58E-02	Max	(4)	1.58E-02	Mean-NP	(4)
Vanadium	mg/L	2.13E-02	(1)	1.61E-01		mg/L	6.44E-02	95% UCL-NP	W-Test (3)	2.31E-02	Mean-NP	W-Test (3)
Zinc	mg/L	2.14E-01	(1)	1.79E+00		mg/L	3.45E-01	95% UCL-NP	W-Test (3)	2.14E-01	Mean-NP	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Wilk for data sets with under 50 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

J = Associated value is estimated.

(1) Data set is neither normally or lognormally distributed.

(2) Data set is log-normally distributed.

(3) Shapiro-Wilk W Test was used for data sets where n<=50.

(4) The exposure point concentration (EPC) calculated is greater than maximum detected concentration; therefore maximum detected concentration is the EPC.

TABLE 3.8

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Aluminum	mg/L	3.02E+00	(1)	6.67E+01		mg/L	5.74E+00	95% UCL-T	W-Test (3)	2.39E+00	Mean-T	W-Test (3)
Antimony	mg/L	8.14E-03	(2)	1.69E-02		mg/L	1.69E-02	Max	(4)	1.50E-02	Mean-NP	W-Test (3)
Arsenic	mg/L	1.96E-02	(1)	6.48E-02		mg/L	2.26E-02	95% UCL-T	W-Test (3)	1.96E-02	Mean-T	W-Test (3)
Barium	mg/L	1.92E-01	(2)	2.53E+00		mg/L	3.37E-01	95% UCL-NP	W-Test (3)	1.90E-01	Mean-NP	W-Test (3)
Beryllium	mg/L	2.38E-03	(2)	3.04E-03	J	mg/L	3.04E-03	Max	(4)	3.04E-03	Max	(4)
Chromium	mg/L	2.63E-01	(1)	6.39E+00		mg/L	6.84E-01	95% UCL-T	W-Test (3)	2.80E-01	Mean-T	W-Test (3)
Chromium VI (Hexavalent)	mg/L	6.12E-02	(2)	5.71E-01		mg/L	1.02E-01	95% UCL-NP	W-Test (3)	6.30E-02	Mean-NP	W-Test (3)
Copper	mg/L	3.86E-02	(2)	1.09E+00		mg/L	2.66E-01	95% UCL-NP	W-Test (3)	4.20E-02	Mean-NP	W-Test (3)
Iron	mg/L	5.43E+00	(2)	1.51E+02		mg/L	3.15E+01	95% UCL-NP	W-Test (3)	5.30E+00	Mean-NP	W-Test (3)
Lead	mg/L	2.95E-02	(2)	8.65E-01		mg/L	1.84E-01	95% UCL-NP	W-Test (3)	3.00E-02	Mean-NP	W-Test (3)
Manganese	mg/L	7.68E-01	(1)	1.92E+01		mg/L	1.91E+00	95% UCL-T	W-Test (3)	7.19E-01	Mean-T	W-Test (3)
Mercury	mg/L	1.93E-04	(2)	1.30E-03		mg/L	4.00E-04	95% UCL-NP	W-Test (3)	3.60E-04	Mean-NP	W-Test (3)
Nickel	mg/L	2.00E-02	(2)	5.44E-01		mg/L	1.44E-01	95% UCL-NP	W-Test (3)	2.40E-02	Mean-NP	W-Test (3)
Selenium	mg/L	1.54E-02	(2)	9.57E-02		mg/L	2.58E-02	95% UCL-NP	W-Test (3)	2.30E-02	Mean-NP	W-Test (3)
Thallium	mg/L	2.13E-02	(2)	9.36E-02		mg/L	3.42E-02	95% UCL-NP	W-Test (3)	2.90E-02	Mean-NP	W-Test (3)
Vanadium	mg/L	1.51E-02	(2)	2.31E-01		mg/L	2.84E-02	95% UCL-NP	W-Test (3)	2.10E-02	Mean-NP	W-Test (3)
Zinc	mg/L	1.01E-01	(2)	2.84E+00		mg/L	2.66E-01	95% UCL-NP	W-Test (3)	9.93E-02	Mean-NP	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Wilk for data sets with under 50 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% U
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

J = Associated value is estimated.

(1) Data set is log-normally distributed.

(2) Data set is neither normally or lognormally distributed.

(3) Shapiro-Wilk W Test was used for data sets where n<=50.

(4) The exposure point concentration (EPC) calculated is greater than maximum detected concentration; therefore maximum detected concentration is the EPC.

TABLE 3.9

EXPOSURE POINT CONCENTRATION (EPC) SUMMARY FOR CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT

OPERABLE UNIT 3

VANADIUM CORPORATION OF AMERICA

NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal

Chemical of Potential Concern	*Units*	*Arithmetic Mean*	*95% UCL of Normal Data*	*Maximum Detected Concentration*	*Maximum Qualifier*	*EPC Units*	*Reasonable Maximum Exposure*			*Central Tendency*		
							Medium EPC Value	*Medium EPC Statistic*	*Medium EPC Rationale*	*Medium EPC Value*	*Medium EPC Statistic*	*Medium EPC Rationale*
Metals												
Arsenic	mg/kg	6.99E+00	(1)	2.79E+01		mg/kg	1.34E+01	95% UCL-NP	W-Test (3)	7.94E+00	Mean-NP	W-Test (3)
Barium	mg/kg	1.93E+02	(1)	6.66E+02		mg/kg	4.89E+02	95% UCL-NP	W-Test (3)	1.92E+02	Mean-NP	W-Test (3)
Beryllium	mg/kg	5.06E-01	6.30E-01	1.09E+00		mg/kg	6.30E-01	95% UCL-N	W-Test (3)	5.06E-01	Mean-N	W-Test (3)
Cadmium	mg/kg	4.83E-01	(1)	2.10E+00		mg/kg	9.08E-01	95% UCL-NP	W-Test (3)	7.52E-01	Mean-NP	W-Test (3)
Chromium	mg/kg	3.81E+02	(2)	2.38E+03	N*	mg/kg	1.02E+03	95% UCL-T	W-Test (3)	4.09E+02	Mean-T	W-Test (3)
Copper	mg/kg	4.81E+01	(2)	3.07E+02		mg/kg	1.28E+02	95% UCL-T	W-Test (3)	5.42E+01	Mean-T	W-Test (3)
Iron	mg/kg	1.88E+04	2.39E+04	4.26E+04		mg/kg	2.39E+04	95% UCL-N	W-Test (3)	1.88E+04	Mean-N	W-Test (3)
Mercury	mg/kg	8.58E-02	(2)	4.20E-01		mg/kg	1.59E-01	95% UCL-NP	W-Test (3)	9.75E-02	Mean-NP	W-Test (3)
Nickel	mg/kg	4.56E+01	(2)	2.16E+02		mg/kg	1.41E+02	95% UCL-T	W-Test (3)	5.81E+01	Mean-T	W-Test (3)
Selenium	mg/kg	1.02E+01	1.28E+01	2.51E+01		mg/kg	1.28E+01	95% UCL-N	W-Test (3)	1.01E+01	Mean-N	W-Test (3)
Zinc	mg/kg	1.88E+02	(2)	7.98E+02		mg/kg	3.48E+02	95% UCL-T	W-Test (3)	1.95E+02	Mean-T	W-Test (3)

Notes:

For non-detects, 1/2 laboratory detection limit was used as a proxy concentration.

W-Test : Developed by Shapiro and Wilk for data sets with under 50 samples.

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data (95% UCL-T); Non-parametric Method used to Determine 95% UCL (95% UC
Mean of Log-transformed Data (Mean-T); Mean of Normal Data (Mean-N); Non-parametric Method used to Determine Mean (Mean-NP).

J = Associated value is estimated.

N = Spike sample recovery not within control limits.

* = Duplicate analysis not within control limits.

(1) Data set is neither normally or lognormally distributed.

(2) Data set is log-normally distributed.

(3) Shapiro-Wilk W Test was used for data sets where n<=50.

TABLE 3.10

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL AND SLAG - CURRENT MAINTENANCE WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adults

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	USEPA, 2002	100	USEPA, 2002	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	16	Professional Judgement (2)	8	Professional Judgement (2)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (3)	1	Professional Judgement (3)	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	16	Professional Judgement (2)	8	Professional Judgement (2)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	USEPA, 2004	0.02	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (4)	chemical-specific	USEPA, 2004 (4)	
Inhalation	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	INR	Inhalation Rate	m^3/hr	0.83	USEPA, 2002	0.83	USEPA, 2002	CS x INR x ET x EF x ED x 1/PEF x 1/BW x 1/AT
	ET	Exposure Time	hrs/day	8	Professional Judgement (5)	8	Professional Judgement (5)	
	EF	Exposure Frequency	days/year	16	Professional Judgement (2)	8	Professional Judgement (2)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	PEF	Particulate Emission Factor	m^3/kg	1.36E+09	USEPA, 2002	1.36E+09	USEPA, 2002	

Notes:

(1) For surface soil concentrations including slag, see Table 3.1. For surface soil concentrations only, see Table 3.2. For slag concentrations only, see Table 3.3.

(2) Professional Judgement; commercial worker will do maintenance for 2 days/month from April to November or 16 days (RME) and 1 day/month from April to November or 1 days (CT).

(3) Professional Judgment; assumed 100% absorption for conservatism.

(4) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).

(5) Professional Judgment; assumed 8 hour work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.

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

USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.11

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SURFACE SOIL AND SLAG - CURRENT/FUTURE TRESPASSER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	USEPA, 1997	100	USEPA, 1997	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	128	Professional Judgement (2)	64	Professional Judgement (2)	
	ED	Exposure Duration	years	12	Professional Judgement (3)	12	Professional Judgement (3)	
	BW	Body Weight	kg	50	USEPA, 1997 (4)	50	USEPA, 1997 (4)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (5)	1	Professional Judgement (5)	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,400	USEPA, 1997 (6)	4,400	USEPA, 1997 (6)	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	128	Professional Judgement (2)	64	Professional Judgement (2)	
	ED	Exposure Duration	years	12	Professional Judgement (3)	12	Professional Judgement (3)	
	BW	Body Weight	kg	50	USEPA, 1997 (4)	50	USEPA, 1997 (4)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	USEPA, 2004	0.04	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (7)	chemical-specific	USEPA, 2004 (7)	
Inhalation	CS	Chemical Concentration in Surface Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	INR	Inhalation Rate	m^3/hr	1.2	USEPA, 1997 (8)	1.2	USEPA, 1997 (8)	CS x INR x ET x EF x ED x 1/PEF x 1/BW x 1/AT
	ET	Exposure Time	hrs/day	4	Professional Judgement (9)	2	Professional Judgement (9)	
	EF	Exposure Frequency	days/year	128	Professional Judgement (2)	64	Professional Judgement (2)	
	ED	Exposure Duration	years	12	Professional Judgement (3)	12	Professional Judgement (3)	
	BW	Body Weight	kg	50	USEPA, 1997 (4)	50	USEPA, 1997 (4)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
	PEF	Particulate Emission Factor	m^3/kg	1.36E+09	USEPA, 2002	1.36E+09	USEPA, 2002	

Notes:
(1) For surface soil concentrations including slag, see Table 3.1. For surface soil concentrations only, see Table 3.2. For slag concentrations only, see Table 3.3.
(2) Professional Judgement; adolescent will trespass for 16 days/month from April to November or 128 days (RME) and 8 days/month from April to November or 64 days (CT).
(3) Trespasser is an 7 through 18 year old therefore the exposure duration is 12 years.
(4) Body weight is the average of 13 yr old mean body weights, Table 7-3 of Exposure Factor Handbook, Volume 1.
(5) Professional Judgement; assumed 100% absorption for conservatism.
(6) Skin surface area for youths aged 12-13 yrs old; assuming 25% of the total body surface area is exposed.
(7) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).
(8) Recommended short-term exposure inhalation rate for children performing moderate activities, Table 5-23 of Exposure Factor Handbook, Volume 1.
(9) Professional Judgement; adolescent will trespass for 2 hours (CT) and 4 hours (RME).

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 1997: Exposure Factors Handbook. Volume. 1: General Factors. EPA/600/P-95/002Fa. August 1997.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.12

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL AND SLAG - FUTURE INDUSTRIAL/ COMMERCIAL WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/ Commercial Worker
Receptor Age: Adults

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	USEPA, 2002	100	USEPA, 2002	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (2)	1	Professional Judgement (2)	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	USEPA, 2004	0.02	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (3)	chemical-specific	USEPA, 2004 (3)	
Inhalation	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	INR	Inhalation Rate	m^3/hr	0.83	USEPA, 2002	0.83	USEPA, 2002	CS x INR x ET x EF x ED x 1/PEF x 1/BW x 1/AT
	ET	Exposure Time	hrs/day	8	Professional Judgement (4)	8	Professional Judgement (4)	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	PEF	Particulate Emission Factor	m^3/kg	1.36E+09	USEPA, 2002	1.36E+09	USEPA, 2002	

Notes:
(1) For soil concentrations including slag, see Table 3.4. For soil concentrations only, see Table 3.5. For slag concentrations only, see Table 3.6.
(2) Professional Judgment; assumed 100% absorption for conservatism.
(3) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).
(4) Professional Judgment; assumed 8 hour work day.

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.13

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SOIL AND SLAG - FUTURE CONSTRUCTION/ UTILITY WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/ Utility Worker
Receptor Age: Adults

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	330	USEPA, 2002	330	USEPA, 2002	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	20	Professional Judgement (2)	10	Professional Judgement (2)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (3)	1	Professional Judgement (3)	
Dermal	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	20	Professional Judgement (2)	10	Professional Judgement (2)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	USEPA, 2004	0.1	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (4)	chemical-specific	USEPA, 2004 (4)	
Inhalation	CS	Chemical Concentration in Soil	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	INR	Inhalation Rate	m^3/hr	0.83	USEPA, 2002	0.83	USEPA, 2002	CS x INR x ET x EF x ED x 1/PEF x 1/BW x 1/AT
	ET	Exposure Time	hrs/day	8	Professional Judgement (5)	8	Professional Judgement (5)	
	EF	Exposure Frequency	days/year	20	Professional Judgement (2)	10	Professional Judgement (2)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	PEF	Particulate Emission Factor	m^3/kg	4.72E+07	See Table 3.14	4.72E+07	See Table 3.14	

Notes:
(1) For soil concentrations including slag, see Table 3.4. For soil concentrations only, see Table 3.5. For slag concentrations only, see Table 3.6.
(2) Professional Judgement; assumes 2 weeks (CT) and one month (RME) excavation period during a construction campaign.
(3) Professional Judgement; assumed 100% absorption for conservatism.
(4) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).
(5) Professional Judgement; assumed 8-hour work day.

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 2002: USEPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.14

DERIVATION OF PARTICULATE EMISSION FACTOR (PEF) - CONSTRUCTION/ UTILITY WORKER INHALATION EXPOSURE TO PARTICULATES
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

$$PEF_{SC} = Q/C_{sr} \times 1/F_D \times [(T \times A_R) / (556 \times ((W/3)^{0.4} \times ((365\ d/y - p) / 365\ d/y) \times VKT)]$$

$$Q/C_{sr} = A \times EXP [(\ln A_s - B)^2 / C]$$

INPUT PARAMETERS		*REFERENCE*
PEF_{sc}/ subchronic road particulate emission factor (m^3/kg) =	**4.72E+07**	Equation 5-5, USEPA, 2002
Q/C_{sr}/ inverse of ratio of the 1-h geometric mean air concentration =	13.22	Equation 5-6, USEPA, 2002
A/ constant (unitless) =	12.9351	USEPA, 2002
B/ constant (unitless) =	5.7383	USEPA, 2002
C/ constant (unitless) =	71.7711	USEPA, 2002
A_s/ areal extent of site surface soil contamination (acres) =	88.0	Site Specific
F_D/ dispersion correction factor (unitless) =	0.185	USEPA, 2002
T/ total time over which construction occurs (s) =	3.15E+07	USEPA, 2002 (site-specific, within a 1 year construction campaign)
A_R/ surface area of contaminated road segment (m^2) =	3,638	Site Specific (A_R = LR*WR*0.092903 m^2/ft^2)
LR - length of road segment (ft) =	1,958	Site Specific
WR - width of road segment (ft) =	20	USEPA, 2002
W/ mean vehicle weight (tons) =	8	USEPA, 2002, Assumes 20 two-ton cars and 10 twenty-ton trucks (W = (20*2+10*20)/30)
p/ number of days with at least 0.01 inches of precipitation (days/yr) =	150	USEPA, 2002
VKT/ sum of fleet vehicle kilometres traveled during the exposure duration (km) =	358.2	Assuming that the area is configured as a square with the unpaved construction access road segment dividing the square evenly, the road length would be equal to the square root of 356,123 m^2, 596.8 m (0.597 km). Assuming that each vehicle travels the length of the road once per day, 5 days per week for a total of 20 days, (30*0.597*20).

Reference:
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, Office of Emergency and Remedial Response, OSWER 9355.4-24, December 2002.

TABLE 3.15

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR GROUNDWATER - FUTURE CONSTRUCTION/ UTILITY WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/ Utility Worker
Receptor Age: Adult

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CW	Chemical Concentration in Groundwater	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	IR	Ingestion Rate	L/hour	0.005	USEPA, 1989 (2)	0.005	USEPA, 1989 (2)	CW x IR x ET x EF x ED x 1/BW x 1/AT
	ET	Exposure Time	hour/day	2	Professional Judgement (3)	1	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	20	Professional Judgement (4)	10	Professional Judgement (4)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
Dermal	CW	Chemical Concentration in Groundwater	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CW x SA x CF x PC x ET x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	L/cm^3	0.001	–	0.001	–	
	ET	Exposure Time	hour/day	2	Professional Judgement (3)	1	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	20	Professional Judgement (4)	10	Professional Judgement (4)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	PC	Permeability Constant	cm/hour	chemical-specific	USEPA, 2004	chemical-specific	USEPA, 2004	

Notes:

(1) For groundwater concentrations, see Table 3.7.

(2) The inadvertent groundwater ingestion rate is 5 ml/hour or 0.005 L/hour. The incidental ingestion rate of 50 ml/hour as specified in RAGS Part A (1989) was derived from the incidental water ingestion rate for an adult while swimming. Because the workers are not swimming in the exposed groundwater, but instead may have only occasional limited contact, a factor of 10 was applied to arrive at the reasonable incidental ingestion rate of 0.005 L/hr.

(3) Professional Judgement; assumes worker is in direct contact with groundwater for 1 hour/day (CT) and 2 hours/day (RME).

(4) Professional Judgement; assumes 2 weeks (CT) and one month (RME) excavation period during a construction campaign.

Sources :

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.

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

USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.16

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SURFACE WATER - CURRENT MAINTENANCE WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	IR	Ingestion Rate	L/hour	0.005	USEPA, 1989 (2)	0.005	USEPA, 1989 (2)	CW x IR x ET x EF x ED x 1/BW x 1/AT
	ET	Exposure Time	hour/day	1	Professional Judgement (3)	0.5	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	16	Professional Judgement (4)	8	Professional Judgement (4)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CW x SA x CF x PC x ET x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	L/cm^3	0.001	–	0.001	–	
	ET	Exposure Time	hour/day	1	Professional Judgement (3)	0.5	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	16	Professional Judgement (4)	8	Professional Judgement (4)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	PC	Permeability Constant	cm/hour	chemical-specific	USEPA, 2004	chemical-specific	USEPA, 2004	

Notes:

(1) For surface water concentrations, see Table 3.8

(2) The inadvertent surface water ingestion rate is 5 ml/hour or 0.005 L/hour. The incidental ingestion rate of 50 ml/hour as specified in USEPA (1989) was derived from the incidental water ingestion rate for an adult while swimming. Because the workers are not swimming in the surface water, but instead may have only occasional limited contact, a factor of 10 was applied to arrive at the reasonable incidental ingestion rate of 0.005 L/hr.

(3) Professional Judgment; assumes worker is in direct contact with surface water for half an hour/day (CT) and 1 hour/day (RME).

(4) Professional Judgement; commercial worker will do maintenance for 2 days/month from April to November or 16 days (RME) and 1 day/month from April to November or 1 days (CT).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.

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

USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.17

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SURFACE WATER - CURRENT/FUTURE TRESPASSER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	IR	Ingestion Rate	L/hour	0.005	USEPA, 1989 (2)	0.005	USEPA, 1989 (2)	CW x IR x ET x EF x ED x 1/BW x 1/AT
	ET	Exposure Time	hour/day	4	Professional Judgement (3)	2	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	128	Professional Judgement (4)	64	Professional Judgement (4)	
	ED	Exposure Duration	years	12	Professional Judgement (5)	12	Professional Judgement (5)	
	BW	Body Weight	kg	50	USEPA, 1997 (6)	50	USEPA, 1997 (6)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,400	USEPA, 1997 (7)	4,400	USEPA, 1997 (7)	CW x SA x CF x PC x ET x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	L/cm^3	0.001	–	0.001	–	
	ET	Exposure Time	hour/day	4	Professional Judgement (3)	2	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	128	Professional Judgement (4)	64	Professional Judgement (4)	
	ED	Exposure Duration	years	12	Professional Judgement (5)	12	Professional Judgement (5)	
	BW	Body Weight	kg	50	USEPA, 1997 (6)	50	USEPA, 1997 (6)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
	PC	Permeability Constant	cm/hour	chemical-specific	USEPA, 2004	chemical-specific	USEPA, 2004	

Notes:

(1) For surface water concentrations, see Table 3.8

(2) The inadvertent surface water ingestion rate is 5 ml/hour or 0.005 L/hour. The incidental ingestion rate of 50 ml/hour as specified in USEPA (1989) was derived from the incidental water ingestion rate for an adult while swimming. Because the trespassers are not swimming in the surface water, but instead may have only occasional limited contact, a factor of 10 was applied to arrive at the reasonable incidental ingestion rate of 0.005 L/hr.

(3) Professional Judgement; adolescent will trespass for 2 hours (CT) and 4 hours (RME).

(4) Professional Judgement; adolescent will trespass for 16 days/month from April to November or 128 days (RME) and 8 days/month from April to November or 64 days (CT).

(5) Trespasser is an 7 through 18 year old therefore the exposure duration is 12 years.

(6) Body weight is the average of 13 yr old mean body weights, Table 7-3 of Exposure Factor Handbook, Volume 1.

(7) Skin surface area for youths aged 12-13 yrs old; assuming 25% of the total body surface area is exposed.

Sources :

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.

USEPA, 1997: Exposure Factors Handbook. Volume. 1: General Factors. EPA/600/P-95/002Fa. August 1997.

USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.18

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SURFACE WATER - FUTURE INDUSTRIAL/ COMMERCIAL WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/ Commercial Worker
Receptor Age: Adult

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	IR	Ingestion Rate	L/hour	0.005	USEPA, 1989 (2)	0.005	USEPA, 1989 (2)	CW x IR x ET x EF x ED x 1/BW x 1/AT
	ET	Exposure Time	hour/day	1	Professional Judgement (3)	0.5	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CW x SA x CF x PC x ET x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	L/cm^3	0.001	–	0.001	–	
	ET	Exposure Time	hour/day	1	Professional Judgement (3)	0.5	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	PC	Permeability Constant	cm/hour	chemical-specific	USEPA, 2004	chemical-specific	USEPA, 2004	

Notes:

(1) For surface water concentrations, see Table 3.8

(2) The inadvertent surface water ingestion rate is 5 ml/hour or 0.005 L/hour. The incidental ingestion rate of 50 ml/hour as specified in USEPA (1989) was derived from the incidental water ingestion rate for an adult while swimming. Because the workers are not swimming in the surface water, but instead may have only occasional limited contact, a factor of 10 was applied to arrive at the reasonable incidental ingestion rate of 0.005 L/hr.

(3) Professional Judgment; assumes worker is in direct contact with surface water for half an hour/day (CT) and 1 hour/day (RME).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.

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

USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.19

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SURFACE WATER - FUTURE CONSTRUCTION/ UTILITY WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/ Utility Worker
Receptor Age: Adult

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	IR	Ingestion Rate	L/hour	0.005	USEPA, 1989 (2)	0.005	USEPA, 1989 (2)	CW x IR x ET x EF x ED x 1/BW x 1/AT
	ET	Exposure Time	hour/day	2	Professional Judgement (3)	1	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	20	Professional Judgement (4)	10	Professional Judgement (4)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
Dermal	CW	Chemical Concentration in Surface Water	mg/L	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CW x SA x CF x PC x ET x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	L/cm^3	0.001	–	0.001	–	
	ET	Exposure Time	hour/day	2	Professional Judgement (3)	1	Professional Judgement (3)	
	EF	Exposure Frequency	days/year	20	Professional Judgement (4)	10	Professional Judgement (4)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	PC	Permeability Constant	cm/hour	chemical-specific	USEPA, 2004	chemical-specific	USEPA, 2004	

Notes:

(1) For surface water concentrations, see Table 3.8

(2) The inadvertent surface water ingestion rate is 5 ml/hour or 0.005 L/hour. The incidental ingestion rate of 50 ml/hour as specified in USEPA (1989) was derived from the incidental water ingestion rate for an adult while swimming. Because the workers are not swimming in the surface water, but instead may have only occasional limited contact, a factor of 10 was applied to arrive at the reasonable incidental ingestion rate of 0.005 L/hr.

(3) Professional Judgment; assumes worker is in direct contact with groundwater for 1 hour/day (CT) and 2 hours/day (RME).

(4) Professional Judgement; assumes 2 weeks (CT) and one month (RME) excavation period during a construction campaign.

Sources :

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.

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

USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.20

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SEDIMENT - CURRENT MAINTENANCE WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adults

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	USEPA, 2002	100	USEPA, 2002	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	16	Professional Judgement (2)	8	Professional Judgement (2)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (3)	1	Professional Judgement (3)	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	16	Professional Judgement (2)	8	Professional Judgement (2)	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	USEPA, 2004	0.02	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (4)	chemical-specific	USEPA, 2004 (4)	

Notes:
(1) For sediment concentrations, see Table 3.9
(2) Professional Judgement; commercial worker will do maintenance for 2 days/month from April to November or 16 days (RME) and 1 day/month from April to November or 1 days (CT).
(3) Professional Judgment; assumed 100% absorption for conservatism.
(4) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).

Sources :
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.21

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SEDIMENT - CURRENT/FUTURE TRESPASSER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	USEPA, 1997	100	USEPA, 1997	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	128	Professional Judgement (2)	64	Professional Judgement (2)	
	ED	Exposure Duration	years	12	Professional Judgement (3)	12	Professional Judgement (3)	
	BW	Body Weight	kg	50	USEPA, 1997 (4)	50	USEPA, 1997 (4)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (5)	1	Professional Judgement (5)	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	4,400	USEPA, 1997 (6)	4,400	USEPA, 1997 (6)	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	128	Professional Judgement (2)	64	Professional Judgement (2)	
	ED	Exposure Duration	years	12	Professional Judgement (3)	12	Professional Judgement (3)	
	BW	Body Weight	kg	50	USEPA, 1997 (4)	50	USEPA, 1997 (4)	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	4,380	USEPA, 1989	4,380	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	USEPA, 2004	0.04	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (7)	chemical-specific	USEPA, 2004 (7)	

Notes:
(1) For sediment concentrations, see Table 3.9.
(2) Professional Judgement; adolescent will trespass for 16 days/month from April to November or 128 days (RME) and 8 days/month from April to November or 64 days (CT).
(3) Trespasser is an 7 through 18 year old therefore the exposure duration is 12 years.
(4) Body weight is the average of 13 yr old mean body weights, Table 7-3 of Exposure Factor Handbook, Volume 1.
(5) Professional Judgement; assumed 100% absorption for conservatism.
(6) Skin surface area for youths aged 12-13 yrs old; assuming 25% of the total body surface area is exposed.
(7) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 1997: Exposure Factors Handbook. Volume. 1: General Factors. EPA/600/P-95/002Fa. August 1997.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.22

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SEDIMENT - FUTURE INDUSTRIAL/ COMMERCIAL WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/ Commercial Worker
Receptor Age: Adults

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	100	USEPA, 2002	100	USEPA, 2002	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (2)	1	Professional Judgement (2)	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	250	USEPA, 2004	219	USEPA, 2004	
	ED	Exposure Duration	years	25	USEPA, 2004	9	USEPA, 2004	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	9,125	USEPA, 1989	3,285	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.2	USEPA, 2004	0.02	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (3)	chemical-specific	USEPA, 2004 (3)	

Notes:
(1) For sediment concentrations, see Table 3.9
(2) Professional Judgment; assumed 100% absorption for conservatism.
(3) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.23

VALUES USED FOR DAILY INTAKE CALCULATIONS FOR SEDIMENT - FUTURE CONSTRUCTION/ UTILITY WORKER
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/ Utility Worker
Receptor Age: Adults

Exposure Route	*Parameter Code*	*Parameter Definition*	*Units*	*RME Value*	*RME Rationale/ Reference*	*CT Value*	*CT Rationale/ Reference*	*Intake Equation/ Model Name*
Ingestion	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR	Ingestion Rate of Soil	mg/day	330	USEPA, 2002	330	USEPA, 2002	CS x IR x ABS x CF x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	20	Professional Judgement (2)	10	Professional Judgement (2)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	ABS	Absorption Factor	%/100	1	Professional Judgement (3)	1	Professional Judgement (3)	
Dermal	CS	Chemical Concentration in Sediment	mg/kg	(1)	(1)	(1)	(1)	CDI (mg/kg-day) =
	SA	Skin Surface Area Available for Contact	cm^2	3,300	USEPA, 2004	3,300	USEPA, 2004	CS x CF x SA x AF x ABS x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	–	1.00E-06	–	
	EF	Exposure Frequency	days/year	20	Professional Judgement (2)	10	Professional Judgement (2)	
	ED	Exposure Duration	years	1	Professional Judgement	1	Professional Judgement	
	BW	Body Weight	kg	70	USEPA, 2002	70	USEPA, 2002	
	AT-C	Averaging Time (cancer)	days	25,550	USEPA, 1989	25,550	USEPA, 1989	
	AT-N	Averaging Time (non-cancer)	days	365	USEPA, 1989	365	USEPA, 1989	
	AF	Soil to Skin Adherence Factor	mg/cm^2	0.3	USEPA, 2004	0.1	USEPA, 2004	
	ABS	Absorption Factor	%/100	chemical-specific	USEPA, 2004 (4)	chemical-specific	USEPA, 2004 (4)	

Notes:
(1) For sediment concentrations, see Table 3.9.
(2) Professional Judgement; assumes 2 weeks (CT) and one month (RME) excavation period during a construction campaign.
(3) Professional Judgement; assumed 100% absorption for conservatism.
(4) Published numbers include: Arsenic (3%), Cadmium (0.1%), Metals (1%).

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual, Part A OERR. EPA/540-1-89-002.
USEPA, 2002: USEPA Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.
USEPA, 2004: RAGs Volume 1, Human Health Evaluation Manual, Part E: Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

TABLE 3.24

ADULT LEAD MODEL FOR MAINTENANCE WORKERS EXPOSED TO LEAD
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Model Parameters	*Symbol*	*Units*	*Surface Soil & Slag Maintenance Worker*	*Surface Soil Maintenance Worker*	*Surface Slag Maintenance Worker*	*Ref*
Concentration of Lead in Soil	PbS	µg/g	309	–	1221	Site-Specific
Concentration of Lead in Surface Water	PbW	µg/L	184	184	184	Site-Specific
95th Percentile PbB in fetus	$PbB_{fetal,0.95}$	µg/dL	10	10	10	(1)
R (Mean ratio of fetal to maternal PbB)	$R_{fetal/maternal}$	unitless	0.9	0.9	0.9	(1)
Individual geometric standard deviation	GSD_i	unitless	2	2	2	(2)
Baseline blood lead value	$PbB_{adult,0}$	µg/dL	1.98	1.98	1.98	(2)
Biokinetic slope factor	BKSF	µg/dL per µg/day	0.4	0.4	0.4	(1)
Soil ingestion rate	IR_S	g/day	0.1	0.1	0.1	(3)
Water ingestion rate	IR_W	L/d	0.005	0.005	0.005	0.005 L/h x 1 h/d
Soil Exposure Frequency	EF_S	days/yr	16	16	16	Exposure scenario Specific
Water Exposure Frequency	EF_W	days/yr	16	16	16	Exposure scenario Specific
Absolute absorption fraction of lead in soil	AF_S		0.12	0.12	0.12	(1)
Absolute absorption fraction of lead in water	AF_W		0.2	0.2	0.2	(1)
Averaging time	AT	days/yr	365	365	365	(1)

EXPOSURE VALUE	Formula	PbB (µg/dL)	PbB (µg/dL)	PbB (µg/dL)
Blood lead contribution from Soil	$PbB_{SOIL} = (PbS \times BKSF \times IR_S \times AF_S \times EF_S)/AT$	6.50E-02	–	2.57E-01
Blood lead contribution from Surface Water	$PbB_{WATER} = (PbW \times BKSF \times IR_w \times AF_w \times EF_w)/AT$	3.23E-03	3.23E-03	3.23E-03
Total from site exposure	$PbB_{From\ Site\ Exposure} = PbB_{SOIL} + PbB_{WATER}$	6.82E-02	3.23E-03	2.60E-01
Total from site exposure + non-site exposure	$PbB_{site+non-site} = PbB_{From\ Site\ Exposure} + PbB_{adult,0}$	2.05	1.98	2.24
95th percentile for fetal blood lead	$PbB_{fetal,0.95} = R_{fetal/maternal} \times GSD_i^{1.645} \times PbB_{site+non-site}$	5.77	5.58	6.31

Notes:

(1) USEPA, 2003:Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. January 2003.

(2) USEPA, 2002. Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). Office of Solid Waste and Emergency Response. OSWER #9285.7-52, March 2002.

(3) USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

TABLE 3.25

ADULT LEAD MODEL FOR ADOLESCENT TRESPASSERS EXPOSED TO LEAD
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Model Parameters	*Symbol*	*Units*	*Surface Soil & Slag Adolescent Trespasser*	*Surface Soil Adolescent Trespasser*	*Surface Slag Adolescent Trespasser*	*Ref*
Concentration of Lead in Soil	PbS	µg/g	309	–	1221	Site-Specific
Concentration of Lead in Surface Water	PbW	µg/L	184	184	184	Site-Specific
95th Percentile PbB in fetus	$PbB_{fetal,0.95}$	µg/dL	10	10	10	(1)
R (Mean ratio of fetal to maternal PbB)	$R_{fetal/maternal}$	unitless	0.9	0.9	0.9	(1)
Individual geometric standard deviation	GSD_i	unitless	2	2	2	(2)
Baseline blood lead value	$PbB_{adult,0}$	µg/dL	1.98	1.98	1.98	(2)
Biokinetic slope factor	BKSF	µg/dL per µg/day	0.4	0.4	0.4	(1)
Soil ingestion rate	IR_S	g/day	0.1	0.1	0.1	(3)
Water ingestion rate	IR_W	L/d	0.005	0.005	0.005	0.005 L/h x 1 h/d
Soil Exposure Frequency	EF_S	days/yr	128	128	128	Exposure scenario Specific
Water Exposure Frequency	EF_W	days/yr	128	128	128	Exposure scenario Specific
Absolute absorption fraction of lead in soil	AF_S		0.12	0.12	0.12	(1)
Absolute absorption fraction of lead in water	AF_W		0.2	0.2	0.2	(1)
Averaging time	AT	days/yr	365	365	365	(1)

EXPOSURE VALUE	Formula	PbB (µg/dL)	PbB (µg/dL)	PbB (µg/dL)
Blood lead contribution from Soil	$PbB_{SOIL} = (PbS \times BKSF \times IR_S \times AF_S \times EF_S)/AT$	5.20E-01	–	2.06E+00
Blood lead contribution from Surface Water	$PbB_{WATER} = (PbW \times BKSF \times IR_w \times AF_w \times EF_w)/AT$	2.58E-02	2.58E-02	2.58E-02
Total from site exposure	$PbB_{From\ Site\ Exposure} = PbB_{SOIL} + PbB_{WATER}$	5.45E-01	2.58E-02	2.08E+00
Total from site exposure + non-site exposure	$PbB_{site\ +\ non\text{-}site} = PbB_{From\ Site\ Exposure} + PbB_{adult,\ 0}$	2.53	2.01	4.06
95th percentile for fetal blood lead	$PbB_{fetal,0.95} = R_{fetal/maternal} \times GSD_i^{1.645} \times PbB_{site\ +\ non\text{-}site}$	**7.11**	**5.65**	**11.43**

Notes:

(1) USEPA, 2003:Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. January 2003.

(2) USEPA, 2002: Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). Office of Solid Waste and Emergency Response. OSWER #9285.7-52, March 2002.

(3) USEPA, 1997: Exposure Factors Handbook. Volume. 1: General Factors. EPA/600/P-95/002Fa. August 1997.

TABLE 3.26

ADULT LEAD MODEL FOR INDUSTRIAL/ COMMERCIAL WORKERS EXPOSED TO LEAD
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Model Parameters	*Symbol*	*Units*	*Soil & Slag Industrial Worker*	*Soil Industrial Worker*	*Slag Industrial Worker*	*Ref*
Concentration of Lead in Soil	PbS	µg/g	81.6	226	133	Site-Specific
Concentration of Lead in Surface Water	PbW	µg/L	184	184	184	Site-Specific
95th Percentile PbB in fetus	$PbB_{fetal,0.95}$	µg/dL	10	10	10	(1)
R (Mean ratio of fetal to maternal PbB)	$R_{fetal/maternal}$	unitless	0.9	0.9	0.9	(1)
Individual geometric standard deviation	GSD_i	unitless	2	2	2	(2)
Baseline blood lead value	$PbB_{adult,0}$	µg/dL	1.98	1.98	1.98	(2)
Biokinetic slope factor	BKSF	µg/dL per µg/day	0.4	0.4	0.4	(1)
Soil ingestion rate	IR_S	g/day	0.1	0.1	0.1	(3)
Water ingestion rate	IR_W	L/d	0.005	0.005	0.005	0.005 L/h x 1 h/d
Soil Exposure Frequency	EF_S	days/yr	250	250	250	Exposure scenario Specific
Water Exposure Frequency	EF_W	days/yr	250	250	250	Exposure scenario Specific
Absolute absorption fraction of lead in soil	AF_S		0.12	0.12	0.12	(1)
Absolute absorption fraction of lead in water	AF_W		0.2	0.2	0.2	(1)
Averaging time	AT	days/yr	365	365	365	(1)

EXPOSURE VALUE	Formula	PbB (µg/dL)	PbB (µg/dL)	PbB (µg/dL)
Blood lead contribution from Soil	$PbB_{SOIL} = (PbS \times BKSF \times IR_S \times AF_S \times EF_S)/AT$	2.68E-01	7.44E-01	4.38E-01
Blood lead contribution from Surface Water	$PbB_{WATER} = (PbW \times BKSF \times IR_w \times AF_w \times EF_w)/AT$	5.04E-02	5.04E-02	5.04E-02
Total from site exposure	$PbB_{From\ Site\ Exposure} = PbB_{SOIL} + PbB_{WATER}$	3.19E-01	7.94E-01	4.88E-01
Total from site exposure + non-site exposure	$PbB_{site\ +\ non\text{-}site} = PbB_{From\ Site\ Exposure} + PbB_{adult,0}$	2.30	2.77	2.47
95th percentile for fetal blood lead	$PbB_{fetal,0.95} = R_{fetal/maternal} \times GSD_i^{1.645} \times PbB_{site\ +\ non\text{-}site}$	6.47	7.81	6.95

Notes:

(1) USEPA, 2003:Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. January 2003.

(2) USEPA, 2002. Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). Office of Solid Waste and Emergency Response. OSWER #9285.7-52, March 2002.

(3) USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

TABLE 3.27

ADULT LEAD MODEL FOR CONSTRUCTION/ UTILITY WORKERS EXPOSED TO LEAD
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Model Parameters	*Symbol*	*Units*	*Soil & Slag Construction Worker*	*Soil Construction Worker*	*Slag Construction Worker*	*Ref*
Concentration of Lead in Soil	PbS	µg/g	81.6	226	133	Site-Specific
Concentration of Lead in Ground Water	PbW	µg/L	61.2	61.2	61.2	Site-Specific
Concentration of Lead in Surface Water	PbW	µg/L	184	184	184	Site-Specific
95th Percentile PbB in fetus	$PbB_{fetal,0.95}$	µg/dL	10	10	10	(1)
R (Mean ratio of fetal to maternal PbB)	$R_{fetal/maternal}$	unitless	0.9	0.9	0.9	(1)
Individual geometric standard deviation	GSD_i	unitless	2	2	2	(2)
Baseline blood lead value	$PbB_{adult,0}$	µg/dL	1.98	1.98	1.98	(2)
Biokinetic slope factor	BKSF	µg/dL per µg/day	0.4	0.4	0.4	(1)
Soil ingestion rate	IR_S	g/day	0.33	0.33	0.33	(3)
Water ingestion rate	IR_W	L/d	0.005	0.005	0.005	0.005 L/h x 1 h/d
Soil Exposure Frequency	EF_S	days/yr	20	20	20	Exposure scenario Specific
Water Exposure Frequency	EF_W	days/yr	20	20	20	Exposure scenario Specific
Absolute absorption fraction of lead in soil	AF_S		0.12	0.12	0.12	(1)
Absolute absorption fraction of lead in water	AF_W		0.2	0.2	0.2	(1)
Averaging time	AT	days/yr	365	365	365	(1)

EXPOSURE VALUE	Formula	PbB (µg/dL)	PbB (µg/dL)	PbB (µg/dL)
Blood lead contribution from Soil	$PbB_{SOIL} = (PbS \times BKSF \times IR_S \times AF_S \times EF_S)/AT$	7.08E-02	1.96E-01	1.16E-01
Blood lead contribution from Ground Water	$PbB_{WATER} = (PbW \times BKSF \times IR_w \times AF_w \times EF_w)/AT$	1.34E-03	1.34E-03	1.34E-03
Blood lead contribution from Surface Water	$PbB_{WATER} = (PbW \times BKSF \times IR_w \times AF_w \times EF_w)/AT$	4.03E-03	4.03E-03	4.03E-03
Total from site exposure	$PbB_{From\ Site\ Exposure} = PbB_{SOIL} + PbB_{WATER}$	7.62E-02	2.02E-01	1.21E-01
Total from site exposure + non-site exposure	$PbB_{site\ +\ non\text{-}site} = PbB_{From\ Site\ Exposure} + PbB_{adult,\ 0}$	2.06	2.18	2.10
95th percentile for fetal blood lead	$PbB_{fetal,0.95} = R_{fetal/maternal} \times GSD_i^{1.645} \times PbB_{site\ +\ non\text{-}site}$	**5.79**	**6.14**	**5.91**

Notes:

(1) USEPA, 2003:Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. January 2003.

(2) USEPA, 2002. Blood Lead Concentrations of U.S. Adult Females: Summary Statistics from Phase 1 and 2 of the National Health and Nutrition Evaluation Survey (NHANES III). Office of Solid Waste and Emergency Response. OSWER #9285.7-52, March 2002.

(3) USEPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December 2002.

TABLE 4.1

NON-CANCER TOXICITY DATA – ORAL/DERMAL ROUTE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Chemical of Potential Concern (COPC)	*Chronic/ Subchronic*	*Oral RfD Value*	*Oral RfD Units*	*Oral to Dermal Adjustment Factor (1)*	*Adjusted Dermal RfD (2)*	*Units*	*Primary Target Organ*	*Combined Uncertainty/Modifying Factors*	*Sources of RfD: Target Organ*	*Dates of RfD: Target Organ (3) (MM/DD/YY)*
Metals										
Aluminum	chronic	1.00E+00	mg/kg-d	100%	1.00E+00	mg/kg-d	–	–	NCEA	10/01/04
Antimony	chronic	4.00E-04	mg/kg-d	15%	6.00E-05	mg/kg-d	blood system	1000	IRIS	11/10/04
Arsenic	chronic	3.00E-04	mg/kg-d	100%	3.00E-04	mg/kg-d	skin discoloration	3	IRIS	11/10/04
Barium	chronic	7.00E-02	mg/kg-d	7%	4.90E-03	mg/kg-d	no effects	3	IRIS	11/10/04
Beryllium	chronic	2.00E-03	mg/kg-d	0.7%	1.40E-05	mg/kg-d	chronic beryllium disease	300	IRIS	11/10/04
Cadmium	chronic	5.00E-04	mg/kg-d	5%	2.50E-05	mg/kg-d	kidney	10	IRIS	11/10/04
Chromium	chronic	1.50E+00	mg/kg-d	1.3%	1.95E-02	mg/kg-d	no effects	1000	IRIS	11/10/04
Chromium VI (Hexavalent)	chronic	3.00E-03	mg/kg-d	2.5%	7.50E-05	mg/kg-d	no effects	900	IRIS	11/10/04
Cobalt	chronic	2.00E-02	mg/kg-d	100%	2.00E-02	mg/kg-d	–	–	NCEA	10/01/04
Copper	chronic	4.00E-02	mg/kg-d	100%	4.00E-02	mg/kg-d	gastrointestinal system	–	HEAST	07/01/97
Iron	chronic	3.00E-01	mg/kg-d	100%	3.00E-01	mg/kg-d	–	–	NCEA	10/01/04
Lead	chronic	–	–	–	–	–	–	–	–	–
Manganese	chronic	4.67E-02	mg/kg-d	4%	1.87E-03	mg/kg-d	central nervous system	3	IRIS	11/10/04
Mercury	chronic	3.00E-04	mg/kg-d	100%	3.00E-04	mg/kg-d	autoimmune system	1000	IRIS	11/10/04
Nickel	chronic	2.00E-02	mg/kg-d	4%	8.00E-04	mg/kg-d	body weight	300	IRIS	11/10/04
Selenium	chronic	5.00E-03	mg/kg-d	100%	5.00E-03	mg/kg-d	clinical selenosis	3	IRIS	11/10/04
Thallium	chronic	7.00E-05	mg/kg-d	100%	7.00E-05	mg/kg-d	liver	3000	IRIS	11/10/04
Vanadium	chronic	1.00E-03	mg/kg-d	2.6%	2.60E-05	mg/kg-d	–	–	NCEA	10/01/04
Zinc	chronic	3.00E-01	mg/kg-d	100%	3.00E-01	mg/kg-d	blood system	3	IRIS	11/10/04

Notes:

– = Not Available

N/A = Not Applicable

(1) USEPA, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part E Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004.

(2) Adjusted Dermal RfD = Oral RfD x Oral to Dermal Adjustment Factor

(3) IRIS, Integrated Risk Information System Database, November 10, 2004.
Provisional values supplied by NCEA. Values may be taken from either Region III Risk-Based Concentration Table (10/08/04) or Region IX Preliminary Remediation Goals Table (10/20/04).
HEAST, Health Effects Assessment Summary Table, July 1, 1997.

TABLE 4.2

NON-CANCER TOXICITY DATA -- INHALATION
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Chemical of Potential Concern (COPC)	*Chronic/ Subchronic*	*Value Inhalation RfC*	*Units*	*Adjusted Inhalation RfD (1)*	*Units*	*Primary Target Organ*	*Combined Uncertainty/Modifying Factors*	*Sources of RfC:RfD: Target Organ*	*Dates (2) (MM/DD/YY)*
Metals									
Aluminum	chronic	3.50E-03	mg/m3	1.00E-03	mg/kg-d	–	–	NCEA	10/01/04
Antimony	–	–	–	–	–	–	–	–	–
Arsenic	–	–	–	–	–	–	–	–	–
Barium	chronic	5.00E-04	mg/m3	1.40E-04	mg/kg-d	no effects	1000	HEAST	07/01/97
Beryllium	chronic	2.00E-05	mg/m3	5.70E-06	mg/kg-d	chronic beryllium disease	10	IRIS	11/10/04
Cadmium	chronic	2.00E-04	mg/m3	5.70E-05	mg/kg-d	–	–	NCEA	10/01/04
Chromium	–	–	–	–	–	–	–	–	–
Chromium VI (Hexavalent) (3)	chronic	1.00E-04	mg/m3	2.80E-05	mg/kg-d	no effects	300	IRIS	11/10/04
Cobalt	chronic	2.00E-05	mg/m3	5.70E-06	mg/kg-d	–	–	NCEA	10/01/04
Copper	–	–	–	–	–	–	–	–	–
Iron	–	–	–	–	–	–	–	–	–
Lead	–	–	–	–	–	–	–	–	–
Manganese	chronic	5.00E-05	mg/m3	1.43E-05	mg/kg-d	central nervous system	1000	IRIS	08/16/04
Mercury	chronic	3.00E-04	mg/m3	8.60E-05	mg/kg-d	autoimmune system	30	IRIS	08/16/04
Nickel	–	–	–	–	–	–	–	–	–
Selenium	–	–	–	–	–	–	–	–	–
Thallium	–	–	–	–	–	–	–	–	–
Vanadium	–	–	–	–	–	–	–	–	–
Zinc	–	–	–	–	–	–	–	–	–

Notes:

– = Not Available

(1) (RfC x Inhalation Rate)/Body Weight

(2) IRIS, Integrated Risk Information System Database, November 10, 2004.
Provisional values supplied by NCEA. Values may be taken from either Region III Risk-Based Concentration Table (10/08/04) or Region IX Preliminary Remediation Goals Table (10/20/04).
HEAST, Health Effects Assessment Summary Table, July 1, 1997.

(3) Toxicity data for Chromium VI particulates.

TABLE 4.3

CANCER TOXICITY DATA – ORAL/DERMAL ROUTE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Chemical of Potential Concern (COPC)	*Oral Cancer Slope Factor*	*Oral to Dermal Adjustment Factor (1)*	*Adjusted Dermal Cancer Slope Factor (2)*	*Units*	*Weight of Evidence/ Cancer Guideline Description*	*Source*	*Date (3) (MM/DD/YY)*
Metals							
Aluminum	–	–	–	–	–	–	–
Antimony	–	–	–	–	–	–	–
Arsenic	1.50E+00	100%	1.50E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	11/10/04
Barium	–	–	–	–	D	–	–
Beryllium	–	–	–	–	B1	–	–
Cadmium	–	–	–	–	B1	–	–
Chromium	–	–	–	–	D	–	–
Chromium VI (Hexavalent)	–	–	–	–	–	–	–
Cobalt	–	–	–	–	–	–	–
Copper	–	–	–	–	D	–	–
Iron	–	–	–	–	–	–	–
Lead	–	–	–	–	B2	–	–
Manganese	–	–	–	–	D	–	–
Mercury	–	–	–	–	D	–	–
Nickel	–	–	–	–	–	–	–
Selenium	–	–	–	–	D	–	–
Thallium	–	–	–	–	–	–	–
Vanadium	–	–	–	–	–	–	–
Zinc	–	–	–	–	D	–	–

Notes:

– = Not Available

(1) USEPA, Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual, Part E Supplemental Guidance for Dermal Risk Assessment, EPA/540/R/99/005, July 2004

(2) Adjusted Dermal CSF = Oral CSF / Oral to Dermal Adjustment Factor

(3) IRIS, Integrated Risk Information System Database, November 10, 2004.
Provisional values supplied by NCEA. Values may be taken from either Region III Risk-Based Concentration Table (10/08/04) or Region IX Preliminary Remediation Goals Table (10/20/04).
HEAST, Health Effects Assessment Summary Table, July 1, 1997.

EPA Weight of Evidence Classification :

A - Known Human carcinogen

B1 - Probable human carcinogen - indicates that limited human data are available

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

TABLE 4.4

CANCER TOXICITY DATA – INHALATION
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Chemical of Potential Concern (COPC)	*Unit Risk*	*Units*	*Adjustment (1)*	*Inhalation Cancer Slope Factor (2)*	*Units*	*Weight of Evidence/ Cancer Guideline Description*	*Source*	*Date (3) (MM/DD/YY)*
Metals								
Aluminum	–	–	–	–	–	–	–	–
Antimony	–	–	–	–	–	–	–	–
Arsenic	4.30E-03	$\mu g/m^3$	3500	1.50E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	11/10/04
Barium	–	–	–	–	–	D	–	–
Beryllium	2.40E-03	$\mu g/m^3$	3500	8.40E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	11/10/04
Cadmium	1.80E-03	$\mu g/m^3$	3500	6.30E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	11/10/04
Chromium	–	–	–	–	–	D	–	–
Chromium VI (Hexavalent)	1.20E-02	$\mu g/m^3$	3500	4.20E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	11/10/04
Cobalt	2.80E-03	$\mu g/m^3$	3500	9.80E+00	$(mg/kg\text{-}day)^{-1}$	–	NCEA	10/01/04
Copper	–	–	–	–	–	D	–	–
Iron	–	–	–	–	–	–	–	–
Lead	–	–	–	–	–	B2	–	–
Manganese	–	–	–	–	–	D	–	–
Mercury	–	–	–	–	–	D	–	–
Nickel	–	–	–	–	–	–	–	–
Selenium	–	–	–	–	–	D		–
Thallium	–	–	–	–	–	–	–	–
Vanadium	–	–	–	–	–	–	–	–
Zinc	–	–	–	–	–	D	–	–

Note:

– = Not Available

(1) Adjustment Factor = 70 kg x 1/20 m^3/day x 1,000 $\mu g/mg$

(2) Inhalation CSF = Unit Risk x Adjustment Factor

(3) IRIS, Integrated Risk Information System Database, November 10, 2004.
Provisional values supplied by NCEA. Values may be taken from either Region III Risk-Based Concentration Table (10/08/04) or Region IX Preliminary Remediation Goals Table (10/20/04).
HEAST, Health Effects Assessment Summary Table, July 1, 1997.

EPA Weight of Evidence Classification :

A - Known Human carcinogen
B1 - Probable human carcinogen - indicates that limited human data are available
B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 5.1

RISK ASSESSMENT SUMMARY FOR CURRENT/FUTURE TRESPASSER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/ Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Surface Soil and Slag	Surface Soil/ Ambient Air	–	Aluminum	NC	NC	NC	NC	Aluminum	–	2.59E-02	9.14E-04	2.28E-03	2.91E-02
			Antimony	NC	NC	NC	NC	Antimony	blood system	6.70E-02	NC	3.93E-02	1.06E-01
			Arsenic	3.26E-06	1.15E-09	8.60E-07	4.12E-06	Arsenic	skin discoloration	4.22E-02	NC	1.11E-02	5.34E-02
			Cadmium	NC	7.00E-10	NC	7.00E-10	Cadmium	kidney	3.67E-02	1.14E-05	6.46E-03	4.32E-02
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.24E-02	NC	1.97E-03	2.43E-02
			Iron	NC	NC	NC	NC	Iron	–	5.05E-02	NC	4.45E-03	5.50E-02
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	8.10E-02	9.34E-03	1.78E-01	2.68E-01
			Nickel	NC	NC	NC	NC	Nickel	body weight	3.63E-02	NC	7.99E-02	1.16E-01
			Thallium	NC	NC	NC	NC	Thallium	liver	3.89E-02	NC	3.43E-03	4.24E-02
			Vanadium	NC	NC	NC	NC	Vanadium	–	4.63E-02	NC	1.57E-01	2.03E-01
Surface Water	Surface Water	–	Antimony	NC	–	NC	NC	Antimony	blood system	5.93E-03	–	3.48E-02	4.07E-02
			Beryllium	NC	–	NC	NC	Beryllium	chronic beryllium disease	2.13E-04	–	2.68E-02	2.70E-02
			Chromium VI (Hexavalent)	NC	–	NC	NC	Chromium VI (Hexavalent)	no effects	4.78E-03	–	3.37E-01	3.42E-01
			Iron	NC	–	NC	NC	Iron	–	1.47E-02	–	1.30E-02	2.77E-02
			Manganese	NC	–	NC	NC	Manganese	central nervous system	5.74E-03	–	1.26E-01	1.32E-01
			Thallium	NC	–	NC	NC	Thallium	liver	6.85E-02	–	6.03E-02	1.29E-01
			Vanadium	NC	–	NC	NC	Vanadium	–	3.99E-03	–	1.35E-01	1.39E-01
Sediment	Sediment	–	Arsenic	2.41E-06	–	6.37E-07	3.05E-06	Arsenic	skin discoloration	3.13E-02	–	8.25E-03	3.95E-02
			Iron	NC	–	NC	NC	Iron	–	5.58E-02	–	4.91E-03	6.07E-02

Total Risk Across Surface Soil and Slag	4.1E-06	Total Hazard Index Across Surface Soil and Slag	9.4E-01
Total Risk Across Surface Water	NC	Total Hazard Index Across Surface Water	8.4E-01
Total Risk Across Sediment	3.0E-06	Total Hazard Index Across Sediment	1.0E-01

Total Risk Across All Media and All Exposure Routes (surface soil and slag)	8.7E-06	Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	2.0E+00
Total Risk Across All Media and All Exposure Routes (surface soil)	6.4E-06	Total Hazard Index Across All Media and All Exposure Routes (surface soil)	1.6E+00
Total Risk Across All Media and All Exposure Routes (slag)	7.8E-06	Total Hazard Index Across All Media and All Exposure Routes (slag)	3.9E+00

Note:
NC = Not Calculated

TABLE 5.2

RISK ASSESSMENT SUMMARY FOR FUTURE INDUSTRIAL WORKER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/ Commercial Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Soil and Slag	Surface Soil/ Ambient Air	–	Aluminum	NC	NC	NC	NC	Aluminum	–	2.83E-02	1.38E-03	1.87E-03	3.15E-02
			Arsenic	5.07E-06	2.48E-09	1.00E-06	6.08E-06	Arsenic	skin discoloration	3.16E-02	NC	6.25E-03	3.78E-02
			Cadmium	NC	1.44E-09	NC	1.44E-09	Cadmium	kidney	2.62E-02	1.12E-05	3.46E-03	2.97E-02
			Chromium VI (Hexavalent)	NC	4.17E-08	NC	4.17E-08	Chromium VI (Hexavalent)	no effects	1.90E-02	9.93E-05	5.01E-02	6.92E-02
			Iron	NC	NC	NC	NC	Iron	–	9.24E-02	NC	6.10E-03	9.85E-02
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	3.80E-02	6.06E-03	6.26E-02	1.07E-01
			Nickel	NC	NC	NC	NC	Nickel	body weight	3.02E-02	NC	4.98E-02	8.00E-02
			Thallium	NC	NC	NC	NC	Thallium	liver	7.55E-02	NC	4.98E-03	8.04E-02
			Vanadium	NC	NC	NC	NC	Vanadium	–	5.72E-02	NC	1.45E-01	2.02E-01
Surface Water	Surface Water	–	Chromium VI (Hexavalent)	NC	–	NC	NC	Chromium VI (Hexavalent)	no effects	1.67E-03	–	8.81E-02	8.98E-02
			Manganese	NC	–	NC	NC	Manganese	central nervous system	2.00E-03	–	3.30E-02	3.50E-02
			Thallium	NC	–	NC	NC	Thallium	liver	2.39E-02	–	1.58E-02	3.97E-02
			Vanadium	NC	–	NC	NC	Vanadium	–	1.39E-03	–	3.53E-02	3.67E-02
Sediment	Sediment		Arsenic	7.01E-06	–	1.39E-06	8.40E-06	Arsenic	skin discoloration	4.36E-02	–	8.63E-03	5.22E-02
			Iron	NC	–	NC	NC	Iron	–	7.79E-02	–	5.14E-03	8.30E-02

Total Risk Across Soil and Slag	6.1E-06	Total Hazard Index Across Soil and Slag	7.4E-01
Total Risk Across Surface Water	NC	Total Hazard Index Across Surface Water	2.0E-01
Total Risk Across Sediment	8.4E-06	Total Hazard Index Across Sediment	1.4E-01

Total Risk Across All Media and All Exposure Routes (soil and slag)	1.6E-05	Total Hazard Index Across All Media and All Exposure Routes (soil and slag)	1.2E+00
Total Risk Across All Media and All Exposure Routes (soil)	1.4E-05	Total Hazard Index Across All Media and All Exposure Routes (surface soil)	8.8E-01
Total Risk Across All Media and All Exposure Routes (slag)	1.6E-05	Total Hazard Index Across All Media and All Exposure Routes (slag)	2.4E+00

Note:
NC = Not Calculated

APPENDIX A

STATISTICAL METHODS

TABLE OF CONTENTS

LIST OF TABLES
(Following Text)

1.0 INTRODUCTION

Two estimates of exposure are used in the risk assessment process: (i) the mean, or central tendency (CT), exposure, and (ii) the reasonable maximum exposure (RME). The CT exposure scenario uses the mean value to represent probable exposure conditions. The RME scenario generally uses a conservative 95 percent upper confidence limit of the mean to estimate a reasonable maximum exposure. The determinations of the CT and RME estimates are statistically based and driven by characteristics of the data. Key factors determining the statistical methodologies employed include: (i) the probability distribution of the observed data (e.g., normal vs. lognormal, etc.), and (ii) the degree of censored data (non-detected results) present.

The following sections present the procedures used to determine the CT and RME values of the chemicals of potential concern (COPCs) in this risk assessment. A number of guidance documents will be consulted in developing the statistical methodologies including MOE (1997), USEPA (1989), USEPA (1992) updated by USEPA (2002), USEPA (1997), USEPA (2000), and USEPA (2003).

2.0 STATISTICAL PROCEDURES

The development of COPC exposure estimates for each parameter and area of concern is a three step process consisting of (i) determining the percentage of non-detects present, (ii) data distribution testing, and (iii) selecting the appropriate statistical method for exposure estimate calculations.

The first step of the statistical evaluation is to determine the percentage of the non-detects present in each data set. Suggested approaches to account for the presence of non-detect analytical results are outlined in USEPA (2000), and USEPA (2002), and these guidelines are summarized in Table A.1.

The second step of the statistical analysis to establish COPC exposure estimates is to determine the data distribution. Each data set is tested for normality and lognormality using either the Shapiro-Wilk W-test (1965) (for sample sizes up to 50) or the Shapiro-Francia W'-test (1972) (for sample sizes of 50 to 100). Additional tests of normality for larger data sets, if needed, are presented in USEPA (2000).

Methods for determining the CT and RME values are discussed in USEPA 2002 (which updates USEPA 1992), USEPA 1997, and USEPA 2003. The alternative procedures suggested are listed in Table A.2. A summary of the selected statistical methods used to determine the CT and RME values, based on the observed distribution of the data and the proportion of non-detect values is given in Tables A.3 and A.4.

The following sections discuss the calculation procedures used to develop the CT and RME estimates. Section 2.1 deals with the statistical methods used for normally distributed data sets, Section 2.2 discusses the statistical methods used for the lognormally distributed data sets, and Section 2.3 discusses statistical methods used for non-normal data sets. Each section is organized into separate divisions to deal with the cases of a low degree of censored (non-detect) data (0 to 15 percent), moderately censored (16 to 50 percent), highly censored (51 to 75 percent), very highly censored (76 to 99 percent), and 100 percent non-detected data.

2.1 NORMAL DISTRIBUTION

2.1.1 UP TO 15 PERCENT NON-DETECTS

In order to calculate the CT and RME values, the non-detect values will be replaced with one-half the reported detection limit. The arithmetic mean and standard deviation of

this substituted data set will be then calculated. The calculated mean is taken as the CT value. The RME value is established by calculating the 95 percent upper confidence limit (UCL) of the arithmetic mean for the normal distribution using the following equation.

$$95\%UCL = \bar{x} + t_{(0.05,n-1,1)} \cdot s / \sqrt{n}$$

Where:

$\bar{x}$	=	mean of the substituted data set;
$t_{(0.05, n-1, 1)}$	=	student *t*-statistic for a one-tailed 95 percent confidence (α=0.05) and n-1 degrees of freedom;
s	=	standard deviation of the substituted data set; and
n	=	number of samples.

2.1.2 NON-DETECTS GREATER THAN 15 PERCENT UP TO 50 PERCENT

In this case, the mean and standard deviation of the censored data set are adjusted using Cohen's method, as recommended in USEPA 2002. This method is presented in McBean & Rovers (1998) and USEPA (2000). Cohen's method adjusts the sample mean and sample standard deviation to account for the censored data below the detection limit as follows.

Step 1) Compute the sample mean $\bar{x}_d$ using detected data only.

Step 2) Compute the sample variance s_d^2 using detected data only.

Step 3) Compute the two parameters *h* (proportion of non-detects) and γ as:

$$h = \frac{n - m}{n} \qquad \gamma = \frac{s_d^2}{(\bar{x} - DL)^2}$$

Where *m* is the number of detected data points, *n* is the total number of samples and DL is the detection limit.

Step 4) Determine the value of the parameter $\hat{\lambda}$ from the Table A.5 based on h and γ.

Step 5) Estimate the corrected sample mean ($\bar{x}$) and standard deviation (s) as:

$$\bar{x} = \bar{x}_d - \hat{\lambda}(\bar{x}_d - DL) \quad \text{and} \quad s = \sqrt{s_d^2 + \hat{\lambda}(\bar{x}_d - DL)^2}\ .$$

The Cohen-adjusted mean is taken as the CT value. The RME value is established using the Cohen-adjusted mean and standard deviation to calculate the 95 percent UCL of the arithmetic mean using the equation presented in Section 2.1.1.

2.1.3 NON-DETECTS GREATER THAN 50 PERCENT UP TO 74 PERCENT

When more than half of a data set consists of non-detect results, estimates of the mean value and standard deviation become uncertain. If the data set contains greater than 50 percent non-detects (up to 75 percent), the CT and RME values will be calculated using a bounding method estimating maximum values for the mean and 95 percent UCL, as described in Section 3.2 and Appendix A of USEPA (2002).

The CT value is calculated as the mean of the data set, substituting non-detect values with the full reported detection limit. This provides a conservative maximum value for the CT estimate.

For the RME value, an optimization process [USEPA's (2002) bounding method] is applied to find a conservative maximum bound for the 95 percent UCL of the arithmetic mean. This involved re-calculating the normal UCL (see Section 2.1.1) iteratively, allowing the non-detect values to vary between zero and the reported detection limit until a maximum value for the 95 percent UCL is obtained.

2.1.4 NON-DETECTS GREATER THAN 75 PERCENT UP TO 99 PERCENT

According to USEPA (2002), for highly censored data sets (greater than 75 percent non-detects), the recommended approach to calculate exposure estimates is to substitute non-detect results with their full detection limits and report the resulting exposure terms as values likely to be overestimated.

2.1.5 100 PERCENT NON-DETECTS

In any cases where all analytical data for a COPC are non-detect results, then the maximum detection limit is taken for both CT and RME scenarios.

2.2 LOGNORMAL DISTRIBUTION

USEPA (2003) presents three recommended methods for establishing CT and RME estimate from lognormally distributed data depending on the standard deviation of the log-transformed data. These methods are (i) the Student's *t* method, (ii) the Land (H-statistic) method, and (iii) the Chebyshev Inequality method.

The Student's *t* method is presented in Section 2.1.1. If the standard deviation of the lognormal data is small (less than 0.5), then USEPA recommends using the Student's *t* method.

The Land method is appropriate for calculating UCLs of lognormally distributed data. However, as USEPA (2002) notes, the method is very sensitive to deviations from lognormality, large variance or skewness of the dataset, and small datasets (fewer than thirty data points). The Land method can be used in conjunction with a modified Cohen's procedure (USEPA, 2002; Gilbert, 1987) to account for non-detect data.

The Chebyshev Inequality method may provide a more useful estimate (i.e., lower) of the UCL than obtained using the Land Method (USEPA, 2002). It is a distribution-free method that is applicable to a wide variety of data sets (not only lognormal data), as long as the skewness of the dataset is not large. The Chebyshev Inequality method using minimum variance unbiased estimators (MVUEs) of the mean and standard deviation of lognormal data sets is recommended for use by USEPA (2002). For small, moderately skewed datasets, a 99 percent UCL calculation using the Chebyshev Inequality is recommended (as opposed to the 95 percent value typically used).

A list of specific methods recommended for calculating RME estimates for lognormally distributed data sets are given in Table A.4 (USEPA, 2002).

2.2.1 UP TO 15 PERCENT NON-DETECTS

In order to calculate the CT and RME values, the non-detect values will be replaced with one-half the reported detection limit.

For the CT exposure estimate, the arithmetic mean of lognormally-distributed data ($\bar{x}$) is calculated as follows:

$$\bar{x} = e^{(\bar{y} + \frac{s_y^2}{2})}$$

Where:

$\bar{y}$ = mean of the natural log-transformed, substituted data set; and

s_y^2 = standard deviation of the natural log-transformed substituted data set.

If a calculated CT exposure estimate exceeded the corresponding RME estimate (see following), the CT exposure will be set equal to the RME estimate.

For the RME exposure estimate, the standard deviation of the log-transformed data will be calculated, and Table A.4 used to select the UCL method to use. The selected method will be either (i) the Student's t UCL (see Section 2.1.1), (ii) Land's H-UCL, or (iii) Chebyshev Inequality UCL.

Land's H-UCL is calculated as follows:

Step 1) Compute the arithmetic mean $\bar{x}_{\log}$ of the log-transformed data.

Step 2) Compute the standard deviation $s_{\log}$ of the log-transformed data.

Step 3) Look up the $H_{1-\alpha}$ statistic from Table A.6.

Step 4) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$UCL_{1-\alpha} = e^{\left(\bar{x}_{\log} + \frac{s_{\log}^2}{2} + \frac{H_{1-\alpha} s_{\log}}{\sqrt{n-1}}\right)}$$

Where n is the number of samples.

The Chebyshev Inequality UCL is calculated as follows:

Step 1) Compute the arithmetic mean $\bar{x}_{\log}$ of the log-transformed data.

Step 2) Compute the variance $s_{\log}^2$ of the log-transformed data.

Step 3) Look up the g_n statistic from Table A.7.

Step 4) Compute the minimum-variance unbiased estimator (MVUE) of the population mean for a lognormal distribution as:

$$\hat{\mu}_{\log} = e^{\bar{x}_{\log} g_n \frac{s_{\log}^2}{2}}$$

Where n is the number of samples.

Step 5) Calculate the MVUE of the variance of this mean as:

$$\sigma_{\mu}^2 = e^{2\bar{x}_{log}}\left[\left(g_n \frac{s_{log}^2}{2}\right)^2 - g_n\left(\frac{n-2}{n-1}s_{log}^2\right)\right].$$

Step 6) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$UCL_{1-\alpha} = \hat{\mu}_{log} + \sqrt{\left(\frac{1}{\alpha} - 1\right)\sigma_{\mu}^2}.$$

2.2.2 NON-DETECTS GREATER THAN 15 PERCENT UP TO 50 PERCENT

When a moderate proportion of non-detect results is present in a data set, in order to calculate the CT estimate, a correction for non-detects will be made using Gilbert's modified Cohen's method (USEPA, 2002). Gilbert (1987, page 182) suggests extending Cohen's method to account for non-detect values in lognormally distributed concentrations. Cohen's method (USEPA, 2000, page 4-43) assumes the data are normally distributed, so it must be applied to the log-transformed concentration values. If $\hat{\mu}_y$ and $\hat{\sigma}_y$ are the Cohen-corrected (see Section 2.1.2) sample mean and standard deviation, respectively, of the log-transformed concentrations, then the corrected estimates of the mean and standard deviation of the underlying lognormal distribution can be obtained from the following expressions:

$$\hat{\mu} = e^{\left(\hat{\mu}_y + \frac{\hat{\sigma}_y^2}{2}\right)}$$

$$\hat{\sigma} = \hat{\mu}\sqrt{e^{\hat{\sigma}_y^2} - 1}$$

This method assumes a single detection level for all the data values. During CT calculations, if the detection limit varied, then the highest detection limit will be used for the calculations to provide a conservative estimate.

If a calculated CT exposure estimate exceeded the corresponding RME estimate (see following), the CT exposure will be set equal to the RME estimate.

For the RME value, USEPA's bounding methodology (2002) is applied to untransformed data to find a maximum value for the mean, standard deviation, and skewness. The 95 percent UCL is then calculated using Hall's Bootstrap.

The use of Gilbert's modified Cohen's method for lognormal data is evaluated for use in calculating RME estimates for moderately censored data sets. However, attempts to use the procedure in conjunction with the lognormal UCL methods (e.g., Land's method, Chebyshev Inequality) most often resulted with unusable values. This resulted from either calculating UCLs much higher than the maximum data point observed, or by data characteristics being unsuitable for the required calculation (e.g., needing to use a Cohen's parameter λ that is far outside existing tabulated values for this method). As a result of persistent issues with these methods, RME estimates for lognormal, moderately censored data will be calculated using Hall's Bootstrap procedure. This procedure takes into account sample bias and skewness (such as present in lognormal distributions), and may be used with a bounding methodology to provide upper bonds on the UCL (USEPA, 2002). Hall's Bootstrap is calculated as follows.

Step 1) Compute the arithmetic mean $\bar{x}$.

Step 2) Compute the standard deviation s.

Step 3) Compute the skewness k.

Step 4) Re-sample the data a very large number of times, and calculate the each bootstrap set's mean $\bar{x}_b$, standard deviation s_b and skewness k_b.

Step 5) For each bootstrap set, calculate the studentized mean:

$$W = \frac{(\bar{x}_b - \bar{x})}{s_b}$$

Step 6) For each bootstrap set, calculate Hall's statistic:

$$Q = W + \frac{k_b W^2}{3} + \frac{k_b^2 W^3}{27} + \frac{k_b}{6n}$$

Step 7) Sort all the Q values (lowest to highest) and select the lower α^{th} quantile of the B re-sample sets. This is the $(\alpha B)^{th}$ lowest value (e.g., for 10,000 resample sets, and an α=0.05, select the 500th lowest value).

Step 8) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$W(Q)=\frac{3}{k}\left[\sqrt[3]{1+\left(Q_\alpha-\frac{k}{6n}\right)}-1\right]$$

Where n is the number of samples.

Step 9) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$UCL_{1-\alpha}=\overline{x}-W(Q_\alpha)s.$$

In calculating Hall's bootstrap, five replicate calculations of the ten-thousand resample sets each will be generated, and the median UCL value used. These replicates will be used to determine whether or not each given data set is sensitive to small differences with the random re-sampling algorithm used by the procedure.

2.2.3 NON-DETECTS GREATER THAN 50 PERCENT UP TO 74 PERCENT

In order to calculate exposure estimates for highly-censored data sets (i.e., greater than 50 percent non-detect up to 75 percent), conservative bounding assumptions will be made, as described below.

The CT value is determined by substituting the full detection limit for non-detect values and applying a bootstrap re-sampling procedure. The bootstrap is carried out using 2,000 re-sampled data sets of the same sample size as the original data set, and the CT estimate is then taken as the average of the bootstrap means.

In this case of a highly censored data set, Hall's Bootstrap procedure fails with increasing degrees of non-detect data due to undefined skewness values if a re-sampled data set by random chance contains only non-detects. For the RME value, USEPA's Bootstrap t methodology (2003) will therefore be applied to calculate the 95 percent UCL. A modified bounding methodology is applied by considering four non-detect substitution scenarios: i) zero, ii) one-half detection limit, iii) full detection limit, and iv) alternating zero and full detection limit. These scenarios will be considered because attempting bounding procedures on each individual re-sample set in computationally impractical. The bootstrap t calculation is applied under each of the four scenarios and the largest resulting UCL will be selected as the RME estimate.

The bootstrap t is calculated as follows (USEPA, 2003):

Step 1) Calculate the arithmetic mean $\bar{x}$ of the original data.

Step 2) Re-sample the original data a very large number of times (in this case thousands of times) and calculate each resample set's mean ($\bar{x}_b$) and standard deviation (s_b).

Step 3) For each re-sample set calculate the value.

$$t_b = \frac{(\bar{x}_b - \bar{x})}{s_b} \times \sqrt{n}$$

Where n is the number of samples.

Step 4) Sort the t_b values from the lowest to the highest, and select the pivotal quantity $t_{(\alpha \cdot N)}$, where N is the number of bootstrap sets (e.g., if 10,000 bootstrap sets are generated and α=0.05, select the 500th lowest t_b value)

Step 5) Calculate the UCL of the population mean as:

$$UCL = \bar{x} - \frac{t_{(\alpha \cdot N)} s}{\sqrt{n}}$$

2.2.4 NON-DETECTS GREATER THAN 75 PERCENT UP TO 99 PERCENT

For very highly censored data sets (greater than 75 percent non-detects), USEPA (2002) recommends calculating exposure estimates substituting non-detects with their full detection limits, and reporting the resulting values as likely to be overestimated. The CT value is calculated as the arithmetic mean of a lognormal distribution (introduced in Section 2.2.1), setting non-detects as their detection limits. If a calculated CT exposure estimate exceeded the corresponding RME estimate (see following), the CT exposure is set equal to the RME estimate. For the RME calculation, the non-detects will be substituted with the full detection limit, the standard deviation of the log-transformed data calculated, and Table A.4 will be consulted to select an appropriate UCL method. The selected methods are presented in Section 2.1.1 (Student's t method) and Section 2.2.1 (Land's Method and Chebyshev Inequality Procedure).

2.2.5 100 PERCENT NON-DETECTS

As for the normal case, in any situations where all analytical data for a COPC with a lognormal distribution will be non-detect results, then the maximum detection limit will be taken for both CT and RME scenarios.

2.3 NON-NORMAL DATASETS

For any data sets that will be neither normally, nor lognormally distributed, the non-parametric/distribution-free methods presented in USEPA (2002) will be used to calculate CT and RME exposures. The specific methods applied are presented below.

2.3.1 UP TO 15 PERCENT NON-DETECTS

For the CT exposure estimate, the arithmetic mean is calculated substituting non-detects with one-half the detection limit and using a bootstrap method to estimate the arithmetic mean. The bootstrap is carried out using 2,000 re-sampled data sets of the same sample size as the original data set. The CT value is then taken as the average of the bootstrap means.

For the RME exposure estimate, non-detects will be substituted with one-half the detection limit, and the standard deviation calculated. If the standard deviation is below 0.75 and the number of samples is 30 or greater, then the adjusted central limit theorem (CLT) UCL is calculated. Otherwise, Hall's bootstrap 95-UCL is used.

If sample size is sufficiently large, the Central Limit Theorem (CLT) states that the mean will be normally distributed, no matter how complex the underlying distribution of concentrations might be (USEPA, 2002). An adjusted CLT UCL method is presented in USEPA (2002) and is calculated as follows.

Step 1) Compute the arithmetic mean $\overline{x}$.

Step 2) Compute the standard deviation s.

Step 3) Compute the skewness β.

Step 4) Let z_α be the $(1-\alpha)^{th}$ quantile of the standard normal distribution (for 95 percent confidence, $z_\alpha = 1.645$).

Step 5) Compute the one-sided $(1-\alpha)$ upper confidence limit on the mean as:

$$UCL_{1-\alpha} = \bar{x} + (z_\alpha + \frac{\beta}{6\sqrt{n}}(1+2z_\alpha^2))\frac{s}{\sqrt{n}}$$

Where n is the number of samples.

The Hall's Bootstrap procedure is calculated as described in Section 2.2.2.

2.3.2 NON-DETECTS GREATER THAN 15 PERCENT AND LESS THAN 50 PERCENT

For CT exposure estimates, a conservative approach is taken substituting non-detects with the full detection limit and calculating the bootstrap arithmetic mean (see Section 2.3.1).

For RME exposure estimates, Hall's bootstrap procedure (see Section 2.2.2) is used, applying bounding methodology to find maximum mean, standard deviation, and skewness values for the original data set prior to re-sampling. These bounded estimates will be used to calculate the Hall's Bootstrap UCL for the data using 5 sets of 10,000 re-samples each (as in Section 2.3.1), and the median of these five UCLs taken as the RME estimate.

2.3.3 NON-DETECTS GREATER THAN 50 PERCENT UP TO 75 PERCENT

For CT exposure estimates, the conservative method used for the moderately censored case (described in Section 2.3.2) is used. For RME exposure estimates, the Bootstrap t method with modified bounding procedure described in Section 2.2.3 is applied.

2.3.4 NON-DETECTS GREATER THAN 75 PERCENT UP TO 99 PERCENT

As noted for the normal (Section 2.1.4) and lognormal (Section 2.2.4) cases for very highly censored data sets (greater than 75 percent non-detects), USEPA (2002) recommends substituting non-detects with their full detection limits and reporting exposure estimates as likely to be overestimated. Both CT and RME values will be calculated accordingly, as follows.

For CT exposure estimates, a conservative approach is taken substituting non-detects with the full detection limit and calculating the bootstrap arithmetic mean (see Section 2.3.1). This is the same method used for the moderately censored 15 to 50 percent non-detect case (Section 2.3.2).

For RME estimates, the non-detects will be substituted with the full detection limit and Bootstrap *t* is used to calculate the UCL (refer to Section 2.2.3).

2.3.5 100 PERCENT NON-DETECTS

In any cases where all analytical data for a COPC will be non-detect results, then the maximum detection limit is taken for both CT and RME estimates.

3.0 MAXIMUM DETECTED VALUE

USEPA (1992 and 2002) allow an optional use of the maximum observed concentrations for the RME estimate in cases where the calculated UCL exceeds the maximum value. However, USEPA (2002) warns that this may not be appropriate for data sets with very small sample sizes, because the observed maximum may be below the population mean.

If the RME estimate calculated using any of the statistical methods presented in Section 2.0 is larger than the maximum detected value, then the maximum detected value is used for the RME.

4.0 REFERENCES

Chernick, M.R., (1999). *Bootstrap Methods A Practitioner's Guide,* John Wiley & Sons, New York, 263p.

Efron, B. and Tibshirani, R.J., (1993). *An Introduction to the Bootstrap,* Chapman & Hall, New York, 436p.

Gilbert, R.O., (1987). *Statistical Methods for Environmental Pollution Monitoring.* John Wiley & Sons, New York, 320p.

Land, C.E., 1975. Tables of Confidence Limits for Linear Functions of the Normal Mean and Variance *in* Selected Tables in Mathematical Statistics, volume 3, eds H.L. Harter & D.B. Owen. Providence, Rhode Island: American Mathematical Society. pp. 385-419.

McBean, E.A. and Rovers, F.A., (1998). *Statistical Procedures for Analysis of Environmental Monitoring Data & Risk Assessment,* Prentice Hall, New Jersey, 313p.

MOE, (1997). *Guidance on Site Specific Risk Assessment for Use at Contaminated Site in Ontario.*

Shapiro, S.S. & R.S. Francia, 1972. An Approximate Analysis of Variance Test for Normality. Journal of the American Statistical Association **67(337):** 215-216.

Shapiro, S.S. & M.B. Wilk, 1965. An Analysis of Variance Test for Normality (Complete Samples). Biometrika **52(3/4):** 591-611.

USEPA, (1989). *Risk Assessment Guidance for Superfund (RAGS), Interim Final,* EPA/540/1-89/002, December 1989;

USEPA, (1992). U.S. EPA *Supplemental Guidance to RAGS: Calculating the Concentration Term,* OSWER Directive 9285.7-081, May 1992.

USEPA, (1997). *The Lognormal Distribution in Environmental Applications* EPA/600/R-97/006 December 1997.

USEPA, (2000). *Guidance for Data Quality Assessment Practical Methods for Data Analysis EPA QA/G-9,* EPA/600/R-96/084 July 2000.

USEPA, (2002). *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites,* Office of Emergency and Remedial Response, OSWER 9285.6-10, December 2002.

USEPA, (2003). *ProUCL User's Guide,* version 2.1, February 2003.

TABLE A.1

GUIDELINES FOR ANALYZING DATA WITH NON-DETECTS [1]

Percentage of Non-detects	*Statistical Analysis Method*
<15%	Replace non-detects with detection limit/2, detection limit, or a very small number.
15% - 50%	Trimmed mean, Cohen's adjustment, Winsorized mean and standard deviation, bounding method[2], probability substitution based on specific distribution[2].
>50% - 90%	Use tests for proportions, bounding method[2][3].

Notes:

(1) adapted from USEPA, (2000), *Guidance for Data Quality Assessment Practical Methods for Data Analysis EPA QA/G-9*, EPA/600/R-96/084, July 2000.

(2) USEPA, (2002), *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, Office of Emergency and Remedial Response, OSWER 9285.6-10, December 2002.

(3) When greater than 75 percent non-detects present and the sample size is small (less than five samples), the bounding method should be conservatively applied setting non-detects at the detection limit (USEPA, 2002).

TABLE A.2

RECOMMENDED METHODS FOR CALCULATING UPPER CONFIDENCE LIMITS (UCLs)

Method	*Applicability*	*Advantages*	*Disadvantages*	*Reference*
(i) *For Normal or Lognormal Distributions*				
Student's *t*	means normally distributed, samples random	simple, robust if n is large	distribution of means must be normal	Gilbert 1987; EPA 1992
Land's *H*	lognormal data, small variance, large n, samples random	good coverage[1]	sensitive to deviations from lognormality, produces very high values for large variance or small n	Gilbert 1987; EPA 1992
Chebyshev Inequality (MVUE)	skewness and variance small or moderate, samples random	often smaller than Land	may need to resort to higher confidence levels for adequate coverage	Singh *et al*. 1997
Wong	gamma distribution	second order accuracy[2]	requires numerical solution of an improper integral	Schulz and Griffin 1999; Wong 1993
(ii) *Nonparametric/Distribution-free Methods*				
Central Limit Theorem - Adjusted	large n, samples random	simple, robust	sample size may not be sufficient	Gilbert 1987; Singh *et al*. 1997
Bootstrap *t* Resampling	sampling is random and representative	useful when distribution cannot be identified	inadequate coverage for some distributions; computationally intensive	Singh *et al*. 1997; Efron 1982
Hall's Bootstrap Procedure	sampling is random and representative	useful when distribution cannot be identified; takes bias and skewness into account	inadequate coverage for some distributions; computationally intensive	Hall 1988; Hall 1992; Manly 1997; Schultz and Griffin 1999
Jackknife Procedure	sampling is random and representative	useful when distribution cannot be identified	inadequate coverage for some distributions; computationally intensive	Singh *et al*. 1997
Chebyshev Inequality	skewness and variance small or moderate, samples random	useful when distribution cannot be identified	inappropriate for small sample sizes when skewness or variance is large	Singh *et al*. 1997; EPA 2000c

Notes:

This Table was taken from USEPA, 2002.

TABLE A.2

RECOMMENDED METHODS FOR CALCULATING UPPER CONFIDENCE LIMITS (UCLs)

(1) Coverage refers to whether a UCL method performs in accordance with its definition.

(2) As opposed to maximum likelihood estimation, which offers first order accuracy.

TABLE A.3

STATISTICAL METHODS USED FOR DETERMINING EXPOSURE ESTIMATES
UNDER CENTRAL TENDENCY (CT) AND REASONABLE MAXIMUM EXPOSURE (RME) SCENARIOS

Percentage of Non-detect Values	*Data Distribution*		
	Normal	*Lognormal*	*Not Normal*
I) Central Tendency (CT) Exposure Scenarios			
0-15 percent	Substitute non-detect results with one-half detection limit. Calculate arithmetic mean.	Substitute non-detect results with one-half detection limit. Calculate arithmetic mean of lognormal distribution.	Substitute non-detect results with one-half detection limit. Calculate arithmetic mean of 2000 bootstrap resample set means.
>15-50 percent	Use Cohen's method to determine non-detect-adjusted estimate of arithmetic mean.	Use Gilbert's modified Cohen's method to determine non-detect-adjusted estimate of arithmetic mean for lognormal data.	Substitute non-detect results with full detection limit. Calculate arithmetic mean of 2000 bootstrap resample set means.
>50-74 percent	Substitute non-detect results with full detection limit. Calculate arithmetic mean.	Substitute non-detect results with full detection limit. Calculate arithmetic mean of 2000 bootstrap resample set means.	Substitute non-detect results with full detection limit. Calculate arithmetic mean of 2000 bootstrap resample set means.
>75-99 percent	Substitute non-detect results with full detection limit. Calculate arithmetic mean.	Substitute non-detect results with full detection limit. Calculate arithmetic mean of lognormal distribution.	Substitute non-detect results with full detection limit. Calculate arithmetic mean of 2000 bootstrap resample set means.
100 percent	Use maximum detection limit.	Use maximum detection limit.	Use maximum detection limit.

TABLE A.3

STATISTICAL METHODS USED FOR DETERMINING EXPOSURE ESTIMATES UNDER CENTRAL TENDENCY (CT) AND REASONABLE MAXIMUM EXPOSURE (RME) SCENARIOS

Percentage of Non-detect Values	*Data Distribution*		
	Normal	*Lognormal*	*Not Normal*
II) Reasonable Maximum Exposure (RME) Scenarios[1]			
0-15 percent[2]	Substitute non-detect results with one-half detection limit. Calculate Student's *t* 95-percent UCL of arithmetic mean.	Substitute non-detect results with one-half detection limit. Calculate standard deviation of log-transformed data. Use Table D.4 to select UCL method.	Substitute non-detect results with one-half detection limit. If $s>0.75$ and $n>29$: Use Adjusted Central Limit Theorem 95-percent UCL of mean. Otherwise, calculate Hall's bootrap 95-UCL.
>15-50 percent[2]	Use Cohen's method to determine non-detect-adjusted estimates of mean and standard deviation. Calculate Student's *t* 95-percent UCL of arithmetic mean.	Use Cohen's method to determine non-detect-adjusted estimates of mean and standard deviation of log-transformed data. Use Table D.4 to select UCL method.	Use bounding methodology[3] to find maximum mean, standard deviation and skewness. Calculate Hall's bootstrap 95-percent UCL.
>50-74 percent[2]	Use a bounding methodology[3] to find maximum Student's *t* 95-percent UCL of arithmetic mean.	Considering data set with ND=0, ND=0.5 DL, ND=DL and alternating NDs 0 and DL. Calculate bootstrap-*t* 95-percent UCL for each of the four data sets. Select the largest value as "bounded" UCL.	Considering data set with ND=0, ND=0.5 DL, ND=DL and alternating NDs 0 and DL. Calculate bootstrap-*t* 95-percent UCL for each of the four data sets. Select the largest value as "bounded" UCL.
>75-99 percent[2]	Substitute non-detects with their full detection limit. Calculate Student's *t* UCL of arithmetic mean (likely to be overestimated - per USEPA 2002).	Substitute non-detects with their full detection limit. Calculate standard deviation of log-transformed data. Use Table D.4 to select UCL method (likely to be overestimated - per USEPA 2002).	Substitute non-detects with their full detection limit. Calculate bootstrap-*t* 95-percent UCL (likely to be overestimated - per USEPA 2002).
100 percent	Use maximum detection limit.	Use maximum detection limit.	Use maximum detection limit.

Notes:

(1) RMEs are calculated as 95 percent upper confidence limits of the mean. Specific UCL methods were chosen based on Figure 1 and the text of USEPA (2002) and (2003).

(2) As per USEPA 2002, if the calculated UCL value exceeds the maximum detected value and a sufficient number of samples have been collected to meet data quality objectives, then the maximum detected value is used for the UCL.

(3) See Appendix A of USEPA 2002 for description of bounding methodology (note that "Step 9" of the appendix should say "less than", not "greater than").

(4) For Student's *t* UCL, use Cohen's method; for Land's H UCL, use Gilbert's modified Cohen's method; for Chebyshev UCL, use Cohen's method on log-transformed data.

TABLE A.4

95 PERCENT UPPER CONFIDENCE LIMIT (UCL) CALCULATION METHODS FOR LOGNORMAL DATA

Standard deviation of log-transformed data (s)	*Number of Samples (n)*	*Selected Upper Confidence Limit Method*[1]
$0 \le s < 0.5$	For all n (≥ 5)	Student's *t* UCL
$0.5 \le s < 1.0$	For all n	Land's H-UCL
$1.0 \le s < 1.5$	$n < 25$	Chebyshev UCL (95% MVUE)
	$n \ge 25$	Land's H-UCL
$1.5 \le s < 2.0$	$n < 20$	Chebyshev UCL (99% MVUE)
	$20 \le n \le 50$	Chebyshev UCL (95% MVUE)
	$n \ge 50$	Land's H-UCL
$2.0 \le s < 2.5$	$n < 25$	Chebyshev UCL (99% MVUE)
	$25 \le n \le 70$	Chebyshev UCL (95% MVUE)
	$n \ge 70$	Land's H-UCL
$2.5 \le s < 3.0$	$n < 30$	Chebyshev UCL (max of 99% MVUE or 99% mean)
	$30 \le n \le 70$	Chebyshev UCL (max of 95% MVUE or 95% mean)
	$n \ge 70$	Land's H-UCL
$s \ge 3.0$	Small n	Further investigation required
	$n > 100$	Land's H-UCL

Note:

[1] Source: Table A1 of USEPA (2003) -- ProUCL User's Guide Version 2.1, February, 2003.

TABLE A.5

VALUES OF LAMBDA (λ) FOR COHEN'S METHOD

	Percentage of Non-detects (h)						
λ	*0.01*	*0.05*	*0.10*	*0.15*	*0.25*	*0.40*	*0.50*
0.01	0.0102	0.0530	0.1111	0.1747	0.3205	0.5989	0.8403
0.05	0.0105	0.0547	0.1143	0.1793	0.3279	0.6101	0.8540
0.10	0.0110	0.0566	0.1180	0.1848	0.3366	0.6234	0.8703
0.15	0.0113	0.0584	0.1215	0.1898	0.3448	0.6361	0.8860
0.20	0.0116	0.0600	0.1247	0.1946	0.3525	0.6483	0.9012
0.30	0.0122	0.0630	0.1306	0.2034	0.3670	0.6713	0.9300
0.40	0.0128	0.0657	0.1360	0.2114	0.3803	0.6927	0.9570
0.50	0.0133	0.0681	0.1409	0.2188	0.3928	0.7129	0.9826
0.60	0.0137	0.0704	0.1455	0.2258	0.4045	0.7320	1.0070
0.70	0.0142	0.0726	0.1499	0.2323	0.4156	0.7502	1.0303
0.80	0.0146	0.0747	0.1540	0.2386	0.4261	0.7676	1.0527
0.90	0.0150	0.0766	0.1579	0.2445	0.4362	0.7844	1.0743
1.00	0.0153	0.0785	0.1617	0.2502	0.4459	0.8005	1.0951
1.10	0.0157	0.0803	0.1653	0.2557	0.4553	0.8161	1.1152
1.20	0.0160	0.0820	0.1688	0.2610	0.4643	0.8312	1.1347
1.30	0.0164	0.0836	0.1722	0.2661	0.4730	0.8458	1.1537
1.40	0.0167	0.0853	0.1754	0.2710	0.4815	0.8600	1.1721
1.50	0.0170	0.0868	0.1786	0.2758	0.4897	0.8738	1.1901
1.60	0.0173	0.0883	0.1817	0.2805	0.4977	0.8873	1.2076
1.70	0.0176	0.0898	0.1846	0.2851	0.5055	0.9005	1.2248
1.80	0.0179	0.0913	0.1876	0.2895	0.5132	0.9133	1.2415
1.90	0.0181	0.0927	0.1904	0.2938	0.5206	0.9259	1.2579
2.00	0.0184	0.0940	0.1932	0.2981	0.5279	0.9382	1.2739
2.10	0.0187	0.0954	0.1959	0.3022	0.5350	0.9502	1.2897
2.20	0.0189	0.0967	0.1986	0.3062	0.5420	0.9620	1.3051
2.30	0.0192	0.0980	0.2012	0.3102	0.5488	0.9736	1.3203
2.40	0.0194	0.0992	0.2037	0.3141	0.5555	0.9850	1.3352
2.50	0.0197	0.1005	0.2062	0.3179	0.5621	0.9962	1.3498
2.60	0.0199	0.1017	0.2087	0.3217	0.5686	1.0072	1.3642
2.70	0.0202	0.1029	0.2111	0.3254	0.5750	1.0180	1.3784
2.80	0.0204	0.1040	0.2135	0.3290	0.5812	1.0287	1.3924
2.90	0.0206	0.1052	0.2158	0.3326	0.5874	1.0392	1.4061

TABLE A.5

VALUES OF LAMBDA (λ) FOR COHEN'S METHOD

	Percentage of Non-detects (h)						
λ	***0.01***	***0.05***	***0.10***	***0.15***	***0.25***	***0.40***	***0.50***
3.00	0.0209	0.1063	0.2182	0.3361	0.5935	1.0495	1.4197
3.10	0.0211	0.1074	0.2204	0.3396	0.5995	1.0597	1.4330
3.20	0.0213	0.1085	0.2227	0.3430	0.6054	1.0697	1.4462
3.30	0.0215	0.1096	0.2249	0.3464	0.6112	1.0796	1.4592
3.40	0.0217	0.1107	0.2270	0.3497	0.6169	1.0894	1.4720
3.50	0.0219	0.1118	0.2292	0.3529	0.6226	1.0990	1.4847
3.60	0.0221	0.1128	0.2313	0.3562	0.6282	1.1086	1.4972
3.70	0.0223	0.1138	0.2334	0.3594	0.6337	1.1180	1.5096
3.80	0.0225	0.1148	0.2355	0.3625	0.6391	1.1273	1.5218
3.90	0.0227	0.1158	0.2375	0.3656	0.6445	1.1364	1.5339
4.00	0.0229	0.1168	0.2395	0.3687	0.6498	1.1455	1.5458
4.10	0.0231	0.1178	0.2415	0.3717	0.6551	1.1545	1.5577
4.20	0.0233	0.1188	0.2435	0.3747	0.6603	1.1634	1.5693
4.30	0.0235	0.1197	0.2454	0.3777	0.6654	1.1722	1.5809
4.40	0.0237	0.1207	0.2473	0.3806	0.6705	1.1809	1.5924
4.50	0.0239	0.1216	0.2492	0.3836	0.6755	1.1895	1.6037
4.60	0.0241	0.1225	0.2511	0.3864	0.6805	1.1980	1.6149
4.70	0.0242	0.1235	0.2530	0.3893	0.6855	1.2064	1.6260
4.80	0.0244	0.1244	0.2548	0.3921	0.6903	1.2148	1.6370
4.90	0.0246	0.1253	0.2567	0.3949	0.6952	1.2230	1.6479
5.00	0.0248	0.1262	0.2585	0.3977	0.7000	1.2312	1.6587
5.10	0.0249	0.1270	0.2603	0.4004	0.7047	1.2394	1.6694
5.20	0.0251	0.1279	0.2621	0.4031	0.7094	1.2474	1.6800
5.30	0.0253	0.1288	0.2638	0.4058	0.7141	1.2554	1.6905
5.40	0.0255	0.1296	0.2656	0.4085	0.7187	1.2633	1.7010
5.50	0.0256	0.1305	0.2673	0.4111	0.7233	1.2711	1.7113
5.60	0.0258	0.1313	0.2690	0.4137	0.7278	1.2789	1.7215
5.70	0.0260	0.1322	0.2707	0.4163	0.7323	1.2866	1.7317
5.80	0.0261	0.1330	0.2724	0.4189	0.7368	1.2943	1.7418
5.90	0.0263	0.1338	0.2741	0.4215	0.7412	1.3019	1.7518
6.00	0.0264	0.1346	0.2757	0.4240	0.7456	1.3094	1.7617

Source: McBean & Rovers, 1998

TABLE A.6

VALUES OF H(0.95) FOR LAND'S METHOD

Standard deviation of log-transformed data (S_{log})	*Number of Samples*												
	3	***5***	***7***	***10***	***12***	***15***	***21***	***31***	***51***	***101***	***301***	***601***	***1001***
0.10	2.750	2.035	1.886	1.802	1.775	1.749	1.722	1.701	1.684	1.670	1.659	1.656	1.654
0.20	3.295	2.198	1.992	1.881	1.843	1.809	1.771	1.742	1.718	1.697	1.680	1.674	1.671
0.30	4.109	2.402	2.125	1.977	1.927	1.882	1.833	1.793	1.761	1.733	1.709	1.700	1.696
0.40	5.220	2.651	2.282	2.089	2.026	1.968	1.905	1.856	1.813	1.777	1.746	1.734	1.728
0.50	6.495	2.947	2.465	2.220	2.141	2.068	1.989	1.928	1.876	1.830	1.790	1.776	1.769
0.60	7.807	3.287	2.673	2.368	2.271	2.181	2.085	2.010	1.946	1.891	1.843	1.825	1.816
0.70	9.120	3.662	2.904	2.532	2.414	2.306	2.191	2.102	2.025	1.960	1.902	1.881	1.870
0.80	10.43	4.062	3.155	2.710	2.570	2.443	2.307	2.202	2.112	2.035	1.968	1.944	1.931
0.90	11.74	4.478	3.420	2.902	2.738	2.589	2.432	2.310	2.206	2.117	2.040	2.012	1.997
1.00	13.05	4.905	3.695	3.103	2.915	2.744	2.564	2.423	2.306	2.205	2.117	2.085	2.068
1.25	16.33	6.001	4.426	3.639	3.389	3.163	2.923	2.737	2.580	2.447	2.330	2.288	2.266
1.50	19.60	7.120	5.184	4.207	3.896	3.612	3.311	3.077	2.881	2.713	2.566	2.514	2.486
1.75	22.87	8.250	5.960	4.795	4.422	4.081	3.719	3.437	3.200	2.997	2.820	2.757	2.723
2.00	26.14	9.387	6.747	5.396	4.962	4.564	4.141	3.812	3.533	3.295	3.088	3.013	2.974
2.50	32.69	11.67	8.339	6.621	6.067	5.557	5.013	4.588	4.228	3.920	3.650	3.553	3.503
3.00	39.23	13.97	9.945	7.864	7.191	6.570	5.907	5.388	4.947	4.569	4.238	4.119	4.057
3.50	45.77	16.27	11.56	9.118	8.326	7.596	6.815	6.201	5.681	5.233	4.842	4.700	4.627
4.00	52.31	18.58	13.18	10.38	9.469	8.630	7.731	7.024	6.424	5.908	5.456	5.293	5.208
4.50	58.85	20.88	14.80	11.64	10.62	9.669	8.652	7.854	7.174	6.590	6.077	5.892	5.796
5.00	65.39	23.19	16.43	12.91	11.77	10.71	9.579	8.688	7.929	7.277	6.704	6.497	6.390
6.00	78.47	27.81	19.68	15.45	14.08	12.81	11.44	10.36	9.449	8.661	7.968	7.718	7.588
7.00	91.55	32.43	22.94	18.00	16.39	14.90	13.31	12.05	10.98	10.05	9.242	8.949	8.797
8.00	104.6	37.06	26.20	20.55	18.71	17.01	15.18	13.74	12.51	11.45	10.52	10.19	10.01
9.00	117.7	41.68	29.46	23.10	21.03	19.11	17.05	15.43	14.05	12.85	11.81	11.43	11.23
10.00	130.8	46.31	32.73	25.66	23.35	21.22	18.93	17.13	15.59	14.26	13.10	12.67	12.45

Sources: Land (1975) and Gilbert (1987).

TABLE A.7

VALUES OF g_n FOR CHEBYSHEV'S METHOD

Variance ÷ 2 of log-transformed data ($S_{log}^2 \div 2$)	*Number of Samples*																
	2	*5*	*8*	*10*	*13*	*15*	*20*	*25*	*30*	*50*	*70*	*90*	*100*	*150*	*200*	*500*	*∞*
0.05	1.025	1.041	1.045	1.046	1.047	1.048	1.049	1.049	1.049	1.050	1.050	1.051	1.051	1.051	1.051	1.051	1.051
0.10	1.050	1.082	1.091	1.093	1.096	1.097	1.099	1.100	1.101	1.103	1.103	1.104	1.104	1.104	1.105	1.105	1.105
0.15	1.076	1.125	1.138	1.143	1.147	1.149	1.152	1.154	1.155	1.158	1.159	1.160	1.160	1.161	1.161	1.161	1.162
0.20	1.102	1.169	1.187	1.194	1.200	1.203	1.207	1.210	1.212	1.216	1.217	1.218	1.218	1.219	1.220	1.221	1.221
0.25	1.128	1.214	1.238	1.247	1.255	1.259	1.265	1.268	1.271	1.276	1.278	1.280	1.280	1.281	1.282	1.283	1.284
0.30	1.154	1.260	1.291	1.302	1.312	1.317	1.325	1.330	1.333	1.340	1.342	1.344	1.345	1.346	1.347	1.349	1.350
0.35	1.180	1.307	1.345	1.359	1.372	1.378	1.387	1.393	1.398	1.406	1.410	1.412	1.412	1.415	1.416	1.418	1.419
0.40	1.207	1.356	1.401	1.418	1.433	1.441	1.453	1.460	1.465	1.476	1.480	1.483	1.484	1.486	1.488	1.490	1.492
0.45	1.234	1.406	1.459	1.479	1.498	1.506	1.521	1.530	1.536	1.548	1.554	1.557	1.558	1.562	1.563	1.566	1.568
0.50	1.261	1.457	1.519	1.542	1.564	1.574	1.592	1.602	1.610	1.625	1.631	1.635	1.637	1.641	1.643	1.646	1.649
0.55	1.288	1.509	1.581	1.608	1.633	1.645	1.666	1.678	1.687	1.705	1.713	1.717	1.719	1.724	1.726	1.730	1.733
0.60	1.315	1.563	1.645	1.675	1.705	1.719	1.743	1.757	1.768	1.789	1.798	1.803	1.805	1.811	1.813	1.819	1.822
0.65	1.343	1.618	1.711	1.746	1.780	1.796	1.823	1.840	1.852	1.876	1.887	1.893	1.895	1.902	1.905	1.911	1.916
0.70	1.371	1.675	1.779	1.818	1.857	1.876	1.907	1.926	1.940	1.968	1.981	1.988	1.990	1.998	2.002	2.009	2.014
0.75	1.399	1.733	1.849	1.894	1.938	1.959	1.994	2.016	2.032	2.064	2.079	2.087	2.090	2.099	2.103	2.111	2.117
0.80	1.427	1.792	1.922	1.971	2.021	2.045	2.085	2.110	2.128	2.165	2.182	2.191	2.194	2.205	2.210	2.219	2.226
0.85	1.456	1.853	1.996	2.052	2.108	2.134	2.179	2.208	2.228	2.270	2.289	2.300	2.304	2.316	2.322	2.332	2.340
0.90	1.485	1.915	2.074	2.135	2.197	2.227	2.278	2.310	2.333	2.381	2.402	2.415	2.419	2.432	2.439	2.451	2.460
0.95	1.514	1.979	2.153	2.221	2.291	2.323	2.380	2.417	2.442	2.496	2.521	2.535	2.539	2.555	2.562	2.576	2.586
1.00	1.543	2.044	2.235	2.310	2.387	2.424	2.487	2.528	2.557	2.617	2.645	2.660	2.666	2.683	2.692	2.707	2.718
1.05	1.573	2.111	2.320	2.403	2.487	2.528	2.598	2.644	2.676	2.744	2.774	2.792	2.798	2.818	2.827	2.845	2.858
1.10	1.602	2.180	2.407	2.498	2.591	2.636	2.714	2.765	2.800	2.876	2.911	2.930	2.938	2.959	2.970	2.990	3.004
1.15	1.632	2.250	2.497	2.596	2.699	2.748	2.834	2.891	2.930	3.014	3.053	3.075	3.083	3.108	3.120	3.143	3.158
1.20	1.662	2.321	2.589	2.698	2.810	2.864	2.960	3.022	3.066	3.159	3.203	3.227	3.236	3.263	3.277	3.303	3.320
1.25	1.693	2.395	2.685	2.803	2.926	2.985	3.090	3.159	3.207	3.311	3.359	3.387	3.397	3.427	3.442	3.471	3.490
1.30	1.724	2.470	2.783	2.911	3.045	3.111	3.226	3.301	3.354	3.470	3.523	3.554	3.565	3.599	3.616	3.648	3.669
1.35	1.754	2.547	2.884	3.023	3.169	3.241	3.367	3.450	3.508	3.636	3.695	3.729	3.741	3.779	3.798	3.833	3.857
1.40	1.786	2.626	2.988	3.139	3.298	3.376	3.513	3.604	3.669	3.809	3.875	3.912	3.926	3.968	3.989	4.028	4.055
1.45	1.817	2.706	3.096	3.259	3.431	3.515	3.666	3.766	3.836	3.991	4.063	4.105	4.120	4.166	4.190	4.233	4.263
1.50	1.849	2.788	3.206	3.382	3.569	3.661	3.825	3.933	4.011	4.181	4.260	4.307	4.323	4.374	4.400	4.448	4.482
1.55	1.880	2.873	3.320	3.510	3.711	3.811	3.990	4.108	4.193	4.379	4.467	4.518	4.536	4.592	4.621	4.675	4.711
1.60	1.913	2.959	3.437	3.642	3.859	3.967	4.161	4.291	4.383	4.587	4.683	4.739	4.759	4.821	4.853	4.912	4.953
1.65	1.945	3.047	3.558	3.777	4.012	4.129	4.339	4.480	4.581	4.804	4.910	4.971	4.993	5.062	5.097	5.162	5.207
1.70	1.977	3.137	3.682	3.918	4.171	4.297	4.525	4.678	4.788	5.031	5.147	5.215	5.239	5.314	5.353	5.424	5.474
1.75	2.010	3.229	3.810	4.062	4.334	4.471	4.717	4.883	5.003	5.269	5.395	5.469	5.496	5.578	5.621	5.700	5.755
1.80	2.043	3.323	3.942	4.212	4.504	4.651	4.917	5.097	5.227	5.517	5.655	5.736	5.766	5.856	5.903	5.990	6.050
1.85	2.077	3.420	4.077	4.366	4.680	4.838	5.125	5.320	5.461	5.776	5.927	6.016	6.048	6.147	6.198	6.294	6.360
1.90	2.110	3.518	4.216	4.525	4.861	5.031	5.341	5.552	5.705	6.048	6.212	6.309	6.344	6.453	6.509	6.613	6.686
1.95	2.144	3.619	4.359	4.688	5.049	5.232	5.566	5.794	5.959	6.331	6.511	6.617	6.655	6.773	6.834	6.949	7.029
2.00	2.178	3.721	4.506	4.858	5.243	5.439	5.799	6.045	6.224	6.628	6.823	6.938	6.980	7.109	7.176	7.302	7.389

Source: After Gilbert (1987).

B

APPENDIX B

RISK CALCULATIONS

TABLE B.1.1.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	5.85E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	5.85E-04
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	7.26E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	1.82E-03
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	2.01E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.71E-04
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	5.19E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	7.42E-05
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	1.83E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	9.16E-06
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	1.05E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.10E-04
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	3.89E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	2.59E-05
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	2.13E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	7.10E-05
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	7.01E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.51E-05
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	5.17E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.29E-04
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	6.00E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.00E-03
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	2.26E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	5.52E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.18E-03
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	9.39E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.13E-05
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	7.95E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.97E-04
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	1.52E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.05E-05
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	8.20E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.17E-03
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	1.63E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.63E-03
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	5.46E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.82E-05
	(Total)												1.01E-02
Dermal	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	3.86E-06	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	3.86E-06
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	4.79E-09	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	7.99E-05
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	3.99E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.33E-05
	Barium	1.66E+02	ng/g	1.66E-01	mg/kg	M	3.43E-11	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	6.99E-09
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	1.21E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	8.64E-06
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	6.92E-11	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.77E-06
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	2.57E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.32E-05
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	1.41E-09	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	1.87E-05
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	4.63E-09	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.31E-07
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	3.41E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	8.52E-07
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	3.96E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.32E-05
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	1.49E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	3.64E-07	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.95E-04
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	6.20E-11	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.07E-07
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	5.24E-08	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	6.56E-05
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	1.01E-09	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.01E-07
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	5.41E-10	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	7.73E-06
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	1.08E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	4.15E-04
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	3.60E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.20E-07
	(Total)												8.38E-04

TABLE B.1.1.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	2.85E-08	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	2.85E-05
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	3.55E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	9.83E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	2.53E-10	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.81E-06
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	8.94E-13	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.57E-07
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	5.12E-12	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	8.98E-08
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.90E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	1.04E-11	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	3.71E-07
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	3.42E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.01E-06
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	2.52E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	2.93E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	1.11E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	2.69E-09	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.88E-04
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	4.59E-13	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	5.33E-09
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	3.88E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	7.44E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	4.01E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	7.98E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	2.67E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												2.25E-04
												Total Hazard Index Across All Exposure Routes/Pathways	1.1E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.1.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	2.31E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.31E-03
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	2.39E-06	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	5.98E-03
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	1.13E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.77E-03
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	2.36E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	3.38E-04
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	7.57E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.79E-05
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.64E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	3.28E-03
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	1.24E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	8.24E-05
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	6.23E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	2.08E-04
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	5.73E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.86E-04
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	7.98E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.00E-03
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	1.35E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.51E-03
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	1.93E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	3.38E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	7.23E-03
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	1.56E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.19E-04
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	6.49E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.24E-03
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	4.14E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	8.28E-05
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	2.43E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.48E-03
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	4.13E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	4.13E-03
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	2.61E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.70E-05
	(Total)												4.16E-02
Dermal	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	1.53E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.53E-04
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	1.58E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	2.63E-03
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	2.24E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.47E-04
	Barium	3.77E+02	ng/g	3.77E-01	mg/kg	M	1.56E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	3.18E-07
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	5.00E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.57E-04
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.08E-08	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	4.33E-04
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	8.15E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.18E-04
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	4.11E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	5.48E-04
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	3.78E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.89E-05
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	5.27E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.32E-04
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	8.93E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.98E-04
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	1.28E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	2.23E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.19E-02
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	1.03E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.42E-05
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	4.28E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	5.35E-03
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	2.73E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	5.47E-06
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	1.61E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.30E-04
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	2.73E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.05E-02
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	1.72E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.74E-06
	(Total)												3.38E-02

TABLE B.1.1.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	1.13E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.13E-04
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	1.17E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	5.52E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	1.15E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	8.24E-06
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	3.70E-12	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.49E-07
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	8.00E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.40E-06
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	6.03E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	3.04E-11	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	1.09E-06
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	2.80E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	4.91E-05
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	3.90E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	6.61E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	9.44E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	1.65E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.15E-03
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	7.60E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	8.84E-08
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	3.17E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	2.02E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	1.19E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	2.02E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	1.27E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.33E-03
												Total Hazard Index Across All Exposure Routes/Pathways	7.7E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.2.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	3.32E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	8.30E-04
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	1.96E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.54E-04
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	5.17E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	7.38E-05
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	1.90E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	9.50E-06
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	2.95E-08	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	5.91E-05
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	9.07E-06	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	6.05E-06
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	7.61E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.80E-05
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	9.69E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.42E-05
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	6.00E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.00E-03
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	4.54E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	9.73E-04
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	1.32E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.38E-05
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	7.72E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.86E-05
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	8.64E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.73E-05
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	4.82E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	6.89E-04
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	4.85E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.62E-05
	(Total)												5.47E-03
Dermal	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	2.19E-09	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.65E-05
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	3.89E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.30E-05
	Barium	1.65E+02	ng/g	1.65E-01	mg/kg	M	3.41E-11	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	6.96E-09
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	1.25E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	8.96E-06
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	1.95E-11	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	7.79E-07
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	5.99E-08	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	3.07E-06
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	5.02E-09	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.51E-07
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	6.40E-09	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.60E-07
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	3.96E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.32E-05
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	3.00E-07	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.60E-04
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	8.68E-11	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.89E-07
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	5.09E-09	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	6.37E-06
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	5.70E-10	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.14E-07
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	3.18E-10	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	4.55E-06
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	3.20E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.07E-07
	(Total)												2.48E-04

TABLE B.1.2.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	1.62E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	9.59E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	2.52E-10	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.80E-06
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	9.28E-13	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.63E-07
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	1.44E-12	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	2.53E-08
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	4.43E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	3.71E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.52E-06
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	4.73E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	2.93E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	2.22E-09	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.55E-04
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	6.42E-13	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	7.47E-09
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	3.77E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	4.22E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	2.35E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	2.37E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.64E-04
												Total Hazard Index Across All Exposure Routes/Pathways	5.9E-03

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.2.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	9.67E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	2.42E-03
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	4.95E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.65E-03
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	3.38E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	4.83E-04
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	5.08E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.54E-05
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	8.05E-08	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.61E-04
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	2.92E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.95E-05
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.10E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.48E-04
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	2.42E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	6.04E-05
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	1.36E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.52E-03
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	5.52E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.18E-02
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	3.04E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.01E-03
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.74E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	8.69E-05
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	2.41E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.82E-05
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	1.43E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.04E-03
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	1.27E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.23E-05
	(Total)												2.49E-02
Dermal	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	6.38E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.06E-03
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	9.79E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.26E-04
	Barium	5.40E+02	ng/g	5.40E-01	mg/kg	M	2.23E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	4.55E-07
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	3.36E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.40E-04
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	5.31E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.12E-05
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	1.93E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	9.88E-05
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	7.23E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.62E-05
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	1.59E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.99E-06
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	8.94E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.98E-04
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	3.64E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.95E-02
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	2.01E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.69E-05
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.15E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.43E-04
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	1.59E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.18E-06
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	9.43E-09	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.35E-04
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	8.38E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.79E-06
	(Total)												2.19E-02

TABLE B.1.2.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	4.72E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	2.41E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	1.65E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.18E-05
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	2.48E-12	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	4.35E-07
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	3.93E-12	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	6.89E-08
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	1.43E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	5.35E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	9.39E-05
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	1.18E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	6.62E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	2.70E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.89E-03
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	1.49E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.73E-07
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	8.49E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	1.18E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	6.97E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	6.20E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.99E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.9E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.3.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	6.49E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	6.49E-04
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	3.06E-06	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	7.65E-03
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	1.44E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.80E-04
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	5.48E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	7.83E-05
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	1.36E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	6.82E-06
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.79E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	5.57E-04
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	1.21E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	8.06E-05
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	4.38E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.46E-04
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	6.31E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.16E-05
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	1.08E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.69E-04
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	6.04E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.01E-03
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	4.23E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	8.40E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.80E-03
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	2.25E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.51E-06
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	4.41E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.20E-03
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	4.04E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	8.07E-05
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	1.84E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.63E-03
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	3.14E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	3.14E-03
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	7.01E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.34E-05
	(Total)												2.19E-02
Dermal	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	4.28E-06	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	4.28E-06
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	2.02E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.37E-04
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	2.85E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.51E-06
	Barium	1.75E+02	ng/g	1.75E-01	mg/kg	M	3.62E-11	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	7.38E-09
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	9.01E-11	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	6.43E-06
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.84E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	7.36E-06
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	7.98E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.09E-05
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	2.89E-09	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	3.86E-05
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	4.17E-09	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.08E-07
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	7.10E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.78E-06
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	3.99E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.33E-05
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	2.79E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	5.54E-07	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	2.96E-04
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	1.49E-11	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.96E-08
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	2.91E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	3.64E-04
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	2.66E-09	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	5.33E-07
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	1.22E-09	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.74E-05
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	2.08E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	7.98E-04
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	4.63E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.54E-07
	(Total)												1.94E-03

TABLE B.1.3.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	3.17E-08	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	3.17E-05
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	1.49E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	7.03E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	2.67E-10	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.91E-06
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	6.66E-13	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.17E-07
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.36E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	2.39E-07
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	5.91E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	2.14E-11	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	7.64E-07
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	3.08E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	5.41E-06
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	5.25E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	2.95E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	2.07E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	4.10E-09	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	2.87E-04
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	1.10E-13	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.28E-09
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	2.15E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.97E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	8.99E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	1.54E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	3.42E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												3.27E-04
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.3.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	4.82E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	4.82E-03
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	2.12E-05	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	5.31E-02
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	8.68E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.89E-03
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	1.71E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.44E-04
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	3.43E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.72E-05
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	1.32E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.65E-03
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	5.25E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	3.50E-04
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	4.96E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.65E-03
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	2.29E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.14E-04
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	1.06E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.66E-03
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	1.52E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.06E-03
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	7.65E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	3.56E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	7.62E-03
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	2.35E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.83E-05
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	3.23E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.62E-02
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	1.65E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.29E-04
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	6.34E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	9.05E-03
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	1.17E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.17E-02
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	6.22E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.07E-04
	(Total)												1.19E-01
Dermal	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	3.18E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	3.18E-04
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	1.40E-06	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	2.34E-02
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	1.72E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.73E-04
	Barium	2.73E+02	ng/g	2.73E-01	mg/kg	M	1.13E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.30E-07
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	2.26E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	1.62E-04
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	8.74E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	3.49E-04
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	3.46E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.78E-03
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	3.28E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	4.37E-03
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	1.51E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.55E-06
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	7.01E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.75E-04
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	1.00E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.34E-04
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	5.05E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	2.35E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.26E-02
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	1.55E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.17E-06
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	2.13E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	2.67E-02
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	1.09E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.17E-05
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	4.18E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	5.97E-04
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	7.72E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.97E-02
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	4.11E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.37E-05
	(Total)												1.01E-01

TABLE B.1.3.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	2.35E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	2.35E-04
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	1.04E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	4.24E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	8.35E-10	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	5.97E-06
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	1.68E-12	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	2.94E-07
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	6.46E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.13E-06
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	2.56E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	2.42E-10	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	8.66E-06
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	1.12E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.96E-05
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	5.19E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	7.41E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	3.73E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	1.74E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.21E-03
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	1.15E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.33E-08
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	1.58E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	8.04E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	3.09E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	5.71E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	3.04E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.49E-03
												Total Hazard Index Across All Exposure Routes/Pathways	2.2E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.4.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	6.55E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	6.55E-03
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	8.14E-06	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	2.03E-02
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	2.25E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.52E-03
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	5.81E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	8.31E-04
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	2.05E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.03E-04
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	1.17E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.35E-03
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	4.36E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	2.90E-04
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	2.38E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	7.95E-04
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	7.86E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.93E-04
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	5.79E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.45E-03
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	6.72E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.24E-02
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	2.54E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	6.18E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.32E-02
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.05E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.51E-04
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	8.90E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.45E-03
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	1.71E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.42E-04
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	9.19E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.31E-02
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	1.83E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.83E-02
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	6.12E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.04E-04
	(Total)												1.13E-01
Dermal	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	1.15E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.15E-04
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	1.43E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	2.39E-03
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	1.19E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.97E-04
	Barium	1.66E+02	ng/g	1.66E-01	mg/kg	M	1.02E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.09E-07
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	3.61E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.58E-04
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	2.07E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	8.27E-05
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	7.67E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	3.93E-04
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	4.20E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	5.60E-04
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	1.38E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	6.91E-06
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.02E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.55E-05
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	1.18E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.94E-04
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	4.46E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.09E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	5.82E-03
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.85E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.17E-06
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	1.57E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.96E-03
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	3.01E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.01E-06
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	1.62E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.31E-04
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	3.22E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.24E-02
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.08E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.59E-06
	(Total)												2.50E-02

TABLE B.1.4.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	1.16E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.16E-04
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	1.44E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	3.98E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	1.03E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	7.33E-06
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	3.62E-12	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.35E-07
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	2.07E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	3.64E-07
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	7.69E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	4.21E-11	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	1.50E-06
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	1.39E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	2.43E-05
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.02E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	1.19E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	4.47E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.09E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	7.63E-04
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.86E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	2.16E-08
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	1.57E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	3.01E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	1.62E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	3.23E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.08E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												9.12E-04
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.4.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	2.59E-02	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.59E-02
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	2.68E-05	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	6.70E-02
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	1.27E-05	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.22E-02
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	2.65E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	3.78E-03
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	8.48E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	4.24E-04
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.84E-05	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	3.67E-02
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	1.38E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	9.22E-04
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	6.98E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	2.33E-03
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	6.42E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.21E-03
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	8.94E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.24E-02
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	1.52E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.05E-02
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	2.17E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	3.78E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	8.10E-02
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	1.74E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.81E-03
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	7.27E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.63E-02
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	4.64E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	9.28E-04
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	2.73E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.89E-02
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	4.63E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	4.63E-02
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	2.92E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	9.74E-04
	(Total)												4.66E-01
Dermal	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	2.28E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.28E-03
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	2.36E-06	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.93E-02
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	3.34E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.11E-02
	Barium	3.77E+02	ng/g	3.77E-01	mg/kg	M	2.33E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	4.75E-06
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	7.46E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	5.33E-03
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.62E-07	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	6.46E-03
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	1.22E-04	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	6.24E-03
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	6.14E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	8.19E-03
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	5.65E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.82E-04
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	7.87E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.97E-03
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	1.33E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.45E-03
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	1.91E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	3.33E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.78E-01
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	1.53E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.11E-04
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	6.39E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	7.99E-02
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	4.08E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	8.16E-05
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	2.40E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.43E-03
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	4.07E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.57E-01
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	2.57E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.57E-05
	(Total)												5.04E-01

TABLE B.1.4.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	9.14E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	9.14E-04
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	9.46E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	4.47E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	9.34E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	6.67E-05
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	2.99E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	5.25E-06
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	6.48E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.14E-05
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	4.88E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	2.46E-10	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	8.79E-06
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	2.26E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	3.97E-04
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	3.16E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	5.35E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	7.64E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	1.34E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	9.34E-03
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	6.15E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	7.15E-07
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	2.56E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	1.64E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	9.62E-11	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	1.63E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	1.03E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												1.07E-02
												Total Hazard Index Across All Exposure Routes/Pathways	9.8E-01

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.5.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	3.72E-06	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	9.29E-03
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	2.20E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.33E-03
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	5.79E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	8.27E-04
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	2.13E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.06E-04
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	3.31E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	6.61E-04
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	1.02E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	6.77E-05
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	8.52E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.26E-04
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	1.09E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.71E-04
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	6.72E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.24E-02
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	5.09E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.09E-02
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	1.47E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.91E-04
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	8.64E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.32E-04
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	9.68E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.94E-04
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	5.40E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	7.72E-03
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	5.43E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.81E-04
	(Total)												6.13E-02
Dermal	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	6.54E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.09E-03
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	1.16E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.87E-04
	Barium	1.65E+02	ng/g	1.65E-01	mg/kg	M	1.02E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.08E-07
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	3.75E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.68E-04
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	5.82E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.33E-05
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	1.79E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	9.17E-05
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	1.50E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.50E-06
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	1.91E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	4.78E-06
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	1.18E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.94E-04
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	8.96E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	4.79E-03
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	2.59E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.64E-06
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	1.52E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.90E-04
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	1.70E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.41E-06
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	9.50E-09	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.36E-04
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	9.55E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.18E-06
	(Total)												7.40E-03

TABLE B.1.5.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	6.56E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	3.88E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.02E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	7.29E-06
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	3.76E-12	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.59E-07
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	5.84E-12	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.02E-07
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	1.79E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	1.50E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	2.64E-05
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	1.92E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	1.19E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	8.98E-09	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	6.28E-04
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	2.60E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	3.02E-08
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	1.53E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	1.71E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	9.53E-12	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	9.58E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												6.62E-04

Total Hazard Index Across All Exposure Routes/Pathways 6.9E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.5.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	1.08E-05	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	2.71E-02
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	5.54E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.85E-02
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	3.79E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	5.41E-03
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	5.69E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.85E-04
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	9.01E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.80E-03
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	3.27E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	2.18E-04
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.23E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	6.14E-03
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	2.71E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	6.77E-04
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	1.52E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.06E-02
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	6.18E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.32E-01
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	3.41E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.14E-02
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.95E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	9.74E-04
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	2.70E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	5.40E-04
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	1.60E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.29E-02
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	1.42E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.74E-04
	(Total)												2.79E-01
Dermal	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	9.53E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.59E-02
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	1.46E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.87E-03
	Barium	5.40E+02	ng/g	5.40E-01	mg/kg	M	3.33E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	6.80E-06
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	5.01E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.58E-03
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	7.93E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	3.17E-04
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	2.88E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.48E-03
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.08E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.40E-04
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	2.38E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	5.95E-05
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	1.34E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.45E-03
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	5.44E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	2.91E-01
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	3.00E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.99E-04
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.71E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	2.14E-03
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	2.38E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.75E-05
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	1.41E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.01E-03
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	1.25E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.17E-05
	(Total)												3.27E-01

TABLE B.1.5.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	3.82E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	1.96E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	1.34E-08	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	9.55E-05
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	2.01E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	3.53E-06
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	3.18E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	5.58E-07
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	1.15E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	4.33E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	7.60E-04
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	9.55E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	5.36E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	2.18E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.53E-02
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	1.20E-10	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.40E-06
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	6.87E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	9.53E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	5.65E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	5.02E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.61E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.2E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.6.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	7.27E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	7.27E-03
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	3.43E-05	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	8.57E-02
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	1.61E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.38E-03
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	6.14E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	8.77E-04
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	1.53E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	7.64E-05
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.12E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	6.24E-03
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	1.35E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	9.03E-04
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	4.91E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.64E-03
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	7.07E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.53E-04
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	1.21E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.01E-03
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	6.77E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.26E-02
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	4.74E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	9.41E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	2.01E-02
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	2.52E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.42E-05
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	4.94E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.47E-02
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	4.52E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	9.04E-04
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	2.06E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.95E-02
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	3.52E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	3.52E-02
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	7.86E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.62E-04
	(Total)												2.45E-01
Dermal	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	1.28E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.28E-04
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	6.03E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.01E-02
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	8.52E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.84E-04
	Barium	1.75E+02	ng/g	1.75E-01	mg/kg	M	1.08E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.20E-07
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	2.69E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	1.92E-04
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.49E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.20E-04
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	2.38E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.22E-03
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	8.64E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	1.15E-03
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	1.24E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	6.22E-06
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	2.12E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	5.30E-05
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	1.19E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.97E-04
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	8.34E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	1.66E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	8.86E-03
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	4.44E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.48E-06
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	8.69E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.09E-02
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	7.96E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.59E-05
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	3.63E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	5.18E-04
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	6.20E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.38E-02
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	1.38E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.61E-06
	(Total)												5.78E-02

TABLE B.1.6.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	1.28E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.28E-04
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	6.05E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	2.85E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.08E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	7.73E-06
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	2.70E-12	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	4.73E-07
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.51E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	9.66E-07
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	2.39E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	8.66E-11	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	3.09E-06
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	1.25E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	2.19E-05
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	2.13E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	1.19E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	8.37E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	1.66E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.16E-03
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	4.46E-13	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	5.18E-09
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	8.72E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	7.98E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	3.64E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	6.22E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	1.39E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.32E-03

Total Hazard Index Across All Exposure Routes/Pathways 3.0E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.6.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	5.40E-02	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	5.40E-02
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	2.38E-04	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	5.94E-01
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	9.72E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.24E-02
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	1.92E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.74E-03
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	3.84E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.92E-04
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	1.48E-05	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.96E-02
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	5.88E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	3.92E-03
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	5.56E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.85E-02
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	2.56E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.28E-03
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	1.19E-03	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.97E-02
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	1.70E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.67E-02
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	8.56E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	3.98E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	8.53E-02
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	2.63E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.77E-04
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	3.62E-03	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.81E-01
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	1.84E-05	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.69E-03
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	7.10E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.01E-01
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	1.31E-04	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.31E-01
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	6.97E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.32E-03
	(Total)												1.33E+00
Dermal	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	4.75E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	4.75E-03
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	2.09E-05	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.49E-01
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	2.57E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.55E-03
	Barium	2.73E+02	ng/g	2.73E-01	mg/kg	M	1.69E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	3.44E-06
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	3.38E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.42E-03
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	1.30E-07	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	5.22E-03
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	5.17E-04	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	2.65E-02
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	4.89E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	6.52E-02
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	2.25E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.13E-04
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	1.05E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.62E-03
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	1.50E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.99E-03
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	7.54E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	3.51E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.87E-01
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	2.31E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.72E-05
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	3.18E-04	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	3.98E-01
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	1.62E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.25E-04
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	6.25E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	8.92E-03
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	1.15E-05	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	4.43E-01
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	6.13E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.04E-04
	(Total)												1.51E+00

TABLE B.1.6.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	1.91E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.91E-03
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	8.39E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	3.43E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	6.76E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	4.83E-05
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	1.36E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	2.38E-06
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	5.23E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	9.18E-06
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	2.07E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	1.96E-09	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	7.01E-05
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	9.04E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.59E-04
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	4.20E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	6.00E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	3.02E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	1.41E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	9.83E-03
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	9.28E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.08E-07
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	1.28E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	6.51E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	2.50E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	4.62E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	2.46E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.20E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.8E+00

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.7.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	1.54E-02	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.54E-02
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	5.95E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.98E-02
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	1.24E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	1.77E-03
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	6.57E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.28E-04
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	2.07E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	4.13E-03
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.06E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	7.07E-04
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	1.46E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	4.86E-03
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	1.53E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.63E-04
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	9.93E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.48E-03
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	1.96E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.55E-02
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	4.86E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	1.22E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	2.62E-02
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	3.09E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.03E-03
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.49E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.46E-03
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	3.69E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	7.37E-04
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	3.21E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	4.59E-02
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	4.34E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	4.34E-02
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.45E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.85E-04
	(Total)												2.41E-01
Dermal	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	1.02E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.02E-04
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	1.18E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.93E-04
	Barium	1.45E+02	ng/g	1.45E-01	mg/kg	M	8.19E-10	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	1.67E-07
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	4.33E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.10E-04
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	1.36E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	5.45E-05
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	7.00E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	3.59E-04
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	9.62E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	1.28E-03
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	1.01E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.03E-06
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	6.55E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.64E-05
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	1.30E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.32E-04
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	3.21E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	8.07E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	4.32E-03
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	2.04E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.79E-06
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	9.84E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.23E-03
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	2.43E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.87E-06
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	2.12E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.03E-04
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	2.87E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.10E-02
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	9.60E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.20E-06
	(Total)												1.98E-02

TABLE B.1.7.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	7.53E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	7.53E-04
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	2.90E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	6.06E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	4.33E-05
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	3.21E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	5.63E-06
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	1.01E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.77E-06
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	5.18E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	7.11E-10	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	2.54E-05
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	7.45E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.31E-04
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	4.85E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	9.59E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	2.37E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	5.97E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	4.18E-03
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	1.51E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.75E-07
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	7.28E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	1.80E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	1.57E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	2.12E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	7.10E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												5.14E-03
												Total Hazard Index Across All Exposure Routes/Pathways	2.7E-01

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.7.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation.
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	2.83E-02	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.83E-02
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	9.47E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.16E-02
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.67E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.38E-03
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	9.51E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	4.75E-04
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	1.31E-05	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.62E-02
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	1.56E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.04E-03
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	5.70E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.90E-02
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	5.58E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.79E-03
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	5.25E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.31E-02
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	2.77E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	9.24E-02
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	7.99E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	1.77E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	3.80E-02
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	3.48E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.16E-02
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	6.04E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.02E-02
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	5.29E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.06E-03
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	5.28E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	7.55E-02
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	5.72E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	5.72E-02
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	2.04E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.79E-04
	(Total)												4.31E-01
Dermal	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	1.87E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.87E-03
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	1.87E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.25E-03
	Barium	1.70E+02	ng/g	1.70E-01	mg/kg	M	1.10E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.24E-06
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	6.27E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	4.48E-03
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	8.65E-08	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	3.46E-03
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	1.03E-04	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	5.27E-03
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	3.76E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	5.01E-02
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	3.68E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.84E-04
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	3.47E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	8.67E-04
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	1.83E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.10E-03
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	5.27E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	1.17E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	6.26E-02
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	2.30E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.66E-04
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	3.99E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	4.98E-02
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	3.49E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.98E-05
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	3.49E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	4.98E-03
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	3.77E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.45E-01
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	1.34E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.48E-05
	(Total)												3.42E-01

TABLE B.1.7.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	1.38E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.38E-03
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	4.62E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	8.13E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	5.81E-05
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	4.64E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	8.14E-06
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	6.40E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.12E-05
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	7.61E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	2.78E-09	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	9.93E-05
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	2.72E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	4.78E-04
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	2.56E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	1.35E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	3.90E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	8.66E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	6.06E-03
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	1.70E-10	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.98E-06
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	2.95E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	2.58E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	2.58E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	2.79E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	9.95E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												8.09E-03
												Total Hazard Index Across All Exposure Routes/Pathways	7.8E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.8.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	5.28E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.76E-02
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	1.27E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	1.81E-03
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	5.91E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.96E-04
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	1.05E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.09E-03
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.42E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	9.43E-05
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	1.53E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.67E-04
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	2.86E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	7.15E-04
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	2.08E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.92E-02
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	4.64E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	9.00E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.93E-02
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	3.77E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.26E-03
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	2.24E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.12E-03
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	2.01E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.03E-04
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	1.40E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.67E-04
	(Total)												1.15E-01
Dermal	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	1.05E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.48E-04
	Barium	1.48E+02	ng/g	1.48E-01	mg/kg	M	8.36E-10	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	1.71E-07
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	3.90E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.79E-04
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	6.90E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.76E-05
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	9.34E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.79E-05
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	1.01E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.06E-06
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	1.89E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	4.72E-06
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	1.37E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.57E-04
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	3.06E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	5.94E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	3.18E-03
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	2.49E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.30E-06
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.48E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.85E-04
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	1.33E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.66E-06
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	9.25E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.08E-06
	(Total)												4.54E-03

TABLE B.1.8.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	2.58E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	6.18E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	4.42E-05
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	2.89E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	5.07E-06
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	5.11E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	8.96E-07
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	6.91E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	7.49E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.31E-04
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	1.40E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	1.01E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	2.26E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	4.39E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	3.07E-03
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	1.84E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	2.14E-07
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.10E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	9.83E-11	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	6.84E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												3.25E-03
	Total Hazard Index Across All Exposure Routes/Pathways												1.2E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.8.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	6.91E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.30E-02
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	3.29E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	4.70E-03
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	7.73E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.87E-04
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	1.49E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	2.98E-03
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	2.53E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.68E-04
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	8.70E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.35E-03
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	4.57E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.14E-03
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	3.77E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.26E-01
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	2.21E-04	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	4.39E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	9.40E-02
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	8.26E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.75E-03
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	2.76E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.38E-03
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	2.82E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	5.65E-04
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	2.03E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.78E-04
	(Total)												2.62E-01
Dermal	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	1.37E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.56E-03
	Barium	3.36E+02	ng/g	3.36E-01	mg/kg	M	2.17E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	4.43E-06
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	5.10E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.65E-03
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	9.83E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	3.93E-04
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	1.67E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	8.55E-04
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	5.74E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.87E-04
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	3.02E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	7.55E-05
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	2.49E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.29E-03
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	1.46E-05	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	2.90E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.55E-01
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	5.45E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.82E-04
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	1.82E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	2.28E-03
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	1.86E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.73E-05
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	1.34E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.48E-05
	(Total)												1.76E-01

TABLE B.1.8.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	3.37E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	1.61E-08	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.15E-04
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	3.78E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.62E-06
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	7.27E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.28E-06
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	1.23E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	4.25E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	7.45E-04
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	2.23E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	1.84E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	1.08E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	2.14E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.50E-02
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	4.03E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	4.69E-07
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	1.35E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	1.38E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	9.93E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.59E-02
												Total Hazard Index Across All Exposure Routes/Pathways	4.5E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.9.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	1.55E-02	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.55E-02
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	5.47E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.82E-02
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.10E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	1.58E-03
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	5.20E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.60E-04
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	2.91E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	5.83E-03
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	1.97E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.31E-03
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	2.70E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	9.00E-03
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.11E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.54E-04
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	1.51E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.77E-03
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	1.40E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.68E-02
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	4.86E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	2.96E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	6.34E-02
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	6.77E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.26E-04
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	3.68E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.84E-02
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	4.97E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	9.94E-04
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	4.89E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	6.99E-02
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	5.63E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	5.63E-02
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.10E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.67E-04
	(Total)												3.12E-01
Dermal	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	1.02E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.02E-04
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	1.08E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.61E-04
	Barium	1.29E+02	ng/g	1.29E-01	mg/kg	M	7.29E-10	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	1.49E-07
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	3.43E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.45E-04
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	1.92E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	7.69E-05
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	1.30E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	6.67E-04
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	1.78E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	2.38E-03
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	7.31E-08	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.66E-06
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	9.96E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.49E-05
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	9.27E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.09E-04
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	3.21E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	1.95E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.04E-02
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	4.47E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.49E-06
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	2.43E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	3.04E-03
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	3.28E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.56E-06
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	3.23E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	4.61E-04
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	3.72E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.43E-02
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	7.27E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.42E-06
	(Total)												3.24E-02

TABLE B.1.9.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	7.57E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	7.57E-04
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	2.67E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	5.39E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	3.85E-05
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	2.54E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	4.46E-06
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	1.42E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	2.50E-06
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	9.62E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	1.32E-09	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	4.71E-05
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	5.41E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	9.49E-05
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	7.37E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	6.86E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	2.37E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	1.44E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.01E-02
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	3.31E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	3.84E-08
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	1.80E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	2.43E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	2.39E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	2.75E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	5.38E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.10E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.6E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.9.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	3.37E-02	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	3.37E-02
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	1.06E-05	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.52E-02
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	1.68E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.40E-03
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	7.92E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.96E-04
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	7.21E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.44E-02
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	2.95E-03	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.97E-03
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	1.04E-04	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	3.48E-02
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	1.86E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	9.30E-04
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	9.54E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.39E-02
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	2.48E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.28E-02
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	1.30E-04	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.81E-02	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	3.87E-01
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	9.12E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.04E-04
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	1.07E-03	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.37E-02
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	8.21E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.64E-03
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	8.57E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.22E-01
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	7.98E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	7.98E-02
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	2.10E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.01E-04
	(Total)												8.76E-01
Dermal	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	2.23E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.23E-03
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	2.09E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.97E-03
	Barium	1.72E+02	ng/g	1.72E-01	mg/kg	M	1.11E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.26E-06
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	5.22E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.73E-03
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	4.76E-08	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	1.90E-03
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	1.95E-04	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	9.99E-03
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	6.89E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	9.19E-02
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	1.23E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	6.14E-05
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	6.30E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.57E-03
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	1.64E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.46E-03
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	8.60E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.19E-03	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	6.38E-01
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	6.02E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.01E-05
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	7.08E-05	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	8.85E-02
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	5.42E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.08E-04
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	5.66E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	8.08E-03
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	5.27E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.03E-01
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	1.39E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.63E-05
	(Total)												1.06E+00

TABLE B.1.9.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	1.65E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.65E-03
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	5.16E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	8.21E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	5.86E-05
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	3.86E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.78E-06
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	3.52E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	6.18E-06
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	1.44E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	5.10E-09	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	1.82E-04
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	9.08E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.59E-04
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	4.66E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	1.21E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	6.37E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	8.82E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	6.17E-02
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	4.45E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	5.18E-08
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	5.24E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	4.01E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	4.18E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	3.90E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	1.03E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												6.37E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.0E+00

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.10.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	2.32E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.32E-03
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	8.96E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.99E-03
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	1.87E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.67E-04
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	9.90E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	4.95E-05
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	3.11E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	6.23E-04
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.60E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.07E-04
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	2.20E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	7.32E-04
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	2.30E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.15E-04
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	1.50E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.74E-04
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	2.96E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	9.87E-03
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	7.32E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	1.84E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	3.95E-03
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	4.65E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.55E-04
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	2.25E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.12E-03
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	5.55E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.11E-04
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	4.84E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	6.92E-03
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	6.55E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	6.55E-03
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	2.19E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.30E-05
	(Total)												3.63E-02
Dermal	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	2.32E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.32E-05
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	2.69E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.96E-05
	Barium	1.45E+02	ng/g	1.45E-01	mg/kg	M	1.87E-10	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	3.82E-08
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	9.90E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	7.07E-05
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	3.11E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	1.25E-05
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.60E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	8.20E-05
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	2.20E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	2.93E-04
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	2.30E-08	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.15E-06
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	1.50E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.74E-06
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	2.96E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	9.87E-05
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	7.32E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	1.84E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	9.85E-04
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	4.65E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.55E-06
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	2.25E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	2.81E-04
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	5.55E-09	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.11E-06
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	4.84E-09	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	6.92E-05
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	6.55E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.52E-03
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	2.19E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.30E-07
	(Total)												4.53E-03

TABLE B.1.10.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	9.91E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	9.91E-04
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	3.82E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	7.97E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	5.69E-05
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	4.22E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	7.40E-06
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	1.33E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	2.33E-06
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	6.81E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	9.36E-10	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	3.34E-05
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	9.80E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.72E-04
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	6.38E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	1.26E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	3.12E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	7.86E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	5.49E-03
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	1.98E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	2.30E-07
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	9.58E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	2.37E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	2.06E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	2.79E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	9.34E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												6.76E-03

Total Hazard Index Across All Exposure Routes/Pathways 4.8E-02

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.10.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	7.46E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	7.46E-03
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	2.50E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.33E-03
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	4.40E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	6.28E-04
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	2.51E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.25E-04
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	3.46E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	6.92E-03
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	4.11E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	2.74E-04
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	1.50E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	5.01E-03
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	1.47E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.36E-04
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	1.39E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.47E-03
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	7.32E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.44E-02
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	2.11E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	4.68E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.00E-02
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	9.19E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.06E-03
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	1.59E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.97E-03
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	1.40E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.79E-04
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	1.39E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.99E-02
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	1.51E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.51E-02
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	5.38E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.79E-04
	(Total)												1.14E-01
Dermal	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	2.24E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.24E-04
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	2.25E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.50E-04
	Barium	1.70E+02	ng/g	1.70E-01	mg/kg	M	1.32E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.69E-07
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	7.53E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	5.38E-04
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	1.04E-08	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	4.15E-04
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	1.23E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	6.33E-04
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	4.51E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	6.02E-03
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	4.42E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.21E-05
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	4.16E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.04E-04
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	2.20E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.32E-04
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	6.32E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	1.40E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	7.51E-03
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	2.76E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.19E-05
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	4.78E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	5.98E-03
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	4.19E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	8.38E-06
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	4.18E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	5.98E-04
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	4.53E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.74E-02
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	1.61E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.38E-06
	(Total)												4.10E-02

TABLE B.1.10.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag (0-10 ftbgs)
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	3.18E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	3.18E-03
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	1.07E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.87E-08	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.34E-04
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	1.07E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.88E-05
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	1.48E-09	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	2.59E-05
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	1.75E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	6.41E-09	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	2.29E-04
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	6.28E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.10E-03
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	5.91E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	3.12E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	8.99E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	2.00E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.40E-02
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	3.92E-10	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	4.56E-06
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	6.80E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	5.95E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	5.94E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	6.43E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	2.29E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												1.87E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.11.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	7.96E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.65E-03
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	1.91E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.73E-04
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	8.91E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	4.46E-05
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	1.58E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	3.15E-04
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	2.13E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.42E-05
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	2.31E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.16E-04
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	4.31E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.08E-04
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	3.13E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.04E-02
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	6.99E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	1.36E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	2.90E-03
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	5.68E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.89E-04
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	3.38E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.69E-04
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	3.04E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.07E-05
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	2.11E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.04E-05
	(Total)												1.73E-02
Dermal	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	2.39E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.96E-05
	Barium	1.48E+02	ng/g	1.48E-01	mg/kg	M	1.91E-10	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	3.89E-08
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	8.91E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	6.37E-05
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	1.58E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	6.30E-06
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	2.13E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.09E-05
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	2.31E-08	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.16E-06
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	4.31E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.08E-06
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	3.13E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.04E-04
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	6.99E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	1.36E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	7.25E-04
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	5.68E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.89E-06
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	3.38E-08	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	4.23E-05
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	3.04E-09	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.07E-07
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	2.11E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.04E-07
	(Total)												1.04E-03

TABLE B.1.11.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	3.39E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	8.13E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	5.81E-05
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	3.80E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	6.67E-06
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	6.72E-11	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.18E-06
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	9.09E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	9.86E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.73E-04
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	1.84E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	1.33E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	2.98E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	5.78E-08	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	4.04E-03
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	2.42E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	2.82E-07
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.44E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	1.29E-10	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	9.00E-09	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	(Total)												4.28E-03
												Total Hazard Index Across All Exposure Routes/Pathways	2.3E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.11.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	1.82E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.08E-03
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	8.69E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	1.24E-03
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	2.04E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.02E-04
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	3.93E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	7.86E-04
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	6.67E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	4.45E-05
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	2.30E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.15E-03
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	1.21E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.02E-04
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	9.95E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.32E-02
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	5.85E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	1.16E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	2.48E-02
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	2.18E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	7.27E-04
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	7.29E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.64E-04
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	7.45E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.49E-04
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	5.37E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.79E-04
	(Total)												6.91E-02
Dermal	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	1.64E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.47E-04
	Barium	3.36E+02	ng/g	3.36E-01	mg/kg	M	2.61E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	5.32E-07
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	6.12E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	4.37E-04
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	1.18E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	4.72E-05
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	2.00E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.03E-04
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	6.89E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.44E-05
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	3.62E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	9.06E-06
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	2.98E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	9.95E-04
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	1.75E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	3.48E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.86E-02
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	6.54E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.18E-05
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	2.19E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	2.73E-04
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	2.24E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.47E-06
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	1.61E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.37E-06
	(Total)												2.11E-02

TABLE B.1.11.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	7.78E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	3.70E-08	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	2.65E-04
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	8.70E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.53E-05
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	1.68E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	2.94E-06
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	2.84E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	9.79E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.72E-03
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	5.15E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	4.24E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	2.49E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	4.94E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	3.46E-02
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	9.29E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.08E-06
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	3.11E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	3.18E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	2.29E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												3.66E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-01

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.12.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	2.34E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.34E-03
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	8.24E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.75E-03
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.66E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.38E-04
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	7.84E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.92E-05
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	4.39E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	8.78E-04
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	2.97E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.98E-04
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	4.07E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.36E-03
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.67E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	8.35E-05
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	2.27E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	5.68E-04
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	2.12E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.06E-03
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	7.33E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	4.46E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	9.55E-03
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	1.02E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.40E-05
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	5.55E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.77E-03
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	7.49E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.50E-04
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	7.37E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.05E-02
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	8.48E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	8.48E-03
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.66E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.53E-05
	(Total)												4.71E-02
Dermal	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	2.34E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.34E-05
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	2.47E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.24E-05
	Barium	1.29E+02	ng/g	1.29E-01	mg/kg	M	1.66E-10	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	3.40E-08
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	7.84E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	5.60E-05
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	4.39E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	1.76E-05
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	2.97E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.52E-04
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	4.07E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	5.42E-04
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.67E-08	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	8.35E-07
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	2.27E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	5.68E-06
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	2.12E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.06E-05
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	7.33E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	4.46E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	2.38E-03
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	1.02E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.40E-07
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	5.55E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	6.94E-04
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	7.49E-09	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.50E-06
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	7.37E-09	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.05E-04
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	8.48E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	3.26E-03
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.66E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.53E-07
	(Total)												7.40E-03

TABLE B.1.12.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	9.95E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	9.95E-04
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	3.51E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	7.09E-09	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	5.07E-05
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	3.34E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	5.86E-06
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	1.87E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	3.28E-06
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	1.27E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	1.73E-09	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	6.19E-05
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	7.12E-10	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.25E-04
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	9.69E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	9.02E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	3.12E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	1.90E-07	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.33E-02
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	4.35E-12	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	5.06E-08
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	2.37E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	3.19E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	3.14E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	3.62E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	7.08E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												1.45E-02

Total Hazard Index Across All Exposure Routes/Pathways 6.9E-02

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.12.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	8.91E-03	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	8.91E-03
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	2.79E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.29E-03
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	4.44E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	6.34E-04
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	2.09E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.04E-04
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	1.90E-06	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	3.81E-03
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	7.79E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	5.20E-04
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	2.76E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	9.19E-03
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	4.91E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.46E-04
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	2.52E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	6.30E-03
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	6.56E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.19E-02
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	3.44E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.77E-03	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.02E-01
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	2.41E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.02E-05
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	2.83E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.42E-02
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	2.17E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.33E-04
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	2.26E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.23E-02
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	2.11E-05	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	2.11E-02
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	5.55E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.85E-04
	(Total)												2.31E-01
Dermal	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	2.67E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.67E-04
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	2.51E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.36E-04
	Barium	1.72E+02	ng/g	1.72E-01	mg/kg	M	1.33E-09	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.72E-07
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	6.27E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	4.48E-04
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	5.71E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.28E-04
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	2.34E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.20E-03
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	8.27E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	1.10E-02
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	1.47E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	7.37E-06
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	7.56E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.89E-04
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	1.97E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.56E-04
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	1.03E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	1.43E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	7.65E-02
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	7.22E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.41E-06
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	8.50E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.06E-02
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	6.50E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.30E-05
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	6.79E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	9.70E-04
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	6.32E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.43E-02
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	1.67E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.55E-06
	(Total)												1.27E-01

TABLE B.1.12.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Inhalation	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	3.80E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	3.80E-03
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	1.19E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	1.89E-08	mg/kg-day	1.40E-04	mg/kg-day	N/A	N/A	1.35E-04
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	8.91E-11	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	1.56E-05
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	8.12E-10	mg/kg-day	5.70E-05	mg/kg-day	N/A	N/A	1.42E-05
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	3.32E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	1.18E-08	mg/kg-day	2.80E-05	mg/kg-day	N/A	N/A	4.20E-04
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	2.09E-09	mg/kg-day	5.70E-06	mg/kg-day	N/A	N/A	3.67E-04
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	1.07E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	2.80E-06	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	1.47E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	2.03E-06	mg/kg-day	1.43E-05	mg/kg-day	N/A	N/A	1.42E-01
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	1.03E-11	mg/kg-day	8.60E-05	mg/kg-day	N/A	N/A	1.19E-07
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	1.21E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	9.24E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	9.65E-10	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	8.98E-09	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	2.37E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	(Total)												1.47E-01
												Total Hazard Index Across All Exposure Routes/Pathways	5.1E-01

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.13.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO GROUNDWATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	9.21E+00	mg/L	9.21E+00	mg/L	M	1.80E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.80E-05
	Antimony	1.00E-02	mg/L	1.00E-02	mg/L	M	1.96E-08	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	4.89E-05
	Arsenic	2.21E-02	mg/L	2.21E-02	mg/L	M	4.32E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.44E-04
	Chromium	5.10E-02	mg/L	5.10E-02	mg/L	M	9.98E-08	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	6.65E-08
	Chromium VI (Hexavalent)	2.50E-02	mg/L	2.50E-02	mg/L	M	4.89E-08	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.63E-05
	Iron	9.50E+00	mg/L	9.50E+00	mg/L	M	1.86E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.20E-05
	Lead	3.90E-02	mg/L	3.90E-02	mg/L	M	7.63E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	4.76E-01	mg/L	4.76E-01	mg/L	M	9.32E-07	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	2.00E-05
	Selenium	2.77E-02	mg/L	2.77E-02	mg/L	M	5.42E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.08E-05
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	3.09E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	4.42E-04
	Vanadium	2.31E-02	mg/L	2.31E-02	mg/L	M	4.52E-08	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	4.52E-05
	Zinc	2.14E-01	mg/L	2.14E-01	mg/L	M	4.19E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.40E-06
	(Total)												8.09E-04
Dermal	Aluminum	9.21E+00	mg/L	9.21E+00	mg/L	M	1.19E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.19E-05
	Antimony	1.00E-02	mg/L	1.00E-02	mg/L	M	1.29E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	2.15E-04
	Arsenic	2.21E-02	mg/L	2.21E-02	mg/L	M	2.85E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.51E-05
	Chromium	5.10E-02	mg/L	5.10E-02	mg/L	M	6.59E-08	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	3.38E-06
	Chromium VI (Hexavalent)	2.50E-02	mg/L	2.50E-02	mg/L	M	6.46E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	8.61E-04
	Iron	9.50E+00	mg/L	9.50E+00	mg/L	M	1.23E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.09E-05
	Lead	3.90E-02	mg/L	3.90E-02	mg/L	M	5.04E-08	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	4.76E-01	mg/L	4.76E-01	mg/L	M	6.15E-07	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	3.29E-04
	Selenium	2.77E-02	mg/L	2.77E-02	mg/L	M	3.58E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	7.16E-06
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	2.04E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.92E-04
	Vanadium	2.31E-02	mg/L	2.31E-02	mg/L	M	2.98E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.15E-03
	Zinc	2.14E-01	mg/L	2.14E-01	mg/L	M	1.66E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.53E-07
	(Total)												3.00E-03
												Total Hazard Index Across All Exposure Routes/Pathways	3.8E-03

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.13.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO GROUNDWATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.33E+01	mg/L	2.33E+01	mg/L	M	1.83E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.83E-04
	Antimony	1.07E-02	mg/L	1.07E-02	mg/L	M	8.34E-08	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	2.09E-04
	Arsenic	2.57E-02	mg/L	2.57E-02	mg/L	M	2.01E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.71E-04
	Chromium	1.53E-01	mg/L	1.53E-01	mg/L	M	1.20E-06	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	8.00E-07
	Chromium VI (Hexavalent)	3.52E-02	mg/L	3.52E-02	mg/L	M	2.75E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	9.18E-05
	Iron	1.58E+01	mg/L	1.58E+01	mg/L	M	1.24E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.13E-04
	Lead	6.12E-02	mg/L	6.12E-02	mg/L	M	4.79E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.06E-01	mg/L	7.06E-01	mg/L	M	5.52E-06	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.18E-04
	Selenium	3.33E-02	mg/L	3.33E-02	mg/L	M	2.61E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	5.21E-05
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	1.24E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.77E-03
	Vanadium	6.44E-02	mg/L	6.44E-02	mg/L	M	5.04E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	5.04E-04
	Zinc	3.45E-01	mg/L	3.45E-01	mg/L	M	2.70E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.99E-06
	(Total)												4.02E-03
Dermal	Aluminum	2.33E+01	mg/L	2.33E+01	mg/L	M	1.21E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.21E-04
	Antimony	1.07E-02	mg/L	1.07E-02	mg/L	M	5.51E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	9.18E-04
	Arsenic	2.57E-02	mg/L	2.57E-02	mg/L	M	1.33E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.43E-04
	Chromium	1.53E-01	mg/L	1.53E-01	mg/L	M	7.92E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.06E-05
	Chromium VI (Hexavalent)	3.52E-02	mg/L	3.52E-02	mg/L	M	3.63E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	4.85E-03
	Iron	1.58E+01	mg/L	1.58E+01	mg/L	M	8.18E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.73E-04
	Lead	6.12E-02	mg/L	6.12E-02	mg/L	M	3.16E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.06E-01	mg/L	7.06E-01	mg/L	M	3.64E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.95E-03
	Selenium	3.33E-02	mg/L	3.33E-02	mg/L	M	1.72E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.44E-05
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	8.16E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.17E-03
	Vanadium	6.44E-02	mg/L	6.44E-02	mg/L	M	3.33E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.28E-02
	Zinc	3.45E-01	mg/L	3.45E-01	mg/L	M	1.07E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.56E-06
	(Total)												2.26E-02
												Total Hazard Index Across All Exposure Routes/Pathways	2.7E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.14.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	1.87E-06	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.87E-06
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	1.17E-08	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	2.94E-05
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	1.53E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.10E-05
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	1.49E-07	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.12E-06
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	2.38E-09	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.19E-06
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	2.19E-07	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.46E-07
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	4.93E-08	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.64E-05
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	3.29E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	8.22E-07
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	4.15E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.38E-05
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	2.35E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	5.63E-07	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.21E-05
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	2.82E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.39E-07
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	1.88E-08	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	9.39E-07
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	1.80E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	3.60E-06
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	2.27E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.24E-04
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	1.64E-08	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.64E-05
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	7.77E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.59E-07
	(Total)												4.75E-04
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	1.23E-06	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.23E-06
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	7.75E-09	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.29E-04
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	1.01E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.37E-05
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	9.81E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.00E-05
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	1.57E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	1.12E-04
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	1.45E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	7.42E-06
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	6.51E-08	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	8.68E-04
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	2.17E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	5.42E-07
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	2.74E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	9.13E-06
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	1.55E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	3.72E-07	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.99E-04
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	1.86E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.20E-07
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	2.48E-09	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	3.10E-06
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	1.19E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.38E-06
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	1.50E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.14E-04
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	1.08E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	4.17E-04
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	3.08E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.03E-07
	(Total)												2.02E-03
												Total Hazard Index Across All Exposure Routes/Pathways	2.5E-03

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.14.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	1.80E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.80E-05
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	5.29E-08	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	1.32E-04
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	7.07E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.36E-04
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	1.05E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	1.51E-05
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	9.52E-09	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	4.76E-06
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	2.14E-06	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.43E-06
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	3.20E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.07E-04
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	8.33E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.08E-05
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	9.87E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.29E-04
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	5.77E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	5.98E-06	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	1.28E-04
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	1.25E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.17E-06
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	4.50E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.25E-05
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	8.07E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.61E-05
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	1.07E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.53E-03
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	8.90E-08	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	8.90E-05
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	8.33E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.78E-06
	(Total)												2.66E-03
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	1.19E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.19E-05
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	3.49E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	5.82E-04
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	4.66E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.55E-04
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	6.96E-07	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	1.42E-04
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	6.28E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	4.49E-04
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	1.41E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	7.25E-05
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	4.23E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	5.64E-03
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	5.50E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.37E-05
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	6.52E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.17E-04
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	3.81E-07	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	3.95E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	2.11E-03
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	8.27E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.76E-06
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	5.94E-08	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	7.43E-05
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	5.33E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.07E-05
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	7.07E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.01E-03
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	5.87E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.26E-03
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	3.30E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.10E-06
	(Total)												1.28E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.5E-02

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	8.38E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	8.38E-05
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	5.26E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	1.32E-03
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	6.86E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.29E-03
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	6.66E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	9.51E-05
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	1.07E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	5.33E-05
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	9.83E-06	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	6.55E-06
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	2.21E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	7.36E-04
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	1.47E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.68E-05
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	1.86E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.20E-04
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	1.05E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	2.52E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	5.40E-04
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	1.26E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.21E-05
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	8.42E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.21E-05
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	8.07E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.61E-04
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	1.02E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.45E-02
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	7.36E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	7.36E-04
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	3.48E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.16E-05
	(Total)												2.13E-02
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	7.37E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	7.37E-05
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	4.63E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	7.72E-03
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	6.04E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.01E-03
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	5.86E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	1.20E-03
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	9.38E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	6.70E-03
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	8.65E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.43E-04
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	3.89E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	5.18E-02
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	1.30E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.24E-05
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	1.64E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.45E-04
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	9.26E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	2.22E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.19E-02
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	1.11E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.70E-05
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	1.48E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.85E-04
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	7.10E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.42E-04
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	8.95E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.28E-02
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	6.48E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	2.49E-02
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	1.84E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.13E-06
	(Total)												1.21E-01
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.15.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	8.06E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	8.06E-04
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	2.37E-06	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	5.93E-03
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	3.17E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.06E-02
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	4.72E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	6.75E-04
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	4.26E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.13E-04
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	9.60E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	6.40E-05
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.44E-05	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	4.78E-03
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	3.73E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	9.33E-04
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	4.42E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.47E-02
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	2.59E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	2.68E-04	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	5.74E-03
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	5.61E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.87E-04
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	2.02E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.01E-03
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	3.62E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	7.23E-04
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	4.80E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	6.85E-02
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	3.99E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	3.99E-03
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	3.73E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.24E-04
	(Total)												1.19E-01
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	7.09E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	7.09E-04
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	2.09E-06	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.48E-02
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	2.79E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.29E-03
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	4.16E-05	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	8.48E-03
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	3.75E-07	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.68E-02
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	8.45E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.33E-03
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	2.53E-05	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	3.37E-01
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	3.28E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	8.21E-04
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	3.89E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.30E-02
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	2.28E-05	mg/kg-day	–	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	2.36E-04	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	1.26E-01
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	4.94E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.65E-04
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	3.55E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	4.44E-03
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	3.18E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.36E-04
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	4.22E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	6.03E-02
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	3.51E-06	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.35E-01
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	1.97E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.57E-05
	(Total)												7.62E-01
												Total Hazard Index Across All Exposure Routes/Pathways	8.8E-01

Notes:
– = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1:16.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	5.12E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	5.12E-05
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	3.21E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	8.04E-04
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	4.19E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.40E-03
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	4.07E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	5.81E-05
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	6.51E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.26E-05
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	6.00E-06	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	4.00E-06
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	1.35E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	4.50E-04
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	9.00E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.25E-05
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	1.14E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.79E-04
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	6.43E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	1.54E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	3.30E-04
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	7.71E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.57E-05
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	5.14E-07	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.57E-05
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	4.93E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	9.86E-05
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	6.21E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	8.88E-03
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	4.50E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	4.50E-04
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	2.13E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.09E-06
	(Total)												1.30E-02
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	3.38E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	3.38E-05
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	2.12E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.54E-03
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	2.77E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.22E-04
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	2.68E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	5.48E-04
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	4.30E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.07E-03
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	3.96E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	2.03E-04
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	1.78E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	2.38E-02
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	5.94E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.49E-05
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	7.50E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.50E-04
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	4.24E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	1.02E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	5.45E-03
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	5.09E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.70E-05
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	6.79E-08	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	8.49E-05
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	3.25E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.51E-05
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	4.10E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	5.86E-03
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	2.97E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.14E-02
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	8.42E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.81E-06
	(Total)												5.52E-02
												Total Hazard Index Across All Exposure Routes/Pathways	6.8E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.16.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	2.81E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.81E-04
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	8.27E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	2.07E-03
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	1.10E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.68E-03
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	1.65E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.35E-04
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	1.49E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	7.44E-05
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	3.35E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	2.23E-05
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	5.01E-06	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	1.67E-03
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	1.30E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.25E-04
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	1.54E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.14E-03
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	9.02E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	9.35E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	2.00E-03
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	1.96E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.52E-05
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	7.04E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.52E-04
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	1.26E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.52E-04
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	1.67E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.39E-02
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	1.39E-06	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	1.39E-03
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	1.30E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.34E-05
	(Total)												4.15E-02
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	1.85E-04	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	1.85E-04
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	5.46E-07	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	9.09E-03
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	7.29E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.43E-03
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	1.09E-05	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.22E-03
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	9.82E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	7.01E-03
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	2.21E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.13E-03
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	6.61E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	8.81E-02
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	8.59E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.15E-04
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	1.02E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.39E-03
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	5.95E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	6.17E-05	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	3.30E-02
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	1.29E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.31E-05
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	9.29E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.16E-03
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	8.32E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.66E-04
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	1.10E-06	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	1.58E-02
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	9.18E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	3.53E-02
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	5.15E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.72E-05
	(Total)												1.99E-01
												Total Hazard Index Across All Exposure Routes/Pathways	2.4E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.17.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	4.68E-06	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	4.68E-06
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	2.94E-08	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	7.34E-05
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	3.83E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.28E-04
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	3.71E-07	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	5.31E-06
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	5.95E-09	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.97E-06
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	5.48E-07	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	3.66E-07
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	1.23E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	4.11E-05
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	8.22E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.05E-06
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	1.04E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.46E-05
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	5.87E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	1.41E-06	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	3.01E-05
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	7.05E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.35E-06
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	4.70E-08	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.35E-06
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	4.50E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	9.00E-06
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	5.68E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	8.11E-04
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	4.11E-08	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	4.11E-05
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	1.94E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.47E-07
	(Total)												1.19E-03
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	3.09E-06	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	3.09E-06
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	1.94E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	3.23E-04
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	2.53E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.42E-05
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	2.45E-07	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	5.00E-05
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	3.93E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.80E-04
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	3.62E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.86E-05
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	1.63E-07	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	2.17E-03
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	5.42E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.36E-06
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	6.85E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.28E-05
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	3.87E-08	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	9.29E-07	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	4.97E-04
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	4.65E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.55E-06
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	6.20E-09	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	7.75E-06
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	2.97E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	5.94E-06
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	3.75E-08	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	5.35E-04
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	2.71E-08	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	1.04E-03
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	7.69E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.56E-07
	(Total)												5.04E-03
												Total Hazard Index Across All Exposure Routes/Pathways	6.2E-03

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.17.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	4.50E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	4.50E-05
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	1.32E-07	mg/kg-day	4.00E-04	mg/kg-day	N/A	N/A	3.31E-04
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	1.77E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.89E-04
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	2.63E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	3.76E-05
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	2.38E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.19E-05
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	5.36E-06	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	3.57E-06
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	8.01E-07	mg/kg-day	3.00E-03	mg/kg-day	N/A	N/A	2.67E-04
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	2.08E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	5.21E-05
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	2.47E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.23E-04
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	1.44E-06	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	1.50E-05	mg/kg-day	4.67E-02	mg/kg-day	N/A	N/A	3.20E-04
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	3.13E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.04E-05
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	1.13E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	5.63E-05
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	2.02E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.04E-05
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	2.68E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	3.82E-03
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	2.22E-07	mg/kg-day	1.00E-03	mg/kg-day	N/A	N/A	2.22E-04
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	2.08E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.94E-06
	(Total)												6.64E-03
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	2.97E-05	mg/kg-day	1.00E+00	mg/kg-day	N/A	N/A	2.97E-05
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	8.73E-08	mg/kg-day	6.00E-05	mg/kg-day	N/A	N/A	1.46E-03
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	1.17E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.89E-04
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	1.74E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	3.55E-04
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	1.57E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	1.12E-03
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	3.54E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.81E-04
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.06E-06	mg/kg-day	7.50E-05	mg/kg-day	N/A	N/A	1.41E-02
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	1.37E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.44E-05
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	1.63E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.43E-04
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	9.52E-07	mg/kg-day	--	mg/kg-day	N/A	N/A	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	9.87E-06	mg/kg-day	1.87E-03	mg/kg-day	N/A	N/A	5.28E-03
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	2.07E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.89E-06
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	1.49E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.86E-04
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	1.33E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.66E-05
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	1.77E-07	mg/kg-day	7.00E-05	mg/kg-day	N/A	N/A	2.52E-03
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	1.47E-07	mg/kg-day	2.60E-05	mg/kg-day	N/A	N/A	5.65E-03
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	8.25E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.75E-06
	(Total)												3.19E-02
												Total Hazard Index Across All Exposure Routes/Pathways	3.9E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.18.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	2.49E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.29E-04
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	6.02E-06	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	8.60E-05
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	1.58E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	7.92E-06
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	2.35E-08	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	4.71E-05
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	1.28E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	8.54E-06
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	1.70E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	4.25E-05
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	5.89E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.96E-03
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	3.05E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.02E-05
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	1.82E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	9.10E-05
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	3.16E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.31E-05
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	6.12E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.04E-05
	(Total)												3.17E-03
Dermal	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	4.92E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.64E-05
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	3.97E-08	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	8.11E-06
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	1.05E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	7.47E-06
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	1.55E-11	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	6.22E-07
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	8.46E-08	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.34E-06
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	1.12E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.80E-07
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	3.89E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.30E-05
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	2.01E-11	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	6.72E-08
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	1.20E-08	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.50E-05
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	2.08E-09	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	4.17E-07
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	4.04E-08	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.35E-07
	(Total)												6.58E-05
												Total Hazard Index Across All Exposure Routes/Pathways	3.2E-03

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.18.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	8.37E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.79E-03
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	3.06E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	4.38E-04
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	3.95E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	1.97E-05
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	5.69E-08	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.14E-04
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	6.39E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	4.26E-05
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	8.04E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.01E-04
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	1.50E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.98E-03
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	9.93E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.31E-05
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	8.81E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.40E-04
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	8.04E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.61E-04
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	2.18E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.26E-05
	(Total)												9.30E-03
Dermal	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	1.66E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.53E-04
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	2.02E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	4.13E-04
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	2.60E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	1.86E-04
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	3.75E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	1.50E-05
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	4.22E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	2.16E-04
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	5.30E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.33E-05
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	9.87E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.29E-04
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	6.55E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.18E-06
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	5.81E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	7.27E-04
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	5.31E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.06E-05
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	1.44E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.79E-06
	(Total)												2.47E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.19.CT

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	2.78E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	9.28E-03
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	6.74E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	9.63E-04
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	1.77E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	8.87E-05
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	2.64E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	5.27E-04
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	1.44E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	9.57E-05
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	1.90E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	4.75E-04
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	6.59E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.20E-02
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	3.42E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.14E-04
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	2.04E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.02E-03
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	3.53E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	7.07E-04
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	6.85E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.28E-04
	(Total)												3.55E-02
Dermal	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	1.47E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.90E-04
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	1.19E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.42E-04
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	3.12E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.23E-04
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	4.64E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	1.86E-05
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	2.53E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.30E-04
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	3.35E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	8.37E-06
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.16E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.87E-04
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	6.02E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.01E-06
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	3.59E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	4.48E-04
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	6.22E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.24E-05
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	1.21E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.02E-06
	(Total)												1.97E-03
												Total Hazard Index Across All Exposure Routes/Pathways	3.7E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.19.RME

CALCULATION OF NON-CANCER HAZARDS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	9.38E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.13E-02
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	3.43E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	4.90E-03
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	4.42E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.21E-04
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	6.37E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.27E-03
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	7.16E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	4.77E-04
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	9.00E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.25E-03
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	1.67E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.58E-02
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	1.11E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.71E-04
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	9.86E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	4.93E-03
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	9.01E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.80E-03
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	2.44E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.13E-04
	(Total)												1.04E-01
Dermal	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	2.48E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.25E-03
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	3.02E-05	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	6.16E-03
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	3.89E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.78E-03
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	5.61E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.24E-04
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	6.30E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	3.23E-03
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	7.92E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.98E-04
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	1.47E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	4.91E-03
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	9.78E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.26E-05
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	8.68E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.08E-02
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	7.92E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.58E-04
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	2.15E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.15E-05
	(Total)												3.69E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.4E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.20.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	6.81E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.27E-02
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	1.65E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	2.35E-03
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	4.34E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	2.17E-04
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	6.45E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.29E-03
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	3.51E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	2.34E-04
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	4.65E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.16E-03
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.61E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.37E-02
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	8.36E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	2.79E-04
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	4.98E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	2.49E-03
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	8.64E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.73E-03
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	1.67E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.58E-04
	(Total)												8.67E-02
Dermal	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	1.35E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.49E-04
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	1.09E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	2.22E-04
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	2.86E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.04E-04
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	4.25E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	1.70E-05
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	2.31E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	1.19E-04
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	3.07E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	7.67E-06
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	1.06E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.55E-04
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	5.52E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.84E-06
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	3.29E-07	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	4.11E-04
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	5.70E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.14E-05
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	1.11E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	3.68E-06
	(Total)												1.80E-03
												Total Hazard Index Across All Exposure Routes/Pathways	8.9E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.20.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	1.31E-05	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.36E-02
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	4.79E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	6.84E-03
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	6.16E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.08E-04
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	8.89E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.78E-03
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	9.98E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	6.65E-04
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	1.26E-04	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	3.14E-03
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	2.34E-02	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.79E-02
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	1.55E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	5.17E-04
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	1.38E-04	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	6.88E-03
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	1.26E-05	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.51E-03
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	3.40E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	1.13E-03
	(Total)												1.45E-01
Dermal	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	2.59E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	8.63E-03
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	3.16E-05	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	6.45E-03
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	4.07E-08	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	2.91E-03
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	5.87E-09	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.35E-04
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	6.59E-05	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	3.38E-03
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	8.29E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.07E-04
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	1.54E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	5.14E-03
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	1.02E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.41E-05
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	9.08E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.14E-02
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	8.29E-07	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.66E-04
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	2.25E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	7.48E-05
	(Total)												3.86E-02
												Total Hazard Index Across All Exposure Routes/Pathways	1.8E-01

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.21.CT

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	1.03E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	3.42E-03
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	2.48E-05	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	3.55E-04
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	6.54E-08	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	3.27E-05
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	9.71E-08	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	1.94E-04
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	5.29E-05	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	3.52E-05
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	7.00E-06	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.75E-04
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.43E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.10E-03
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	1.26E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.20E-05
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	7.51E-06	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	3.75E-04
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.30E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.60E-04
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	2.52E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.41E-05
	(Total)												1.31E-02
Dermal	Arsenic	7.94E+00	mg/kg	7.94E+00	mg/kg	M	3.08E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.03E-04
	Barium	1.92E+02	mg/kg	1.92E+02	mg/kg	M	2.48E-07	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	5.07E-05
	Beryllium	5.06E-01	mg/kg	5.06E-01	mg/kg	M	6.54E-10	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	4.67E-05
	Cadmium	7.52E-01	mg/kg	7.52E-01	mg/kg	M	9.71E-11	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	3.89E-06
	Chromium	4.09E+02	mg/kg	4.09E+02	mg/kg	M	5.29E-07	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	2.71E-05
	Copper	5.42E+01	mg/kg	5.42E+01	mg/kg	M	7.00E-08	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	1.75E-06
	Iron	1.88E+04	mg/kg	1.88E+04	mg/kg	M	2.43E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.10E-05
	Mercury	9.75E-02	mg/kg	9.75E-02	mg/kg	M	1.26E-10	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.20E-07
	Nickel	5.81E+01	mg/kg	5.81E+01	mg/kg	M	7.51E-08	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	9.38E-05
	Selenium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.30E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	2.60E-06
	Zinc	1.95E+02	mg/kg	1.95E+02	mg/kg	M	2.52E-07	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.41E-07
	(Total)												4.11E-04
												Total Hazard Index Across All Exposure Routes/Pathways	1.3E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.1.21.RME

CALCULATION OF NON-CANCER HAZARDS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Non-Cancer)*	*Intake (Non-Cancer) Units*	*Reference Dose*	*Reference Dose Units*	*Reference Concentration*	*Reference Concentration Units*	*Hazard Quotient*
Ingestion	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	3.45E-06	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.15E-02
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	1.26E-04	mg/kg-day	7.00E-02	mg/kg-day	N/A	N/A	1.81E-03
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	1.63E-07	mg/kg-day	2.00E-03	mg/kg-day	N/A	N/A	8.14E-05
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	2.35E-07	mg/kg-day	5.00E-04	mg/kg-day	N/A	N/A	4.69E-04
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	2.64E-04	mg/kg-day	1.50E+00	mg/kg-day	N/A	N/A	1.76E-04
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	3.31E-05	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	8.29E-04
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	6.17E-03	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.06E-02
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	4.09E-08	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.36E-04
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	3.63E-05	mg/kg-day	2.00E-02	mg/kg-day	N/A	N/A	1.82E-03
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	3.32E-06	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	6.63E-04
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	8.98E-05	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	2.99E-04
	(Total)												3.83E-02
Dermal	Arsenic	1.34E+01	mg/kg	1.34E+01	mg/kg	M	3.11E-07	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	1.04E-03
	Barium	4.89E+02	mg/kg	4.89E+02	mg/kg	M	3.79E-06	mg/kg-day	4.90E-03	mg/kg-day	N/A	N/A	7.74E-04
	Beryllium	6.30E-01	mg/kg	6.30E-01	mg/kg	M	4.88E-09	mg/kg-day	1.40E-05	mg/kg-day	N/A	N/A	3.49E-04
	Cadmium	9.08E-01	mg/kg	9.08E-01	mg/kg	M	7.04E-10	mg/kg-day	2.50E-05	mg/kg-day	N/A	N/A	2.82E-05
	Chromium	1.02E+03	mg/kg	1.02E+03	mg/kg	M	7.91E-06	mg/kg-day	1.95E-02	mg/kg-day	N/A	N/A	4.05E-04
	Copper	1.28E+02	mg/kg	1.28E+02	mg/kg	M	9.94E-07	mg/kg-day	4.00E-02	mg/kg-day	N/A	N/A	2.49E-05
	Iron	2.39E+04	mg/kg	2.39E+04	mg/kg	M	1.85E-04	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	6.17E-04
	Mercury	1.59E-01	mg/kg	1.59E-01	mg/kg	M	1.23E-09	mg/kg-day	3.00E-04	mg/kg-day	N/A	N/A	4.09E-06
	Nickel	1.41E+02	mg/kg	1.41E+02	mg/kg	M	1.09E-06	mg/kg-day	8.00E-04	mg/kg-day	N/A	N/A	1.36E-03
	Selenium	1.28E+01	mg/kg	1.28E+01	mg/kg	M	9.95E-08	mg/kg-day	5.00E-03	mg/kg-day	N/A	N/A	1.99E-05
	Zinc	3.48E+02	mg/kg	3.48E+02	mg/kg	M	2.69E-06	mg/kg-day	3.00E-01	mg/kg-day	N/A	N/A	8.98E-06
	(Total)												4.63E-03
												Total Hazard Index Across All Exposure Routes/Pathways	4.3E-02

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for hazard calculation.

TABLE B.2.1.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	7.52E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	9.34E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	2.59E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.88E-08
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	6.67E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	2.36E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	1.35E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	5.00E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	2.74E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	9.02E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	6.64E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	7.72E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	2.91E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	7.09E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.21E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	1.02E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	1.96E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	1.05E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	2.10E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	7.02E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.88E-08
Dermal	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	4.96E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	6.16E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	5.13E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	7.69E-10
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	4.41E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	1.55E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	8.90E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	3.30E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	1.81E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	5.95E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	4.38E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	5.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	1.92E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	4.68E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	7.97E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	6.74E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	1.29E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	6.96E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	1.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	4.63E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.69E-10

TABLE B.2.1.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	3.67E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	4.56E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	1.26E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.90E-11
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	3.26E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	1.15E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	9.66E-13
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	6.58E-13	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	4.15E-12
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	2.44E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	1.34E-12	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	5.61E-11
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	4.40E-12	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	4.31E-11
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	3.24E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	3.77E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	1.42E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	3.46E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	5.90E-14	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	4.99E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	9.57E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	5.15E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	1.03E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	3.43E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.23E-10
										Total Risk Across All Exposure Routes/Pathways	4.0E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.1.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	8.26E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	8.54E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	4.04E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	6.06E-07
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	8.44E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	2.70E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	5.85E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	4.41E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	2.22E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	2.05E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	2.85E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	4.83E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	6.90E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	1.21E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	5.56E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	2.32E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	1.48E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	8.69E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	1.48E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	9.32E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.06E-07
Dermal	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	5.45E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	5.64E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	8.00E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.20E-07
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	5.57E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	1.78E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	3.86E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	2.91E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	1.47E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	1.35E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	1.88E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	3.19E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	4.56E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	7.96E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	3.67E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	1.53E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	9.76E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	5.74E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	9.74E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	6.15E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.20E-07

TABLE B.2.1.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	4.03E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	4.17E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	1.97E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	2.96E-10
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	4.12E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	1.32E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.11E-11
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	2.86E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.80E-10
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	2.15E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	1.09E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	4.56E-10
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	9.99E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	9.79E-10
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	1.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	2.36E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	3.37E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	5.89E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	2.71E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	1.13E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	7.22E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	4.24E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	7.21E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	4.55E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.92E-09
										Total Risk Across All Exposure Routes/Pathways	7.3E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.2.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	4.27E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	2.52E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.79E-08
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	6.64E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	2.44E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	3.80E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	1.17E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	9.78E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	1.25E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	7.72E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	5.84E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	1.69E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	9.92E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	1.11E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	6.20E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	6.23E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.79E-08
Dermal	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	2.82E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	5.00E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	7.50E-10
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	4.38E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	1.61E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	2.51E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	7.70E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	6.46E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	8.22E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	5.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	3.86E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	1.12E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	6.55E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	7.33E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	4.09E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	4.11E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.50E-10

TABLE B.2.2.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	2.08E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	1.23E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.85E-11
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	3.24E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	1.19E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.00E-12
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	1.85E-13	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.17E-12
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	5.69E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	4.78E-12	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	4.68E-11
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	6.08E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	3.77E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	2.85E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	8.26E-14	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	4.84E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	5.42E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	3.03E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	3.04E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.75E-11

Total Risk Across All Exposure Routes/Pathways 3.9E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.2.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	3.46E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	1.77E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.65E-07
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	1.21E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	1.82E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	2.87E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	1.04E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	3.91E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	8.63E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	4.84E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	1.97E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	1.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	6.21E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	8.61E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	5.10E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	4.53E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.65E-07
Dermal	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	2.28E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	3.50E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.25E-08
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	7.97E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	1.20E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	1.90E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	6.88E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	2.58E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	5.70E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	3.19E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	1.30E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	7.17E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	4.10E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	5.68E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	3.37E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	2.99E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.25E-08

TABLE B.2.2.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	1.69E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	8.62E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.29E-10
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	5.90E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	8.86E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	7.45E-12
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	1.40E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	8.84E-12
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	5.09E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.91E-10	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	1.87E-09
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	4.21E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	2.36E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	9.63E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	5.30E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	3.03E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	4.21E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	2.49E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	2.21E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.02E-09

Total Risk Across All Exposure Routes/Pathways 3.2E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.3.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	8.35E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	3.93E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	1.85E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.78E-08
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	7.04E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	1.75E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	3.58E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	1.56E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	5.64E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	8.11E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	1.38E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	7.77E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	5.44E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	1.08E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	2.90E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	5.67E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	5.19E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	2.37E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	4.04E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	9.02E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.78E-08
Dermal	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	5.51E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	2.60E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	3.67E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.50E-10
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	4.65E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	1.16E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	2.36E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	1.03E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	3.72E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	5.36E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	9.13E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	5.13E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	3.59E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	7.13E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	1.91E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	3.74E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	3.42E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	1.56E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	2.67E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	5.95E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.50E-10

TABLE B.2.3.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	4.07E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	1.92E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	9.04E-13	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.36E-11
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	3.44E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	8.57E-14	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	7.20E-13
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	1.75E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.10E-11
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	7.59E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	2.75E-12	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	1.16E-10
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	3.96E-12	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	3.88E-11
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	6.76E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	3.79E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	2.66E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	5.27E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	1.42E-14	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	2.77E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	2.53E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	1.16E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	1.97E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	4.40E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.80E-10
										Total Risk Across All Exposure Routes/Pathways	2.9E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.3.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	1.72E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	7.58E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	3.10E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	4.65E-07
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	6.11E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	1.23E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	4.73E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	1.87E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	1.77E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	8.17E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	3.79E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	5.42E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	2.73E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	1.27E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	8.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	1.15E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	5.88E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	2.26E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	4.18E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	2.22E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.65E-07
Dermal	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	1.14E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	5.00E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	6.14E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	9.21E-08
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	4.03E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	8.09E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	3.12E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	1.24E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	1.17E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	5.39E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	2.50E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	3.58E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	1.80E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	8.38E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	5.54E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	7.62E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	3.88E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.49E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	2.76E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	1.47E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										9.21E-08

TABLE B.2.3.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	8.40E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	3.70E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	1.51E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	2.27E-10
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	2.98E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	5.98E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	5.03E-12
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	2.31E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.45E-10
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	9.15E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	8.66E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	3.64E-09
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	3.99E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	3.91E-10
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	1.85E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	2.65E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	1.33E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	6.20E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	4.09E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	5.63E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	2.87E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.10E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	2.04E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	1.09E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.40E-09

Total Risk Across All Exposure Routes/Pathways 5.6E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.4.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	1.12E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	1.39E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	3.87E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.80E-07
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	9.97E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	3.52E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	2.01E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	7.47E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	4.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	1.35E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	9.92E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	1.15E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	4.35E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.06E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	1.80E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	1.53E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	2.93E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	1.58E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	3.14E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.05E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.80E-07
Dermal	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	1.98E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	2.45E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	2.04E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.06E-08
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	1.75E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	6.19E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	3.54E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.31E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	7.19E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	2.37E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.75E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	2.03E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	7.65E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.86E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.17E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	2.69E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	5.15E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	2.77E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	5.52E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.85E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.06E-08

TABLE B.2.4.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	1.87E+04	mg/kg	1.87E+04	mg/kg	M	1.98E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	2.32E+01	mg/kg	2.32E+01	mg/kg	M	2.46E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.43E+00	mg/kg	6.43E+00	mg/kg	M	6.82E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.02E-10
	Barium	1.66E+02	mg/kg	1.66E+02	mg/kg	M	1.76E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.85E-01	mg/kg	5.85E-01	mg/kg	M	6.21E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	5.21E-12
	Cadmium	3.35E+00	mg/kg	3.35E+00	mg/kg	M	3.55E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	2.24E-11
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.32E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.80E+00	mg/kg	6.80E+00	mg/kg	M	7.21E-12	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	3.03E-10
	Cobalt	2.24E+01	mg/kg	2.24E+01	mg/kg	M	2.38E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	2.33E-10
	Copper	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.75E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	2.03E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	7.23E+01	mg/kg	7.23E+01	mg/kg	M	7.67E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.76E+03	mg/kg	1.76E+03	mg/kg	M	1.87E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.00E-01	mg/kg	3.00E-01	mg/kg	M	3.18E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.54E+02	mg/kg	2.54E+02	mg/kg	M	2.69E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.87E+00	mg/kg	4.87E+00	mg/kg	M	5.17E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.62E+00	mg/kg	2.62E+00	mg/kg	M	2.78E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.22E+01	mg/kg	5.22E+01	mg/kg	M	5.54E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.85E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.66E-10
										Total Risk Across All Exposure Routes/Pathways	6.1E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.4.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1).*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	4.44E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	4.59E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	2.17E-06	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.26E-06
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	4.54E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	1.45E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	3.15E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	2.37E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	1.20E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	1.10E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	1.53E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	2.60E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	3.71E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	6.48E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	2.99E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	1.25E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	7.95E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	4.67E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	7.94E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	5.01E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.26E-06
Dermal	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	3.91E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	4.04E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	5.73E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	8.60E-07
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	3.99E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	1.28E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	2.77E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	2.09E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	1.05E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	9.68E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	1.35E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	2.29E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	3.27E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	5.71E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	2.63E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	1.10E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	7.00E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	4.11E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	6.98E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	4.41E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.60E-07

TABLE B.2.4.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	3.69E+04	mg/kg	3.69E+04	mg/kg	M	1.57E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.82E+01	mg/kg	3.82E+01	mg/kg	M	1.62E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.81E+01	mg/kg	1.81E+01	mg/kg	M	7.67E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.15E-09
	Barium	3.77E+02	mg/kg	3.77E+02	mg/kg	M	1.60E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	1.21E+00	mg/kg	1.21E+00	mg/kg	M	5.13E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	4.31E-11
	Cadmium	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.11E-10	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	7.00E-10
	Chromium Total	1.97E+03	mg/kg	1.97E+03	mg/kg	M	8.37E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	9.95E+00	mg/kg	9.95E+00	mg/kg	M	4.22E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	1.77E-09
	Cobalt	9.15E+01	mg/kg	9.15E+01	mg/kg	M	3.88E-10	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	3.81E-09
	Copper	1.27E+03	mg/kg	1.27E+03	mg/kg	M	5.41E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	9.17E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.09E+02	mg/kg	3.09E+02	mg/kg	M	1.31E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.39E+03	mg/kg	5.39E+03	mg/kg	M	2.29E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	2.49E+00	mg/kg	2.49E+00	mg/kg	M	1.05E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.04E+03	mg/kg	1.04E+03	mg/kg	M	4.40E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	6.61E+00	mg/kg	6.61E+00	mg/kg	M	2.81E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.89E+00	mg/kg	3.89E+00	mg/kg	M	1.65E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.60E+01	mg/kg	6.60E+01	mg/kg	M	2.80E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	4.17E+02	mg/kg	4.17E+02	mg/kg	M	1.77E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.47E-09

Total Risk Across All Exposure Routes/Pathways 4.1E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.5.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	6.37E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	3.77E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.65E-07
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	9.92E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	3.65E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	5.67E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	1.74E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	1.46E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	1.86E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	1.15E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	8.72E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	2.52E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	1.48E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	1.66E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	9.26E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	9.31E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.65E-07
Dermal	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	1.12E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	1.99E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.99E-08
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.75E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	6.42E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	9.98E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	3.07E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	2.57E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	3.27E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	2.03E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	1.54E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	4.44E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	2.61E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	2.92E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	1.63E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	1.64E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.99E-08

TABLE B.2.5.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Antimony	1.06E+01	mg/kg	1.06E+01	mg/kg	M	1.12E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.27E+00	mg/kg	6.27E+00	mg/kg	M	6.65E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	9.98E-11
	Barium	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.75E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	6.44E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	5.41E-12
	Cadmium	9.43E-01	mg/kg	9.43E-01	mg/kg	M	1.00E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	6.30E-12
	Chromium Total	2.90E+02	mg/kg	2.90E+02	mg/kg	M	3.07E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.43E+01	mg/kg	2.43E+01	mg/kg	M	2.58E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	2.53E-10
	Copper	3.10E+01	mg/kg	3.10E+01	mg/kg	M	3.28E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.92E+04	mg/kg	1.92E+04	mg/kg	M	2.03E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.45E+03	mg/kg	1.45E+03	mg/kg	M	1.54E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.20E-01	mg/kg	4.20E-01	mg/kg	M	4.46E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.46E+01	mg/kg	2.46E+01	mg/kg	M	2.61E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.76E+00	mg/kg	2.76E+00	mg/kg	M	2.93E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.54E+00	mg/kg	1.54E+00	mg/kg	M	1.63E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.55E+02	mg/kg	1.55E+02	mg/kg	M	1.64E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.64E-10

Total Risk Across All Exposure Routes/Pathways 6.0E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.5.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	1.86E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	9.50E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.42E-06
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	6.49E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	9.76E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	1.55E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	5.60E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	2.10E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	4.64E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	2.60E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	1.06E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	5.84E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	3.34E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	4.63E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	2.74E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	2.44E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.42E-06
Dermal	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	1.63E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	2.51E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.76E-07
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	5.71E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	8.59E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	1.36E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	4.93E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.85E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	4.08E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	2.29E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	9.33E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	5.14E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	2.94E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	4.07E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	2.41E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	2.15E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.76E-07

TABLE B.2.5.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Antimony	1.54E+01	mg/kg	1.54E+01	mg/kg	M	6.56E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	7.90E+00	mg/kg	7.90E+00	mg/kg	M	3.35E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	5.03E-10
	Barium	5.40E+02	mg/kg	5.40E+02	mg/kg	M	2.29E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.12E-01	mg/kg	8.12E-01	mg/kg	M	3.44E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	2.89E-11
	Cadmium	1.29E+00	mg/kg	1.29E+00	mg/kg	M	5.45E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	3.44E-11
	Chromium Total	4.66E+02	mg/kg	4.66E+02	mg/kg	M	1.98E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.75E+02	mg/kg	1.75E+02	mg/kg	M	7.43E-10	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	7.28E-09
	Copper	3.86E+01	mg/kg	3.86E+01	mg/kg	M	1.64E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.16E+04	mg/kg	2.16E+04	mg/kg	M	9.18E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	8.82E+03	mg/kg	8.82E+03	mg/kg	M	3.74E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.86E+00	mg/kg	4.86E+00	mg/kg	M	2.06E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.78E+01	mg/kg	2.78E+01	mg/kg	M	1.18E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.85E+00	mg/kg	3.85E+00	mg/kg	M	1.63E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.28E+00	mg/kg	2.28E+00	mg/kg	M	9.68E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.03E+02	mg/kg	2.03E+02	mg/kg	M	8.60E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.84E-09
										Total Risk Across All Exposure Routes/Pathways	1.8E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.6.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	1.25E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	5.87E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	2.77E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	4.15E-07
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.05E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	2.62E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	5.35E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	2.32E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	8.42E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	1.21E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	2.07E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	1.16E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	8.13E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	1.61E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	4.33E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	8.47E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	7.75E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	3.53E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	6.04E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	1.35E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.15E-07
Dermal	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	2.19E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	1.03E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	1.46E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.19E-08
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.85E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	4.61E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	9.42E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	4.09E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	1.48E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	2.13E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	3.64E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	2.04E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	1.43E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	2.84E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	7.62E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	1.49E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.36E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	6.22E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	1.06E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	2.37E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.19E-08

TABLE B.2.6.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	2.07E+04	mg/kg	2.07E+04	mg/kg	M	2.20E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	9.77E+01	mg/kg	9.77E+01	mg/kg	M	1.04E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	4.60E+00	mg/kg	4.60E+00	mg/kg	M	4.88E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	7.32E-11
	Barium	1.75E+02	mg/kg	1.75E+02	mg/kg	M	1.86E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	4.36E-01	mg/kg	4.36E-01	mg/kg	M	4.62E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	3.88E-12
	Cadmium	8.90E+00	mg/kg	8.90E+00	mg/kg	M	9.44E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	5.95E-11
	Chromium Total	3.86E+03	mg/kg	3.86E+03	mg/kg	M	4.10E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.40E+01	mg/kg	1.40E+01	mg/kg	M	1.49E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	6.24E-10
	Cobalt	2.02E+01	mg/kg	2.02E+01	mg/kg	M	2.14E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	2.10E-10
	Copper	3.44E+02	mg/kg	3.44E+02	mg/kg	M	3.65E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.93E+04	mg/kg	1.93E+04	mg/kg	M	2.05E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.35E+02	mg/kg	1.35E+02	mg/kg	M	1.43E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	2.68E+03	mg/kg	2.68E+03	mg/kg	M	2.85E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.20E-02	mg/kg	7.20E-02	mg/kg	M	7.64E-14	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+03	mg/kg	1.41E+03	mg/kg	M	1.49E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.37E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.88E+00	mg/kg	5.88E+00	mg/kg	M	6.24E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.00E+02	mg/kg	1.00E+02	mg/kg	M	1.07E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.24E+02	mg/kg	2.24E+02	mg/kg	M	2.38E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										9.70E-10

Total Risk Across All Exposure Routes/Pathways 4.4E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.6.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	9.25E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	4.08E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	1.67E-06	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.50E-06
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	3.28E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	6.59E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	2.54E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	1.01E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	9.53E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	4.39E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	2.04E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	2.92E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	1.47E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	6.83E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	4.51E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	6.20E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	3.16E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.22E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	2.25E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	1.19E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.50E-06
Dermal	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	8.14E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	3.59E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	4.40E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	6.60E-07
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	2.89E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	5.80E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	2.24E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	8.87E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	8.39E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	3.86E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	1.79E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	2.57E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	1.29E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	6.01E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	3.97E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	5.46E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	2.78E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	1.07E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	1.98E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	1.05E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.60E-07

TABLE B.2.6.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	7.70E+04	mg/kg	7.70E+04	mg/kg	M	3.27E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	3.39E+02	mg/kg	3.39E+02	mg/kg	M	1.44E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.39E+01	mg/kg	1.39E+01	mg/kg	M	5.88E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	8.82E-10
	Barium	2.73E+02	mg/kg	2.73E+02	mg/kg	M	1.16E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.48E-01	mg/kg	5.48E-01	mg/kg	M	2.33E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.95E-11
	Cadmium	2.11E+01	mg/kg	2.11E+01	mg/kg	M	8.97E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	5.65E-10
	Chromium Total	8.38E+03	mg/kg	8.38E+03	mg/kg	M	3.56E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	7.93E+01	mg/kg	7.93E+01	mg/kg	M	3.36E-10	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	1.41E-08
	Cobalt	3.65E+01	mg/kg	3.65E+01	mg/kg	M	1.55E-10	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	1.52E-09
	Copper	1.70E+03	mg/kg	1.70E+03	mg/kg	M	7.20E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.43E+04	mg/kg	2.43E+04	mg/kg	M	1.03E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.22E+03	mg/kg	1.22E+03	mg/kg	M	5.18E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	5.68E+03	mg/kg	5.68E+03	mg/kg	M	2.41E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.75E-01	mg/kg	3.75E-01	mg/kg	M	1.59E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.16E+03	mg/kg	5.16E+03	mg/kg	M	2.19E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.63E+01	mg/kg	2.63E+01	mg/kg	M	1.12E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.01E+01	mg/kg	1.01E+01	mg/kg	M	4.29E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	1.87E+02	mg/kg	1.87E+02	mg/kg	M	7.92E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.94E+02	mg/kg	9.94E+02	mg/kg	M	4.22E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.71E-08

Total Risk Across All Exposure Routes/Pathways 3.2E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.7.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	1.98E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	7.65E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.15E-06
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	1.60E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	8.44E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	2.66E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	1.36E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	1.87E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	1.96E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	1.28E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	2.53E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	6.25E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	1.57E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	3.97E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.92E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	4.74E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	4.13E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	5.58E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.87E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.15E-06
Dermal	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	1.31E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	1.51E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.27E-08
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	1.05E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	5.57E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	1.75E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	9.00E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	1.24E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	1.29E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	8.42E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	1.67E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	4.12E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	1.04E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	2.62E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.27E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	3.13E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	2.73E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	3.69E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.23E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.27E-08

TABLE B.2.7.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	9.68E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	3.73E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	5.60E-10
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	7.79E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	4.12E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	3.46E-11
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	1.30E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	8.17E-11
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	6.66E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	9.15E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	3.84E-09
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	9.58E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	9.39E-10
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	6.23E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	1.23E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	3.05E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	7.68E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	1.94E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	9.36E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	2.31E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	2.02E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	2.73E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	9.13E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.46E-09

Total Risk Across All Exposure Routes/Pathways 1.2E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.7.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	1.01E-02	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	3.38E-06	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.07E-06
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	5.95E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	3.39E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	4.68E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	5.56E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	2.03E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	1.99E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	1.88E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	9.90E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	2.85E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	6.33E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	1.24E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	2.16E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	1.89E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	1.89E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	2.04E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	7.28E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.07E-06
Dermal	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	6.66E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	6.69E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.00E-06
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	3.93E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	2.24E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	3.09E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	3.67E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	1.34E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	1.31E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	1.24E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	6.53E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	1.88E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	4.18E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	8.21E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	1.42E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	1.25E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	1.25E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	1.35E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	4.80E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.00E-06

TABLE B.2.7.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	4.93E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	1.65E-10	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	2.48E-09
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	2.91E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	1.66E-11	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.39E-10
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	2.29E-10	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.44E-09
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	2.72E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	9.93E-10	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	4.17E-08
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	9.72E-10	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	9.53E-09
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	9.16E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	4.83E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	1.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	3.09E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	6.07E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	1.05E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	9.22E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	9.21E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	9.97E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	3.55E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.53E-08
										Total Risk Across All Exposure Routes/Pathways	6.1E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.8.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	6.79E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.02E-06
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	1.63E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	7.60E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	1.34E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.82E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	1.97E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	3.68E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	2.67E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	5.96E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	1.16E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	4.85E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	2.88E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	2.59E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	1.80E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.02E-06
Dermal	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	1.34E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.02E-08
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	1.07E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	5.02E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	8.87E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.20E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	1.30E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	2.43E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	1.76E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	3.93E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	7.64E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	3.20E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.90E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	1.71E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	1.19E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.02E-08

TABLE B.2.8.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	3.31E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	4.97E-10
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	7.95E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	3.71E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	3.12E-11
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	6.56E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	4.14E-11
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	8.88E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	9.63E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	9.44E-10
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	1.80E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	1.30E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	2.91E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	5.65E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	2.37E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	1.41E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	1.26E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	8.80E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.51E-09

Total Risk Across All Exposure Routes/Pathways 1.0E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.8.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	2.47E-06	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	3.70E-06
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	1.18E-04	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	2.76E-07	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	5.32E-07	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	9.02E-05	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	3.11E-05	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	1.63E-05	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	1.35E-02	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	7.91E-05	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	1.57E-03	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	2.95E-07	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	9.86E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	1.01E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	7.27E-05	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	(Total)										3.70E-06
Dermal	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	4.89E-07	mg/kg-day	1.50E+00	$(mg/kg\text{-}day)^{-1}$	7.33E-07
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	7.76E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	1.82E-08	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	3.51E-09	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	5.95E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	2.05E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	1.08E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	8.88E-04	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	5.22E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	1.03E-04	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	1.95E-08	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	6.51E-07	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	6.65E-08	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	4.80E-06	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	(Total)										7.33E-07

TABLE B.2.8.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	1.20E-10	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	1.81E-09
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	5.74E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	1.35E-11	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.13E-10
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	2.60E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.64E-10
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	4.40E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	1.52E-09	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	1.49E-08
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	7.98E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	6.57E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	3.86E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	7.66E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	1.44E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	4.81E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	4.92E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	3.55E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.69E-08
										Total Risk Across All Exposure Routes/Pathways	4.5E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.9.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	1.99E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	7.03E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.05E-06
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.42E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	6.69E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	3.75E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	2.53E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	3.47E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.42E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	1.94E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	1.81E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	6.25E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	3.80E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	8.71E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	4.73E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	6.39E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	6.29E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	7.24E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.42E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.05E-06
Dermal	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	1.32E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	1.39E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.09E-08
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	9.37E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	4.41E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	2.47E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	1.67E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	2.29E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	9.40E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	1.28E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	1.19E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	4.13E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	2.51E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	5.75E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	3.12E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	4.22E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	4.15E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	4.78E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	9.35E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.09E-08

TABLE B.2.9.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	9.73E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	3.43E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	5.15E-10
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	6.93E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	3.27E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	2.74E-11
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	1.83E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.15E-10
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	1.24E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	1.69E-10	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	7.12E-09
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	6.96E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	6.82E-10
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	9.47E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	8.82E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	3.05E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	1.86E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	4.25E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	2.31E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	3.12E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	3.07E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	3.53E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	6.92E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.46E-09

Total Risk Across All Exposure Routes/Pathways 1.1E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.9.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	1.21E-02	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	3.77E-06	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.66E-06
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	6.00E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	2.83E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	2.58E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	1.05E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	3.73E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	6.64E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	3.41E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	8.87E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	4.66E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	6.45E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	3.26E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	3.83E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	2.93E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	3.06E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	2.85E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	7.51E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.66E-06
Dermal	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	7.95E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	7.47E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.12E-06
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	3.96E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	1.87E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	1.70E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	6.96E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	2.46E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	4.38E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	2.25E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	5.85E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	3.07E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	4.26E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	2.15E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	2.53E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	1.93E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	2.02E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	1.88E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	4.96E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.12E-06

TABLE B.2.9.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Surface Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	5.88E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	1.84E-10	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	2.76E-09
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	2.93E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	1.38E-11	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.16E-10
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	1.26E-10	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	7.92E-10
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	5.15E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	1.82E-09	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	7.65E-08
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	3.24E-10	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	3.18E-09
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	1.66E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	4.33E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	2.27E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	3.15E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	1.59E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	1.87E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	1.43E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	1.49E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	1.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	3.67E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.34E-08
										Total Risk Across All Exposure Routes/Pathways	6.9E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.10.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	3.32E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	1.28E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.92E-08
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	2.67E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	1.41E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	4.45E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	2.28E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	3.14E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	3.28E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	2.14E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	4.23E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	1.05E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	2.63E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	6.64E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	3.21E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	7.93E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	6.92E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	9.35E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	3.13E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.92E-08
Dermal	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	3.32E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	3.84E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.76E-10
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	2.67E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	1.41E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	4.45E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	2.28E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	3.14E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	3.28E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	2.14E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	4.23E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	1.05E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	2.63E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	6.64E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	3.21E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	7.93E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	6.92E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	9.35E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	3.13E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.76E-10

TABLE B.2.10.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	1.80E+04	mg/kg	1.80E+04	mg/kg	M	1.42E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.94E+00	mg/kg	6.94E+00	mg/kg	M	5.46E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	8.19E-11
	Barium	1.45E+02	mg/kg	1.45E+02	mg/kg	M	1.14E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.66E-01	mg/kg	7.66E-01	mg/kg	M	6.03E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	5.06E-12
	Cadmium	2.41E+00	mg/kg	2.41E+00	mg/kg	M	1.90E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.19E-11
	Chromium Total	1.24E+03	mg/kg	1.24E+03	mg/kg	M	9.74E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.70E+01	mg/kg	1.70E+01	mg/kg	M	1.34E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	5.62E-10
	Cobalt	1.78E+01	mg/kg	1.78E+01	mg/kg	M	1.40E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	1.37E-10
	Copper	1.16E+02	mg/kg	1.16E+02	mg/kg	M	9.11E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.29E+04	mg/kg	2.29E+04	mg/kg	M	1.80E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	4.46E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.43E+03	mg/kg	1.43E+03	mg/kg	M	1.12E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-01	mg/kg	3.60E-01	mg/kg	M	2.83E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.74E+02	mg/kg	1.74E+02	mg/kg	M	1.37E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	4.30E+00	mg/kg	4.30E+00	mg/kg	M	3.38E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.75E+00	mg/kg	3.75E+00	mg/kg	M	2.95E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.07E+01	mg/kg	5.07E+01	mg/kg	M	3.99E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.33E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.98E-10
										Total Risk Across All Exposure Routes/Pathways	2.1E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.10.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	1.07E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	3.57E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.36E-08
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	6.28E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	3.59E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	4.94E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	5.87E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	2.15E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	2.10E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	1.98E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	1.05E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	3.01E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	6.69E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	1.31E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	2.28E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	2.00E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	1.99E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	2.16E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	7.68E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.36E-08
Dermal	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	3.20E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	3.21E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	4.82E-09
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	1.88E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	1.08E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	1.48E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	1.76E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	6.45E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	6.31E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	5.94E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	3.14E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	9.04E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	2.01E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	3.94E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	6.83E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	5.99E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	5.98E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	6.47E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	2.30E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.82E-09

TABLE B.2.10.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL AND SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil and Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	2.89E+04	mg/kg	2.89E+04	mg/kg	M	4.55E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	9.68E+00	mg/kg	9.68E+00	mg/kg	M	1.52E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	2.28E-10
	Barium	1.70E+02	mg/kg	1.70E+02	mg/kg	M	2.68E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	9.71E-01	mg/kg	9.71E-01	mg/kg	M	1.53E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.28E-11
	Cadmium	1.34E+01	mg/kg	1.34E+01	mg/kg	M	2.11E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.33E-10
	Chromium Total	1.59E+03	mg/kg	1.59E+03	mg/kg	M	2.50E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	5.82E+01	mg/kg	5.82E+01	mg/kg	M	9.16E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	3.85E-09
	Cobalt	5.70E+01	mg/kg	5.70E+01	mg/kg	M	8.97E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	8.79E-10
	Copper	5.37E+02	mg/kg	5.37E+02	mg/kg	M	8.45E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.83E+04	mg/kg	2.83E+04	mg/kg	M	4.46E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	8.16E+01	mg/kg	8.16E+01	mg/kg	M	1.28E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.81E+03	mg/kg	1.81E+03	mg/kg	M	2.85E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.56E+00	mg/kg	3.56E+00	mg/kg	M	5.60E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	6.17E+02	mg/kg	6.17E+02	mg/kg	M	9.71E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.41E+00	mg/kg	5.41E+00	mg/kg	M	8.50E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.40E+00	mg/kg	5.40E+00	mg/kg	M	8.49E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	5.84E+01	mg/kg	5.84E+01	mg/kg	M	9.19E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	3.28E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.10E-09

Total Risk Across All Exposure Routes/Pathways 6.3E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.11.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	1.14E-08	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	1.70E-08
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	2.73E-07	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	1.27E-09	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	2.25E-09	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	3.05E-07	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	3.30E-08	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	6.16E-08	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	4.47E-05	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	9.98E-08	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	1.94E-06	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	8.12E-10	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	4.83E-08	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	4.34E-09	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	3.02E-07	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	(Total)										1.70E-08
Dermal	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	3.41E-10	mg/kg-day	1.50E+00	$(mg/kg-day)^{-1}$	5.11E-10
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	2.73E-09	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	1.27E-11	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	2.25E-12	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	3.05E-09	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	3.30E-10	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	6.16E-10	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	4.47E-07	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	9.98E-10	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	1.94E-08	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	8.12E-12	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	4.83E-10	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	4.34E-11	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	3.02E-09	mg/kg-day	--	$(mg/kg-day)^{-1}$	NC
	(Total)										5.11E-10

TABLE B.2.11.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Arsenic	6.16E+00	mg/kg	6.16E+00	mg/kg	M	4.85E-12	mg/kg-day	1.50E+01	$(mg/kg\text{-}day)^{-1}$	7.27E-11
	Barium	1.48E+02	mg/kg	1.48E+02	mg/kg	M	1.16E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Beryllium	6.90E-01	mg/kg	6.90E-01	mg/kg	M	5.43E-13	mg/kg-day	8.40E+00	$(mg/kg\text{-}day)^{-1}$	4.56E-12
	Cadmium	1.22E+00	mg/kg	1.22E+00	mg/kg	M	9.60E-13	mg/kg-day	6.30E+00	$(mg/kg\text{-}day)^{-1}$	6.05E-12
	Chromium Total	1.65E+02	mg/kg	1.65E+02	mg/kg	M	1.30E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Cobalt	1.79E+01	mg/kg	1.79E+01	mg/kg	M	1.41E-11	mg/kg-day	9.80E+00	$(mg/kg\text{-}day)^{-1}$	1.38E-10
	Copper	3.34E+01	mg/kg	3.34E+01	mg/kg	M	2.62E-11	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Iron	2.42E+04	mg/kg	2.42E+04	mg/kg	M	1.90E-08	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Lead	5.41E+01	mg/kg	5.41E+01	mg/kg	M	4.26E-11	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Manganese	1.05E+03	mg/kg	1.05E+03	mg/kg	M	8.26E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Mercury	4.40E-01	mg/kg	4.40E-01	mg/kg	M	3.46E-13	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Nickel	2.62E+01	mg/kg	2.62E+01	mg/kg	M	2.06E-11	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Selenium	2.35E+00	mg/kg	2.35E+00	mg/kg	M	1.85E-12	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Zinc	1.64E+02	mg/kg	1.64E+02	mg/kg	M	1.29E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	(Total)										2.21E-10

Total Risk Across All Exposure Routes/Pathways 1.8E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.11.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	2.61E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.91E-08
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	1.24E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	2.92E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	5.62E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	9.53E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	3.28E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	1.73E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	1.42E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	8.35E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	1.66E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	3.11E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	1.04E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	1.06E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	7.67E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.91E-08
Dermal	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	2.35E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.52E-09
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	3.72E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	8.75E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	1.68E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	2.86E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	9.84E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	5.18E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	4.26E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	2.51E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	4.97E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	9.34E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	3.12E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	3.19E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	2.30E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.52E-09

TABLE B.2.11.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SOIL
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Arsenic	7.06E+00	mg/kg	7.06E+00	mg/kg	M	1.11E-11	mg/kg-day	1.50E+01	$(mg/kg\text{-}day)^{-1}$	1.67E-10
	Barium	3.36E+02	mg/kg	3.36E+02	mg/kg	M	5.29E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Beryllium	7.90E-01	mg/kg	7.90E-01	mg/kg	M	1.24E-12	mg/kg-day	8.40E+00	$(mg/kg\text{-}day)^{-1}$	1.04E-11
	Cadmium	1.52E+00	mg/kg	1.52E+00	mg/kg	M	2.39E-12	mg/kg-day	6.30E+00	$(mg/kg\text{-}day)^{-1}$	1.51E-11
	Chromium Total	2.58E+02	mg/kg	2.58E+02	mg/kg	M	4.06E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Cobalt	8.89E+01	mg/kg	8.89E+01	mg/kg	M	1.40E-10	mg/kg-day	9.80E+00	$(mg/kg\text{-}day)^{-1}$	1.37E-09
	Copper	4.68E+01	mg/kg	4.68E+01	mg/kg	M	7.36E-11	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Iron	3.85E+04	mg/kg	3.85E+04	mg/kg	M	6.06E-08	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Lead	2.26E+02	mg/kg	2.26E+02	mg/kg	M	3.56E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Manganese	4.49E+03	mg/kg	4.49E+03	mg/kg	M	7.06E-09	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Mercury	8.44E-01	mg/kg	8.44E-01	mg/kg	M	1.33E-12	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Nickel	2.82E+01	mg/kg	2.82E+01	mg/kg	M	4.44E-11	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Selenium	2.88E+00	mg/kg	2.88E+00	mg/kg	M	4.54E-12	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	Zinc	2.08E+02	mg/kg	2.08E+02	mg/kg	M	3.27E-10	mg/kg-day	--	$(mg/kg\text{-}day)^{-1}$	NC
	(Total)										1.56E-09
										Total Risk Across All Exposure Routes/Pathways	4.4E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.12.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	3.34E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	1.18E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.77E-08
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	2.38E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	1.12E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	6.27E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	4.24E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	5.81E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	2.39E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	3.25E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	3.02E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	1.05E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	6.37E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	1.46E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	7.93E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	1.07E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	1.05E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	1.21E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	2.37E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.77E-08
Dermal	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	3.34E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	3.53E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.30E-10
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	2.38E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	1.12E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	6.27E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	4.24E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	5.81E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	2.39E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	3.25E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	3.02E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	1.05E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	6.37E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	1.46E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	7.93E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	1.07E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	1.05E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	1.21E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	2.37E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.30E-10

TABLE B.2.12.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	1.81E+04	mg/kg	1.81E+04	mg/kg	M	1.42E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	6.38E+00	mg/kg	6.38E+00	mg/kg	M	5.02E-12	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	7.53E-11
	Barium	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.01E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.07E-01	mg/kg	6.07E-01	mg/kg	M	4.77E-13	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	4.01E-12
	Cadmium	3.40E+00	mg/kg	3.40E+00	mg/kg	M	2.67E-12	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	1.68E-11
	Chromium Total	2.30E+03	mg/kg	2.30E+03	mg/kg	M	1.81E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.15E+01	mg/kg	3.15E+01	mg/kg	M	2.48E-11	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	1.04E-09
	Cobalt	1.29E+01	mg/kg	1.29E+01	mg/kg	M	1.02E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	9.96E-11
	Copper	1.76E+02	mg/kg	1.76E+02	mg/kg	M	1.38E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.64E+04	mg/kg	1.64E+04	mg/kg	M	1.29E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	5.67E+01	mg/kg	5.67E+01	mg/kg	M	4.46E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	3.45E+03	mg/kg	3.45E+03	mg/kg	M	2.72E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	7.90E-02	mg/kg	7.90E-02	mg/kg	M	6.21E-14	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	4.30E+02	mg/kg	4.30E+02	mg/kg	M	3.38E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	5.80E+00	mg/kg	5.80E+00	mg/kg	M	4.56E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	5.71E+00	mg/kg	5.71E+00	mg/kg	M	4.49E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.57E+01	mg/kg	6.57E+01	mg/kg	M	5.17E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.29E+02	mg/kg	1.29E+02	mg/kg	M	1.01E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.24E-09

Total Risk Across All Exposure Routes/Pathways 1.9E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.12.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	1.27E-04	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	3.98E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.97E-08
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	6.34E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	2.99E-09	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	2.72E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	1.11E-05	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	3.94E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	7.02E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	3.60E-06	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	9.37E-05	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	4.92E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	6.81E-05	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	3.44E-10	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	4.05E-06	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	3.10E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	3.23E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	3.01E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	7.93E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	(Total)										5.97E-08
Dermal	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	3.82E-06	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	3.58E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.38E-09
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	1.90E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	8.96E-11	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	8.16E-11	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	3.34E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	1.18E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	2.10E-09	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	1.08E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	2.81E-06	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	1.48E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	2.04E-06	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	1.03E-11	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	1.21E-07	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	9.29E-10	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	9.70E-10	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	9.03E-09	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	2.38E-08	mg/kg-day	–	(mg/kg-day) $^{-1}$	NC
	(Total)										5.38E-09

TABLE B.2.12.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SLAG
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Slag
Exposure Medium: Soil
Exposure Point: Ingestion, Dermal, and Inhalation
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Inhalation	Aluminum	3.45E+04	mg/kg	3.45E+04	mg/kg	M	5.43E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.08E+01	mg/kg	1.08E+01	mg/kg	M	1.70E-11	mg/kg-day	1.50E+01	(mg/kg-day) $^{-1}$	2.55E-10
	Barium	1.72E+02	mg/kg	1.72E+02	mg/kg	M	2.70E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	8.09E-01	mg/kg	8.09E-01	mg/kg	M	1.27E-12	mg/kg-day	8.40E+00	(mg/kg-day) $^{-1}$	1.07E-11
	Cadmium	7.37E+00	mg/kg	7.37E+00	mg/kg	M	1.16E-11	mg/kg-day	6.30E+00	(mg/kg-day) $^{-1}$	7.30E-11
	Chromium Total	3.02E+03	mg/kg	3.02E+03	mg/kg	M	4.75E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.07E+02	mg/kg	1.07E+02	mg/kg	M	1.68E-10	mg/kg-day	4.20E+01	(mg/kg-day) $^{-1}$	7.05E-09
	Cobalt	1.90E+01	mg/kg	1.90E+01	mg/kg	M	2.99E-11	mg/kg-day	9.80E+00	(mg/kg-day) $^{-1}$	2.93E-10
	Copper	9.75E+02	mg/kg	9.75E+02	mg/kg	M	1.53E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.54E+04	mg/kg	2.54E+04	mg/kg	M	3.99E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.33E+02	mg/kg	1.33E+02	mg/kg	M	2.10E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.85E+04	mg/kg	1.85E+04	mg/kg	M	2.90E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.32E-02	mg/kg	9.32E-02	mg/kg	M	1.47E-13	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.10E+03	mg/kg	1.10E+03	mg/kg	M	1.73E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	8.39E+00	mg/kg	8.39E+00	mg/kg	M	1.32E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	8.76E+00	mg/kg	8.76E+00	mg/kg	M	1.38E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	8.16E+01	mg/kg	8.16E+01	mg/kg	M	1.28E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.15E+02	mg/kg	2.15E+02	mg/kg	M	3.38E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.69E-09

Total Risk Across All Exposure Routes/Pathways 7.3E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.13.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO GROUNDWATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	9.21E+00	mg/L	9.21E+00	mg/L	M	2.57E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.00E-02	mg/L	1.00E-02	mg/L	M	2.80E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.21E-02	mg/L	2.21E-02	mg/L	M	6.18E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	9.27E-10
	Chromium	5.10E-02	mg/L	5.10E-02	mg/L	M	1.43E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	2.50E-02	mg/L	2.50E-02	mg/L	M	6.99E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	9.50E+00	mg/L	9.50E+00	mg/L	M	2.66E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.90E-02	mg/L	3.90E-02	mg/L	M	1.09E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	4.76E-01	mg/L	4.76E-01	mg/L	M	1.33E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.77E-02	mg/L	2.77E-02	mg/L	M	7.74E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	4.42E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.31E-02	mg/L	2.31E-02	mg/L	M	6.46E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.14E-01	mg/L	2.14E-01	mg/L	M	5.98E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										9.27E-10
Dermal	Aluminum	9.21E+00	mg/L	9.21E+00	mg/L	M	1.70E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.00E-02	mg/L	1.00E-02	mg/L	M	1.85E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.21E-02	mg/L	2.21E-02	mg/L	M	4.08E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	6.12E-10
	Chromium	5.10E-02	mg/L	5.10E-02	mg/L	M	9.41E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	2.50E-02	mg/L	2.50E-02	mg/L	M	9.23E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	9.50E+00	mg/L	9.50E+00	mg/L	M	1.75E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.90E-02	mg/L	3.90E-02	mg/L	M	7.20E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	4.76E-01	mg/L	4.76E-01	mg/L	M	8.79E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.77E-02	mg/L	2.77E-02	mg/L	M	5.11E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	2.92E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.31E-02	mg/L	2.31E-02	mg/L	M	4.26E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.14E-01	mg/L	2.14E-01	mg/L	M	2.37E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.12E-10
										Total Risk Across All Exposure Routes/Pathways	1.5E-09

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.13.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO GROUNDWATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.33E+01	mg/L	2.33E+01	mg/L	M	2.61E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.07E-02	mg/L	1.07E-02	mg/L	M	1.19E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.57E-02	mg/L	2.57E-02	mg/L	M	2.88E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	4.32E-09
	Chromium	1.53E-01	mg/L	1.53E-01	mg/L	M	1.71E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.52E-02	mg/L	3.52E-02	mg/L	M	3.93E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.58E+01	mg/L	1.58E+01	mg/L	M	1.77E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	6.12E-02	mg/L	6.12E-02	mg/L	M	6.85E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.06E-01	mg/L	7.06E-01	mg/L	M	7.89E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.33E-02	mg/L	3.33E-02	mg/L	M	3.72E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	1.77E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.44E-02	mg/L	6.44E-02	mg/L	M	7.20E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.45E-01	mg/L	3.45E-01	mg/L	M	3.85E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.32E-09
Dermal	Aluminum	2.33E+01	mg/L	2.33E+01	mg/L	M	1.72E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.07E-02	mg/L	1.07E-02	mg/L	M	7.86E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.57E-02	mg/L	2.57E-02	mg/L	M	1.90E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.85E-09
	Chromium	1.53E-01	mg/L	1.53E-01	mg/L	M	1.13E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	3.52E-02	mg/L	3.52E-02	mg/L	M	5.19E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.58E+01	mg/L	1.58E+01	mg/L	M	1.17E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	6.12E-02	mg/L	6.12E-02	mg/L	M	4.52E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.06E-01	mg/L	7.06E-01	mg/L	M	5.21E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	3.33E-02	mg/L	3.33E-02	mg/L	M	2.46E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	1.58E-02	mg/L	1.58E-02	mg/L	M	1.17E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	6.44E-02	mg/L	6.44E-02	mg/L	M	4.75E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.45E-01	mg/L	3.45E-01	mg/L	M	1.53E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.85E-09
										Total Risk Across All Exposure Routes/Pathways	7.2E-09

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.14.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	2.40E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	1.51E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	1.97E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.95E-09
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	1.91E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	3.06E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	2.82E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	6.34E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	4.23E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	5.33E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	3.02E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	7.24E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	3.62E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	2.42E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	2.31E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	2.92E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	2.11E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	9.99E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.95E-09
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	1.59E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	9.96E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	1.30E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.95E-09
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	1.26E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	2.02E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	1.86E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	8.37E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	2.79E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	3.52E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	1.99E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	4.78E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	2.39E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	3.19E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	1.53E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	1.93E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	1.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	3.96E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.95E-09
										Total Risk Across All Exposure Routes/Pathways	4.9E-09

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.14.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	6.42E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	1.89E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	2.52E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.79E-08
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	3.76E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	3.40E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	7.65E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.14E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	2.97E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	3.53E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	2.06E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	2.14E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	4.47E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	1.61E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	2.88E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	3.82E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	3.18E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	2.98E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.79E-08
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	4.24E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	1.25E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	1.67E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.50E-08
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	2.48E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	2.24E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	5.05E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.51E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	1.96E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	2.33E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	1.36E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	1.41E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	2.95E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	2.12E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	1.90E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	2.52E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	2.10E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	1.18E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.50E-08
										Total Risk Across All Exposure Routes/Pathways	6.3E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.15.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	1.44E-05	mg/kg-day	--	(mg/kg-day) -1	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	9.02E-08	mg/kg-day	--	(mg/kg-day) -1	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	1.18E-07	mg/kg-day	1.50E+00	(mg/kg-day) -1	1.76E-07
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	1.14E-06	mg/kg-day	--	(mg/kg-day) -1	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	1.83E-08	mg/kg-day	--	(mg/kg-day) -1	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	1.68E-06	mg/kg-day	--	(mg/kg-day) -1	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	3.79E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	2.52E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	3.19E-05	mg/kg-day	--	(mg/kg-day) -1	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	1.80E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	4.32E-06	mg/kg-day	--	(mg/kg-day) -1	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	2.16E-09	mg/kg-day	--	(mg/kg-day) -1	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	1.44E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	1.38E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	1.74E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	1.26E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	5.97E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	(Total)										1.76E-07
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	1.26E-05	mg/kg-day	--	(mg/kg-day) -1	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	7.94E-08	mg/kg-day	--	(mg/kg-day) -1	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	1.03E-07	mg/kg-day	1.50E+00	(mg/kg-day) -1	1.55E-07
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	1.00E-06	mg/kg-day	--	(mg/kg-day) -1	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	1.61E-08	mg/kg-day	--	(mg/kg-day) -1	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	1.48E-06	mg/kg-day	--	(mg/kg-day) -1	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	6.67E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	2.22E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	2.80E-05	mg/kg-day	--	(mg/kg-day) -1	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	1.59E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	3.81E-06	mg/kg-day	--	(mg/kg-day) -1	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	1.90E-09	mg/kg-day	--	(mg/kg-day) -1	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	2.54E-08	mg/kg-day	--	(mg/kg-day) -1	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	1.22E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	1.53E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	1.11E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	3.15E-07	mg/kg-day	--	(mg/kg-day) -1	NC
	(Total)										1.55E-07
										Total Risk Across All Exposure Routes/Pathways	3.3E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.15.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	1.38E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	4.06E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	5.43E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	8.14E-07
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	8.09E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	7.31E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	1.65E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	2.46E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	6.40E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	7.58E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	4.43E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	4.59E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	9.62E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	3.46E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	6.20E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	8.23E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	6.83E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	6.40E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.14E-07
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	1.22E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	3.58E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	4.78E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	7.16E-07
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	7.12E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	6.43E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	1.45E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	4.33E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	5.63E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	6.67E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	3.90E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	4.04E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	8.46E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	6.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	5.46E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	7.24E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	6.01E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	3.38E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.16E-07
										Total Risk Across All Exposure Routes/Pathways	1.5E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.16.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	6.58E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	4.13E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	5.39E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	8.08E-08
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	5.23E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	8.38E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	7.72E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	1.74E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	1.16E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	1.46E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	8.27E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	1.98E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	9.92E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	6.61E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	6.34E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	7.99E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	5.79E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	2.73E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.08E-08
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	4.35E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	2.73E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	3.56E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.34E-08
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	3.45E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	5.53E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	5.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	2.29E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	7.64E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	9.64E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	5.46E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	1.31E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	6.55E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	8.73E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	4.18E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	5.27E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	3.82E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	1.08E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.34E-08

Total Risk Across All Exposure Routes/Pathways 1.3E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.16.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water.
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	1.00E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	2.95E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	3.94E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.92E-07
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	5.88E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	5.31E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	1.20E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.79E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	4.65E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	5.51E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	3.22E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	3.34E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	6.99E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	2.51E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	4.50E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	5.98E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	4.97E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	4.65E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.92E-07
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	6.62E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	1.95E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	2.60E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.90E-07
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	3.88E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	3.51E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	7.89E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	2.36E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	3.07E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	3.64E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	2.13E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	2.20E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	4.61E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	3.32E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	2.97E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	3.94E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	3.28E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	1.84E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.90E-07
										Total Risk Across All Exposure Routes/Pathways	9.8E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.17.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SURFACE WATER
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	6.68E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	4.19E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	5.47E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	8.20E-10
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	5.31E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	8.50E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	7.83E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	1.76E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	1.17E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	1.48E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	8.39E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	2.01E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	1.01E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	6.71E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	6.43E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	8.11E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	5.87E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	2.77E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.20E-10
Dermal	Aluminum	2.39E+00	mg/L	2.39E+00	mg/L	M	4.41E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.50E-02	mg/L	1.50E-02	mg/L	M	2.77E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	1.96E-02	mg/L	1.96E-02	mg/L	M	3.61E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	5.41E-10
	Barium	1.90E-01	mg/L	1.90E-01	mg/L	M	3.50E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	5.61E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	2.80E-01	mg/L	2.80E-01	mg/L	M	5.17E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	6.30E-02	mg/L	6.30E-02	mg/L	M	2.32E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	4.20E-02	mg/L	4.20E-02	mg/L	M	7.75E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	5.30E+00	mg/L	5.30E+00	mg/L	M	9.78E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	3.00E-02	mg/L	3.00E-02	mg/L	M	5.54E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	7.19E-01	mg/L	7.19E-01	mg/L	M	1.33E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	3.60E-04	mg/L	3.60E-04	mg/L	M	6.64E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	2.40E-02	mg/L	2.40E-02	mg/L	M	8.86E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.30E-02	mg/L	2.30E-02	mg/L	M	4.24E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	2.90E-02	mg/L	2.90E-02	mg/L	M	5.35E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.10E-02	mg/L	2.10E-02	mg/L	M	3.87E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	9.93E-02	mg/L	9.93E-02	mg/L	M	1.10E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										5.41E-10
										Total Risk Across All Exposure Routes/Pathways	1.4E-09

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.17.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SURFACE WATER
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Surface Water
Exposure Medium: Surface Water
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	6.42E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	1.89E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	2.52E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.79E-09
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	3.76E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	3.40E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	7.65E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.14E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	2.97E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	3.53E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	2.06E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	2.14E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	4.47E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	1.61E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	2.88E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	3.82E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	3.18E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	2.98E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.79E-09
Dermal	Aluminum	5.74E+00	mg/L	5.74E+00	mg/L	M	4.24E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Antimony	1.69E-02	mg/L	1.69E-02	mg/L	M	1.25E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Arsenic	2.26E-02	mg/L	2.26E-02	mg/L	M	1.67E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.50E-09
	Barium	3.37E-01	mg/L	3.37E-01	mg/L	M	2.48E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	3.04E-03	mg/L	3.04E-03	mg/L	M	2.24E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	6.84E-01	mg/L	6.84E-01	mg/L	M	5.05E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium VI (Hexavalent)	1.02E-01	mg/L	1.02E-01	mg/L	M	1.51E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	2.66E-01	mg/L	2.66E-01	mg/L	M	1.96E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	3.15E+01	mg/L	3.15E+01	mg/L	M	2.33E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Lead	1.84E-01	mg/L	1.84E-01	mg/L	M	1.36E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Manganese	1.91E+00	mg/L	1.91E+00	mg/L	M	1.41E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	4.00E-04	mg/L	4.00E-04	mg/L	M	2.95E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.44E-01	mg/L	1.44E-01	mg/L	M	2.12E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	2.58E-02	mg/L	2.58E-02	mg/L	M	1.90E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Thallium	3.42E-02	mg/L	3.42E-02	mg/L	M	2.52E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Vanadium	2.84E-02	mg/L	2.84E-02	mg/L	M	2.10E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	2.66E-01	mg/L	2.66E-01	mg/L	M	1.18E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.50E-09
										Total Risk Across All Exposure Routes/Pathways	6.3E-09

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.18.CT

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	3.20E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	4.79E-08
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	7.74E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	2.04E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	3.03E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	1.65E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	2.18E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	7.57E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	3.93E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	2.34E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	4.06E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	7.87E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.79E-08
Dermal	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	6.33E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	9.49E-10
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	5.11E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	1.34E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	2.00E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	1.09E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	1.44E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	5.00E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	2.59E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	1.54E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	2.68E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	5.19E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										9.49E-10
										Total Risk Across All Exposure Routes/Pathways	4.9E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.18.RME

CALCULATION OF CANCER RISKS FOR CURRENT MAINTENANCE WORKER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Maintenance Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	2.99E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	4.48E-07
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	1.09E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	1.41E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	2.03E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	2.28E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	2.87E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	5.34E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	3.55E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	3.15E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	2.87E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	7.78E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										4.48E-07
Dermal	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	5.92E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	8.88E-08
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	7.22E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	9.30E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	1.34E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	1.51E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	1.89E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	3.52E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	2.34E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	2.08E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	1.90E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	5.13E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										8.88E-08
										Total Risk Across All Exposure Routes/Pathways	5.4E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.19.CT

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	4.77E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	7.16E-07
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	1.16E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	3.04E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	4.52E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	2.46E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	3.26E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	1.13E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	5.86E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	3.49E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	6.06E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	1.17E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.16E-07
Dermal	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	2.52E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	3.78E-08
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	2.03E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	5.35E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	7.96E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	4.33E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	5.74E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	1.99E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	1.03E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	6.15E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	1.07E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	2.07E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										3.78E-08

Total Risk Across All Exposure Routes/Pathways 7.5E-07

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.19.RME

CALCULATION OF CANCER RISKS FOR CURRENT/FUTURE TRESPASSER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Trespasser
Receptor Age: Adolescent

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	1.61E-06	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.41E-06
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	5.88E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	7.57E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	1.09E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	1.23E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	1.54E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	2.87E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	1.91E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	1.69E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	1.54E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	4.18E-05	mg/kg-day	--.	(mg/kg-day) $^{-1}$	NC
	(Total)										2.41E-06
Dermal	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	4.24E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	6.37E-07
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	5.18E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	6.67E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	9.61E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	1.08E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	1.36E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	2.53E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	1.68E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	1.49E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	1.36E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	3.68E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.37E-07
										Total Risk Across All Exposure Routes/Pathways	3.0E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.20.CT

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	8.75E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.31E-06
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	2.12E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	5.58E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	8.29E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	4.51E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	5.98E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	2.07E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	1.07E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	6.40E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	1.11E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	2.15E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.31E-06
Dermal	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	1.73E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.60E-08
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	1.40E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	3.68E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	5.47E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	2.98E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	3.94E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	1.37E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	7.09E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	4.23E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	7.33E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	1.42E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.60E-08
										Total Risk Across All Exposure Routes/Pathways	1.3E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.20.RME

CALCULATION OF CANCER RISKS FOR FUTURE INDUSTRIAL/ COMMERCIAL WORKER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	4.67E-06	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	7.01E-06
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	1.71E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	2.20E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	3.17E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	3.57E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	4.48E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	8.34E-03	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	5.54E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	4.91E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	4.49E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	1.22E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.01E-06
Dermal	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	9.25E-07	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	1.39E-06
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	1.13E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	1.45E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	2.09E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	2.35E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	2.96E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	5.51E-04	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	3.66E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	3.24E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	2.96E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	8.02E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										1.39E-06
										Total Risk Across All Exposure Routes/Pathways	8.4E-06

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.21.CT

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SEDIMENT
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	1.47E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	2.20E-08
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	3.55E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	9.34E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	1.39E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	7.55E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	1.00E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	3.47E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	1.80E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	1.07E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	1.86E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	3.61E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										2.20E-08
Dermal	Arsenic	7.94E+00	mg/L	7.94E+00	mg/L	M	4.40E-10	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	6.59E-10
	Barium	1.92E+02	mg/L	1.92E+02	mg/L	M	3.55E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	5.06E-01	mg/L	5.06E-01	mg/L	M	9.34E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	7.52E-01	mg/L	7.52E-01	mg/L	M	1.39E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	4.09E+02	mg/L	4.09E+02	mg/L	M	7.55E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	5.42E+01	mg/L	5.42E+01	mg/L	M	1.00E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	1.88E+04	mg/L	1.88E+04	mg/L	M	3.47E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	9.75E-02	mg/L	9.75E-02	mg/L	M	1.80E-12	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	5.81E+01	mg/L	5.81E+01	mg/L	M	1.07E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.01E+01	mg/L	1.01E+01	mg/L	M	1.86E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	1.95E+02	mg/L	1.95E+02	mg/L	M	3.61E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.59E-10
										Total Risk Across All Exposure Routes/Pathways	2.3E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.2.21.RME

CALCULATION OF CANCER RISKS FOR FUTURE CONSTRUCTION/ UTILITY WORKER EXPOSURE TO SEDIMENT
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Sediment
Exposure Point: Ingestion and Dermal
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Exposure Route	*Chemical of Potential Concern*	*Medium EPC Value*	*Medium EPC Units*	*Route EPC Value*	*Route EPC Units*	*EPC Selected for Hazard Calculation (1)*	*Intake (Cancer)*	*Intake (Cancer) Units*	*Cancer Slope Factor*	*Cancer Slope Factor Units*	*Cancer Risk*
Ingestion	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	4.93E-08	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	7.40E-08
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	1.81E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	2.32E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	3.35E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	3.76E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	4.73E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	8.81E-05	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	5.85E-10	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	5.19E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	4.74E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	1.28E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										7.40E-08
Dermal	Arsenic	1.34E+01	mg/L	1.34E+01	mg/L	M	4.44E-09	mg/kg-day	1.50E+00	(mg/kg-day) $^{-1}$	6.66E-09
	Barium	4.89E+02	mg/L	4.89E+02	mg/L	M	5.42E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Beryllium	6.30E-01	mg/L	6.30E-01	mg/L	M	6.97E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Cadmium	9.08E-01	mg/L	9.08E-01	mg/L	M	1.01E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Chromium	1.02E+03	mg/L	1.02E+03	mg/L	M	1.13E-07	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Copper	1.28E+02	mg/L	1.28E+02	mg/L	M	1.42E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Iron	2.39E+04	mg/L	2.39E+04	mg/L	M	2.64E-06	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Mercury	1.59E-01	mg/L	1.59E-01	mg/L	M	1.75E-11	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Nickel	1.41E+02	mg/L	1.41E+02	mg/L	M	1.56E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Selenium	1.28E+01	mg/L	1.28E+01	mg/L	M	1.42E-09	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	Zinc	3.48E+02	mg/L	3.48E+02	mg/L	M	3.85E-08	mg/kg-day	--	(mg/kg-day) $^{-1}$	NC
	(Total)										6.66E-09
										Total Risk Across All Exposure Routes/Pathways	8.1E-08

Notes:
-- = Not Available
N/A = Not Applicable
NC = Not Calculated
(1) Medium-Specific (M) EPC selected for risk calculation.

TABLE B.3.1.CT

SUMMARY OF CURRENT MAINTENANCE WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil and Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	5.85E-04	2.85E-05	3.86E-06	6.17E-04
			Antimony	NC	NC	NC	NC	Antimony	blood system	1.82E-03	NC	7.99E-05	1.90E-03
			Arsenic	3.88E-08	1.90E-11	7.69E-10	3.96E-08	Arsenic	skin discoloration	6.71E-04	NC	1.33E-05	6.84E-04
			Barium	NC	NC	NC	NC	Barium	no effects	7.42E-05	1.81E-06	6.99E-09	7.60E-05
			Beryllium	NC	9.66E-13	NC	9.66E-13	Beryllium	chronic beryllium disease	9.16E-06	1.57E-07	8.64E-06	1.80E-05
			Cadmium	NC	4.15E-12	NC	4.15E-12	Cadmium	kidney	2.10E-04	8.98E-08	2.77E-06	2.13E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	2.59E-05	NC	1.32E-05	3.91E-05
			Chromium VI (Hexavalent)	NC	5.61E-11	NC	5.61E-11	Chromium VI (Hexavalent)	no effects	7.10E-05	3.71E-07	1.87E-05	9.01E-05
			Cobalt	NC	4.31E-11	NC	4.31E-11	Cobalt	--	3.51E-05	6.01E-06	2.31E-07	4.13E-05
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	1.29E-04	NC	8.52E-07	1.30E-04
			Iron	NC	NC	NC	NC	Iron	--	2.00E-03	NC	1.32E-05	2.01E-03
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	1.18E-03	1.88E-04	1.95E-04	1.56E-03
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	3.13E-05	5.33E-09	2.07E-07	3.15E-05
			Nickel	NC	NC	NC	NC	Nickel	body weight	3.97E-04	NC	6.56E-05	4.63E-04
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	3.05E-05	NC	2.01E-07	3.07E-05
			Thallium	NC	NC	NC	NC	Thallium	liver	1.17E-03	NC	7.73E-06	1.18E-03
			Vanadium	NC	NC	NC	NC	Vanadium	--	1.63E-03	NC	4.15E-04	2.05E-03
			Zinc	NC	NC	NC	NC	Zinc	blood system	1.82E-05	NC	1.20E-07	1.83E-05
Surface Soil	Surface Soil/ Ambient Air	--	Antimony	NC	NC	NC	NC	Antimony	blood system	8.30E-04	NC	3.65E-05	8.66E-04
			Arsenic	3.79E-08	1.85E-11	7.50E-10	3.86E-08	Arsenic	skin discoloration	6.54E-04	NC	1.30E-05	6.67E-04
			Barium	NC	NC	NC	NC	Barium	no effects	7.38E-05	1.80E-06	6.96E-09	7.56E-05
			Beryllium	NC	1.00E-12	NC	1.00E-12	Beryllium	chronic beryllium disease	9.50E-06	1.63E-07	8.96E-06	1.86E-05
			Cadmium	NC	1.17E-12	NC	1.17E-12	Cadmium	kidney	5.91E-05	2.53E-08	7.79E-07	5.99E-05
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	6.05E-06	NC	3.07E-06	9.12E-06
			Cobalt	NC	4.68E-11	NC	4.68E-11	Cobalt	--	3.80E-05	6.52E-06	2.51E-07	4.48E-05
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.42E-05	NC	1.60E-07	2.44E-05
			Iron	NC	NC	NC	NC	Iron	--	2.00E-03	NC	1.32E-05	2.01E-03
			Manganese	NC	NC	NC	NC	Manganese	--	9.73E-04	1.55E-04	1.60E-04	1.29E-03
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	4.38E-05	7.47E-09	2.89E-07	4.41E-05
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	3.86E-05	NC	6.37E-06	4.49E-05
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.73E-05	NC	1.14E-07	1.74E-05
			Thallium	NC	NC	NC	NC	Thallium	liver	6.89E-04	NC	4.55E-06	6.93E-04
			Zinc	NC	NC	NC	NC	Zinc	blood system	1.62E-05	NC	1.07E-07	1.63E-05

TABLE B.3.1.CT

SUMMARY OF CURRENT MAINTENANCE WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	6.49E-04	3.17E-05	4.28E-06	6.85E-04
			Antimony	NC	NC	NC	NC	Antimony	blood system	7.65E-03	NC	3.37E-04	7.98E-03
			Arsenic	2.78E-08	1.36E-11	5.50E-10	2.83E-08	Arsenic	skin discoloration	4.80E-04	NC	9.51E-06	4.90E-04
			Barium	NC	NC	NC	NC	Barium	no effects	7.83E-05	1.91E-06	7.38E-09	8.02E-05
			Beryllium	NC	7.20E-13	NC	7.20E-13	Beryllium	chronic beryllium disease	6.82E-06	1.17E-07	6.43E-06	1.34E-05
			Cadmium	NC	1.10E-11	NC	1.10E-11	Cadmium	kidney	5.57E-04	2.39E-07	7.36E-06	5.65E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	8.06E-05	NC	4.09E-05	1.22E-04
			Chromium VI (Hexavalent)	NC	1.16E-10	NC	1.16E-10	Chromium VI (Hexavalent)	no effects	1.46E-04	7.64E-07	3.86E-05	1.85E-04
			Cobalt	NC	3.88E-11	NC	3.88E-11	Cobalt	--	3.16E-05	5.41E-06	2.08E-07	3.72E-05
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.69E-04	NC	1.78E-06	2.71E-04
			Iron	NC	NC	NC	NC	Iron	--	2.01E-03	NC	1.33E-05	2.03E-03
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	1.80E-03	2.87E-04	2.96E-04	2.38E-03
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	7.51E-06	1.28E-09	4.96E-08	7.57E-06
			Nickel	NC	NC	NC	NC	Nickel	body weight	2.20E-03	NC	3.64E-04	2.57E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	8.07E-05	NC	5.33E-07	8.13E-05
			Thallium	NC	NC	NC	NC	Thallium	liver	2.63E-03	NC	1.74E-05	2.65E-03
			Vanadium	NC	NC	NC	NC	Vanadium	--	3.14E-03	NC	7.98E-04	3.94E-03
			Zinc	NC	NC	NC	NC	Zinc	blood system	2.34E-05	NC	1.54E-07	2.35E-05
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	1.87E-06	--	1.23E-06	3.11E-06
			Antimony	NC	--	NC	NC	Antimony	blood system	2.94E-05	--	1.29E-04	1.59E-04
			Arsenic	2.95E-09	--	1.95E-09	4.90E-09	Arsenic	skin discoloration	5.10E-05	--	3.37E-05	8.47E-05
			Barium	NC	--	NC	NC	Barium	no effects	2.12E-06	--	2.00E-05	2.21E-05
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	1.19E-06	--	1.12E-04	1.13E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	1.46E-07	--	7.42E-06	7.57E-06
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	1.64E-05	--	8.68E-04	8.84E-04
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	8.22E-07	--	5.42E-07	1.36E-06
			Iron	NC	--	NC	NC	Iron	--	1.38E-05	--	9.13E-06	2.30E-05
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	1.21E-05	--	1.99E-04	2.11E-04
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	9.39E-07	--	6.20E-07	1.56E-06
			Nickel	NC	--	NC	NC	Nickel	body weight	9.39E-07	--	3.10E-06	4.04E-06
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	3.60E-06	--	2.38E-06	5.98E-06
			Thallium	NC	--	NC	NC	Thallium	liver	3.24E-04	--	2.14E-04	5.38E-04
			Vanadium	NC	--	NC	NC	Vanadium	--	1.64E-05	--	4.17E-04	4.34E-04
			Zinc	NC	--	NC	NC	Zinc	blood system	2.59E-07	--	1.03E-07	3.62E-07

TABLE B.3.1.CT

SUMMARY OF CURRENT MAINTENANCE WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Sediment	Sediment	--	Arsenic	4.79E-08	--	9.49E-10	4.89E-08	Arsenic	skin discoloration	8.29E-04	--	1.64E-05	8.45E-04
			Barium	NC	--	NC	NC	Barium	no effects	8.60E-05	--	8.11E-06	9.41E-05
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	7.92E-06	--	7.47E-06	1.54E-05
			Cadmium	NC	--	NC	NC	Cadmium	kidney	4.71E-05	--	6.22E-07	4.77E-05
			Chromium	NC	--	NC	NC	Chromium	no effects	8.54E-06	--	4.34E-06	1.29E-05
			Copper	NC	--	NC	NC	Copper	gastrointestinal disease	4.25E-05	--	2.80E-07	4.27E-05
			Iron	NC	--	NC	NC	Iron	--	1.96E-03	--	1.30E-05	1.98E-03
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	1.02E-05	--	6.72E-08	1.02E-05
			Nickel	NC	--	NC	NC	Nickel	body weight	9.10E-05	--	1.50E-05	1.06E-04
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	6.31E-05	--	4.17E-07	6.35E-05
			Zinc	NC	--	NC	NC	Zinc	blood system	2.04E-05	--	1.35E-07	2.05E-05

Total Risk Across Surface Soil and Slag	4.0E-08
Total Risk Across Surface Soil	3.9E-08
Total Risk Across Slag	2.9E-08
Total Risk Across Surface Water	4.9E-09
Total Risk Across Sediment	4.9E-08

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	1.7E-02
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	1.2E-02
Total Hazard Index Across All Media and All Exposure Routes (slag)	3.0E-02

Total Risk Across All Media and All Exposure Routes (surface soil and slag)	9.4E-08
Total Risk Across All Media and All Exposure Routes (surface soil)	9.2E-08
Total Risk Across All Media and All Exposure Routes (slag)	8.2E-08

Surface Soil and Slag

Total [blood system] HI =	2.1E-03
Total [skin discoloration] HI =	1.6E-03
Total [chronic beryllium disease] HI =	1.5E-04
Total [kidney] HI =	2.6E-04
Total [gastrointestinal system] HI =	1.7E-04
Total [central nervous system] HI =	1.8E-03
Total [autoimmune system] HI =	4.3E-05
Total [body weight] HI =	5.7E-04
Total [clinical selenosis] HI =	1.0E-04
Total [liver] HI =	1.7E-03

Note:
NC = Not Calculated

TABLE B.3.1.RME

SUMMARY OF CURRENT MAINTENANCE WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Surface Soil and Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	2.31E-03	1.13E-04	1.53E-04	2.58E-03
			Antimony	NC	NC	NC	NC	Antimony	blood system	5.98E-03	NC	2.63E-03	8.61E-03
			Arsenic	6.06E-07	2.96E-10	1.20E-07	7.26E-07	Arsenic	skin discoloration	3.77E-03	NC	7.47E-04	4.52E-03
			Barium	NC	NC	NC	NC	Barium	no effects	3.38E-04	8.24E-06	3.18E-07	3.46E-04
			Beryllium	NC	1.11E-11	NC	1.11E-11	Beryllium	chronic beryllium disease	3.79E-05	6.49E-07	3.57E-04	3.95E-04
			Cadmium	NC	1.80E-10	NC	1.80E-10	Cadmium	kidney	3.28E-03	1.40E-06	4.33E-04	3.71E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	8.24E-05	NC	4.18E-04	5.00E-04
			Chromium VI (Hexavalent)	NC	4.56E-10	NC	4.56E-10	Chromium VI (Hexavalent)	no effects	2.08E-04	1.09E-06	5.48E-04	7.57E-04
			Cobalt	NC	9.79E-10	NC	9.79E-10	Cobalt	--	2.86E-04	4.91E-05	1.89E-05	3.54E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.00E-03	NC	1.32E-04	2.13E-03
			Iron	NC	NC	NC	NC	Iron	--	4.51E-03	NC	2.98E-04	4.81E-03
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	7.23E-03	1.15E-03	1.19E-02	2.03E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	5.19E-04	8.84E-08	3.42E-05	5.53E-04
			Nickel	NC	NC	NC	NC	Nickel	body weight	3.24E-03	NC	5.35E-03	8.60E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	8.28E-05	NC	5.47E-06	8.83E-05
			Thallium	NC	NC	NC	NC	Thallium	liver	3.48E-03	NC	2.30E-04	3.71E-03
			Vanadium	NC	NC	NC	NC	Vanadium	--	4.13E-03	NC	1.05E-02	1.46E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	8.70E-05	NC	5.74E-06	9.27E-05
Surface Soil	Surface Soil/ Ambient Air	--	Antimony	NC	NC	NC	NC	Antimony	blood system	2.42E-03	NC	1.06E-03	3.48E-03
			Arsenic	2.65E-07	1.29E-10	5.25E-08	3.18E-07	Arsenic	skin discoloration	1.65E-03	NC	3.26E-04	1.98E-03
			Barium	NC	NC	NC	NC	Barium	no effects	4.83E-04	1.18E-05	4.55E-07	4.95E-04
			Beryllium	NC	7.45E-12	NC	7.45E-12	Beryllium	chronic beryllium disease	2.54E-05	4.35E-07	2.40E-04	2.66E-04
			Cadmium	NC	8.84E-12	NC	8.84E-12	Cadmium	kidney	1.61E-04	6.89E-08	2.12E-05	1.82E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.95E-05	NC	9.88E-05	1.18E-04
			Cobalt	NC	1.87E-09	NC	1.87E-09	Cobalt	--	5.48E-04	9.39E-05	3.62E-05	6.78E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	6.04E-05	NC	3.99E-06	6.44E-05
			Iron	NC	NC	NC	NC	Iron	--	4.52E-03	NC	2.98E-04	4.82E-03
			Manganese	NC	NC	NC	NC	Manganese	--	1.18E-02	1.89E-03	1.95E-02	3.32E-02
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	1.01E-03	1.73E-07	6.69E-05	1.08E-03
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	8.69E-05	NC	1.43E-04	2.30E-04
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	4.82E-05	NC	3.18E-06	5.14E-05
			Thallium	NC	NC	NC	NC	Thallium	liver	2.04E-03	NC	1.35E-04	2.17E-03
			Zinc	NC	NC	NC	NC	Zinc	blood system	4.23E-05	NC	2.79E-06	4.51E-05

TABLE B.3.1.RME

SUMMARY OF CURRENT MAINTENANCE WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	4.82E-03	2.35E-04	3.18E-04	5.37E-03
			Antimony	NC	NC	NC	NC	Antimony	blood system	5.31E-02	NC	2.34E-02	7.64E-02
			Arsenic	4.65E-07	2.27E-10	9.21E-08	5.57E-07	Arsenic	skin discoloration	2.89E-03	NC	5.73E-04	3.47E-03
			Barium	NC	NC	NC	NC	Barium	no effects	2.44E-04	5.97E-06	2.30E-07	2.51E-04
			Beryllium	NC	5.03E-12	NC	5.03E-12	Beryllium	chronic beryllium disease	1.72E-05	2.94E-07	1.62E-04	1.79E-04
			Cadmium	NC	1.45E-10	NC	1.45E-10	Cadmium	kidney	2.65E-03	1.13E-06	3.49E-04	3.00E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	3.50E-04	NC	1.78E-03	2.13E-03
			Chromium VI (Hexavalent)	NC	3.64E-09	NC	3.64E-09	Chromium VI (Hexavalent)	no effects	1.65E-03	8.66E-06	4.37E-03	6.03E-03
			Cobalt	NC	3.91E-10	NC	3.91E-10	Cobalt	--	1.14E-04	1.96E-05	7.55E-06	1.42E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.66E-03	NC	1.75E-04	2.83E-03
			Iron	NC	NC	NC	NC	Iron	--	5.06E-03	NC	3.34E-04	5.40E-03
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	7.62E-03	1.21E-03	1.26E-02	2.14E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	7.83E-05	1.33E-08	5.17E-06	8.35E-05
			Nickel	NC	NC	NC	NC	Nickel	body weight	1.62E-02	NC	2.67E-02	4.28E-02
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	3.29E-04	NC	2.17E-05	3.51E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	9.05E-03	NC	5.97E-04	9.65E-03
			Vanadium	NC	NC	NC	NC	Vanadium	--	1.17E-02	NC	2.97E-02	4.14E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	2.07E-04	NC	1.37E-05	2.21E-04
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	1.80E-05	--	1.19E-05	2.99E-05
			Antimony	NC	--	NC	NC	Antimony	blood system	1.32E-04	--	5.82E-04	7.14E-04
			Arsenic	3.79E-08	--	2.50E-08	6.29E-08	Arsenic	skin discoloration	2.36E-04	--	1.55E-04	3.91E-04
			Barium	NC	--	NC	NC	Barium	no effects	1.51E-05	--	1.42E-04	1.57E-04
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	4.76E-06	--	4.49E-04	4.53E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	1.43E-06	--	7.25E-05	7.40E-05
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	1.07E-04	--	5.64E-03	5.75E-03
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	2.08E-05	--	1.37E-05	3.46E-05
			Iron	NC	--	NC	NC	Iron	--	3.29E-04	--	2.17E-04	5.46E-04
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	1.28E-04	--	2.11E-03	2.24E-03
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	4.17E-06	--	2.76E-06	6.93E-06
			Nickel	NC	--	NC	NC	Nickel	body weight	2.25E-05	--	7.43E-05	9.68E-05
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	1.61E-05	--	1.07E-05	2.68E-05
			Thallium	NC	--	NC	NC	Thallium	liver	1.53E-03	--	1.01E-03	2.54E-03
			Vanadium	NC	--	NC	NC	Vanadium	--	8.90E-05	--	2.26E-03	2.35E-03
			Zinc	NC	--	NC	NC	Zinc	blood system	2.78E-06	--	1.10E-06	3.88E-06

TABLE B.3.1.RME

SUMMARY OF CURRENT MAINTENANCE WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*			
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*
Sediment	Sediment	--	Arsenic	4.48E-07	--	8.88E-08	5.37E-07
			Barium	NC	--	NC	NC
			Beryllium	NC	--	NC	NC
			Cadmium	NC	--	NC	NC
			Chromium	NC	--	NC	NC
			Copper	NC	--	NC	NC
			Iron	NC	--	NC	NC
			Mercury	NC	--	NC	NC
			Nickel	NC	--	NC	NC
			Selenium	NC	--	NC	NC
			Zinc	NC	--	NC	NC

Chemical	*Non-Carcinogenic Hazard Quotient*				
	Primary Target Organ	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Arsenic	skin discoloration	2.79E-03	--	5.53E-04	3.34E-03
Barium	no effects	4.38E-04	--	4.13E-04	8.50E-04
Beryllium	chronic beryllium disease	1.97E-05	--	1.86E-04	2.06E-04
Cadmium	kidney	1.14E-04	--	1.50E-05	1.29E-04
Chromium	no effects	4.26E-05	--	2.16E-04	2.59E-04
Copper	gastrointestinal disease	2.01E-04	--	1.33E-05	2.14E-04
Iron	--	4.98E-03	--	3.29E-04	5.31E-03
Mercury	autoimmune system	3.31E-05	--	2.18E-06	3.53E-05
Nickel	body weight	4.40E-04	--	7.27E-04	1.17E-03
Selenium	clinical selenosis	1.61E-04	--	1.06E-05	1.71E-04
Zinc	blood system	7.26E-05	--	4.79E-06	7.74E-05

Total Risk Across Surface Soil and Slag	7.3E-07
Total Risk Across Surface Soil	3.2E-07
Total Risk Across Slag	5.6E-07
Total Risk Across Surface Water	6.3E-08
Total Risk Across Sediment	5.4E-07

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	1.0E-01
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	7.6E-02
Total Hazard Index Across All Media and All Exposure Routes (slag)	2.5E-01

Total Risk Across All Media and All Exposure Routes (surface soil and slag)	1.3E-06
Total Risk Across All Media and All Exposure Routes (surface soil)	9.2E-07
Total Risk Across All Media and All Exposure Routes (slag)	1.2E-06

Surface Soil and Slag

Total [blood system] HI =	9.5E-03
Total [skin discoloration] HI =	8.3E-03
Total [chronic beryllium disease] HI =	1.1E-03
Total [kidney] HI =	3.8E-03
Total [gastrointestinal system] HI =	2.4E-03
Total [central nervous system] HI =	2.3E-02
Total [autoimmune system] HI =	6.0E-04
Total [body weight] HI =	9.9E-03
Total [clinical selenosis] HI =	2.9E-04
Total [liver] HI =	6.2E-03

Note:
NC = Not Calculated

TABLE B.3.2.CT

SUMMARY OF CURRENT/FUTURE TRESPASSER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil and Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	6.55E-03	1.16E-04	1.15E-04	6.78E-03
			Antimony	NC	NC	NC	NC	Antimony	blood system	2.03E-02	NC	2.39E-03	2.27E-02
			Arsenic	5.80E-07	1.02E-10	3.06E-08	6.11E-07	Arsenic	skin discoloration	7.52E-03	NC	3.97E-04	7.91E-03
			Barium	NC	NC	NC	NC	Barium	no effects	8.31E-04	7.33E-06	2.09E-07	8.38E-04
			Beryllium	NC	5.21E-12	NC	5.21E-12	Beryllium	chronic beryllium disease	1.03E-04	6.35E-07	2.58E-04	3.61E-04
			Cadmium	NC	2.24E-11	NC	2.24E-11	Cadmium	kidney	2.35E-03	3.64E-07	8.27E-05	2.43E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	2.90E-04	NC	3.93E-04	6.83E-04
			Chromium VI (Hexavalent)	NC	3.03E-10	NC	3.03E-10	Chromium VI (Hexavalent)	no effects	7.95E-04	1.50E-06	5.60E-04	1.36E-03
			Cobalt	NC	2.33E-10	NC	2.33E-10	Cobalt	--	3.93E-04	2.43E-05	6.91E-06	4.24E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	1.45E-03	NC	2.55E-05	1.47E-03
			Iron	NC	NC	NC	NC	Iron	--	2.24E-02	NC	3.94E-04	2.28E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	1.32E-02	7.63E-04	5.82E-03	1.98E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	3.51E-04	2.16E-08	6.17E-06	3.57E-04
			Nickel	NC	NC	NC	NC	Nickel	body weight	4.45E-03	NC	1.96E-03	6.41E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	3.42E-04	NC	6.01E-06	3.48E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	1.31E-02	NC	2.31E-04	1.34E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	1.83E-02	NC	1.24E-02	3.07E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	2.04E-04	NC	3.59E-06	2.07E-04
Surface Soil	Surface Soil/ Ambient Air	--	Antimony	NC	NC	NC	NC	Antimony	blood system	9.29E-03	NC	1.09E-03	1.04E-02
			Arsenic	5.65E-07	9.98E-11	2.99E-08	5.95E-07	Arsenic	skin discoloration	7.33E-03	NC	3.87E-04	7.72E-03
			Barium	NC	NC	NC	NC	Barium	no effects	8.27E-04	7.29E-06	2.08E-07	8.34E-04
			Beryllium	NC	5.41E-12	NC	5.41E-12	Beryllium	chronic beryllium disease	1.06E-04	6.59E-07	2.68E-04	3.75E-04
			Cadmium	NC	6.30E-12	NC	6.30E-12	Cadmium	kidney	6.61E-04	1.02E-07	2.33E-05	6.85E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	6.77E-05	NC	9.17E-05	1.59E-04
			Cobalt	NC	2.53E-10	NC	2.53E-10	Cobalt	--	4.26E-04	2.64E-05	7.50E-06	4.60E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.71E-04	NC	4.78E-06	2.76E-04
			Iron	NC	NC	NC	NC	Iron	--	2.24E-02	NC	3.94E-04	2.28E-02
			Manganese	NC	NC	NC	NC	Manganese	--	1.09E-02	6.28E-04	4.79E-03	1.63E-02
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	4.91E-04	3.02E-08	8.64E-06	5.00E-04
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	4.32E-04	NC	1.90E-04	6.22E-04
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.94E-04	NC	3.41E-06	1.97E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	7.72E-03	NC	1.36E-04	7.85E-03
			Zinc	NC	NC	NC	NC	Zinc	blood system	1.81E-04	NC	3.18E-06	1.84E-04

TABLE B.3.2.CT

SUMMARY OF CURRENT/FUTURE TRESPASSER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	7.27E-03	1.28E-04	1.28E-04	7.53E-03
			Antimony	NC	NC	NC	NC	Antimony	blood system	8.57E-02	NC	1.01E-02	9.57E-02
			Arsenic	4.15E-07	7.32E-11	2.19E-08	4.37E-07	Arsenic	skin discoloration	5.38E-03	NC	2.84E-04	5.66E-03
			Barium	NC	NC	NC	NC	Barium	no effects	8.77E-04	7.73E-06	2.20E-07	8.84E-04
			Beryllium	NC	3.88E-12	NC	3.88E-12	Beryllium	chronic beryllium disease	7.64E-05	4.73E-07	1.92E-04	2.69E-04
			Cadmium	NC	5.95E-11	NC	5.95E-11	Cadmium	kidney	6.24E-03	9.66E-07	2.20E-04	6.46E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	9.03E-04	NC	1.22E-03	2.13E-03
			Chromium VI (Hexavalent)	NC	6.24E-10	NC	6.24E-10	Chromium VI (Hexavalent)	no effects	1.64E-03	3.09E-06	1.15E-03	2.79E-03
			Cobalt	NC	2.10E-10	NC	2.10E-10	Cobalt	--	3.53E-04	2.19E-05	6.22E-06	3.82E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	3.01E-03	NC	5.30E-05	3.07E-03
			Iron	NC	NC	NC	NC	Iron	--	2.26E-02	NC	3.97E-04	2.30E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	2.01E-02	1.16E-03	8.86E-03	3.02E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	8.42E-05	5.18E-09	1.48E-06	8.57E-05
			Nickel	NC	NC	NC	NC	Nickel	body weight	2.47E-02	NC	1.09E-02	3.56E-02
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	9.04E-04	NC	1.59E-05	9.20E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	2.95E-02	NC	5.18E-04	3.00E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	3.52E-02	NC	2.38E-02	5.91E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	2.62E-04	NC	4.61E-06	2.66E-04
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	8.38E-05	--	7.37E-05	1.58E-04
			Antimony	NC	--	NC	NC	Antimony	blood system	1.32E-03	--	7.72E-03	9.03E-03
			Arsenic	1.76E-07	--	1.55E-07	3.32E-07	Arsenic	skin discoloration	2.29E-03	--	2.01E-03	4.30E-03
			Barium	NC	--	NC	NC	Barium	no effects	9.51E-05	--	1.20E-03	1.29E-03
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	5.33E-05	--	6.70E-03	6.75E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	6.55E-06	--	4.43E-04	4.50E-04
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	7.36E-04	--	5.18E-02	5.26E-02
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	3.68E-05	--	3.24E-05	6.92E-05
			Iron	NC	--	NC	NC	Iron	--	6.20E-04	--	5.45E-04	1.16E-03
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	5.40E-04	--	1.19E-02	1.24E-02
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	4.21E-05	--	3.70E-05	7.91E-05
			Nickel	NC	--	NC	NC	Nickel	body weight	4.21E-05	--	1.85E-04	2.27E-04
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	1.61E-04	--	1.42E-04	3.03E-04
			Thallium	NC	--	NC	NC	Thallium	liver	1.45E-02	--	1.28E-02	2.73E-02
			Vanadium	NC	--	NC	NC	Vanadium	--	7.36E-04	--	2.49E-02	2.57E-02
			Zinc	NC	--	NC	NC	Zinc	blood system	1.16E-05	--	6.13E-06	1.77E-05

TABLE B.3.2.CT

SUMMARY OF CURRENT/FUTURE TRESPASSER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Sediment	Sediment	--	Arsenic	7.16E-07	--	3.78E-08	7.54E-07	Arsenic	skin discoloration	9.28E-03	--	4.90E-04	9.77E-03
			Barium	NC	--	NC	NC	Barium	no effects	9.63E-04	--	2.42E-04	1.21E-03
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	8.87E-05	--	2.23E-04	3.12E-04
			Cadmium	NC	--	NC	NC	Cadmium	kidney	5.27E-04	--	1.86E-05	5.46E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	9.57E-05	--	1.30E-04	2.25E-04
			Copper	NC	--	NC	NC	Copper	gastrointestinal disease	4.75E-04	--	8.37E-06	4.84E-04
			Iron	NC	--	NC	NC	Iron	--	2.20E-02	--	3.87E-04	2.24E-02
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	1.14E-04	--	2.01E-06	1.16E-04
			Nickel	NC	--	NC	NC	Nickel	body weight	1.02E-03	--	4.48E-04	1.47E-03
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	7.07E-04	--	1.24E-05	7.19E-04
			Zinc	NC	--	NC	NC	Zinc	blood system	2.28E-04	--	4.02E-06	2.32E-04

Total Risk Across Surface Soil and Slag	6.1E-07
Total Risk Across Surface Soil	6.0E-07
Total Risk Across Slag	4.4E-07
Total Risk Across Surface Water	3.3E-07
Total Risk Across Sediment	7.5E-07

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	3.2E-01
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	2.5E-01
Total Hazard Index Across All Media and All Exposure Routes (slag)	4.8E-01

Total Risk Across All Media and All Exposure Routes (surface soil and slag)	1.7E-06
Total Risk Across All Media and All Exposure Routes (surface soil)	1.7E-06
Total Risk Across All Media and All Exposure Routes (slag)	1.5E-06

Surface Soil and Slag

Total [blood system] HI =	3.2E-02
Total [skin discoloration] HI =	2.2E-02
Total [chronic beryllium disease] HI =	7.4E-03
Total [kidney] HI =	3.0E-03
Total [gastrointestinal system] HI =	2.0E-03
Total [central nervous system] HI =	3.2E-02
Total [autoimmune system] HI =	5.5E-04
Total [body weight] HI =	8.1E-03
Total [clinical selenosis] HI =	1.4E-03
Total [liver] HI =	4.1E-02

Note:
NC = Not Calculated

TABLE B.3.2.RME

SUMMARY OF CURRENT/FUTURE TRESPASSER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil and Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	2.59E-02	9.14E-04	2.28E-03	2.91E-02
			Antimony	NC	NC	NC	NC	Antimony	blood system	6.70E-02	NC	3.93E-02	1.06E-01
			Arsenic	3.26E-06	1.15E-09	8.60E-07	4.12E-06	Arsenic	skin discoloration	4.22E-02	NC	1.11E-02	5.34E-02
			Barium	NC	NC	NC	NC	Barium	no effects	3.78E-03	6.67E-05	4.75E-06	3.85E-03
			Beryllium	NC	4.31E-11	NC	4.31E-11	Beryllium	chronic beryllium disease	4.24E-04	5.25E-06	5.33E-03	5.76E-03
			Cadmium	NC	7.00E-10	NC	7.00E-10	Cadmium	kidney	3.67E-02	1.14E-05	6.46E-03	4.32E-02
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	9.22E-04	NC	6.24E-03	7.17E-03
			Chromium VI (Hexavalent)	NC	1.77E-09	NC	1.77E-09	Chromium VI (Hexavalent)	no effects	2.33E-03	8.79E-06	8.19E-03	1.05E-02
			Cobalt	NC	3.81E-09	NC	3.81E-09	Cobalt	--	3.21E-03	3.97E-04	2.82E-04	3.89E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.24E-02	NC	1.97E-03	2.43E-02
			Iron	NC	NC	NC	NC	Iron	--	5.05E-02	NC	4.45E-03	5.50E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	8.10E-02	9.34E-03	1.78E-01	2.68E-01
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	5.81E-03	7.15E-07	5.11E-04	6.32E-03
			Nickel	NC	NC	NC	NC	Nickel	body weight	3.63E-02	NC	7.99E-02	1.16E-01
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	9.28E-04	NC	8.16E-05	1.01E-03
			Thallium	NC	NC	NC	NC	Thallium	liver	3.89E-02	NC	3.43E-03	4.24E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	4.63E-02	NC	1.57E-01	2.03E-01
			Zinc	NC	NC	NC	NC	Zinc	blood system	9.74E-04	NC	8.57E-05	1.06E-03
Surface Soil	Surface Soil/ Ambient Air	--	Antimony	NC	NC	NC	NC	Antimony	blood system	2.71E-02	NC	1.59E-02	4.30E-02
			Arsenic	1.42E-06	5.03E-10	3.76E-07	1.80E-06	Arsenic	skin discoloration	1.85E-02	NC	4.87E-03	2.33E-02
			Barium	NC	NC	NC	NC	Barium	no effects	5.41E-03	9.55E-05	6.80E-06	5.51E-03
			Beryllium	NC	2.89E-11	NC	2.89E-11	Beryllium	chronic beryllium disease	2.85E-04	3.53E-06	3.58E-03	3.87E-03
			Cadmium	NC	3.44E-11	NC	3.44E-11	Cadmium	kidney	1.80E-03	5.58E-07	3.17E-04	2.12E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	2.18E-04	NC	1.48E-03	1.69E-03
			Cobalt	NC	7.28E-09	NC	7.28E-09	Cobalt	--	6.14E-03	7.60E-04	5.40E-04	7.44E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	6.77E-04	NC	5.95E-05	7.36E-04
			Iron	NC	NC	NC	NC	Iron	--	5.06E-02	NC	4.45E-03	5.50E-02
			Manganese	NC	NC	NC	NC	Manganese	--	1.32E-01	1.53E-02	2.91E-01	4.39E-01
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	1.14E-02	1.40E-06	9.99E-04	1.24E-02
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	9.74E-04	NC	2.14E-03	3.12E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	5.40E-04	NC	4.75E-05	5.88E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	2.29E-02	NC	2.01E-03	2.49E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	4.74E-04	NC	4.17E-05	5.16E-04

TABLE B.3.2.RME

SUMMARY OF CURRENT/FUTURE TRESPASSER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	5.40E-02	1.91E-03	4.75E-03	6.06E-02
			Antimony	NC	NC	NC	NC	Antimony	blood system	5.94E-01	NC	3.49E-01	9.43E-01
			Arsenic	2.50E-06	8.82E-10	6.60E-07	3.16E-06	Arsenic	skin discoloration	3.24E-02	NC	8.55E-03	4.10E-02
			Barium	NC	NC	NC	NC	Barium	no effects	2.74E-03	4.83E-05	3.44E-06	2.79E-03
			Beryllium	NC	1.95E-11	NC	1.95E-11	Beryllium	chronic beryllium disease	1.92E-04	2.38E-06	2.42E-03	2.61E-03
			Cadmium	NC	5.65E-10	NC	5.65E-10	Cadmium	kidney	2.96E-02	9.18E-06	5.22E-03	3.49E-02
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	3.92E-03	NC	2.65E-02	3.04E-02
			Chromium VI (Hexavalent)	NC	1.41E-08	NC	1.41E-08	Chromium VI (Hexavalent)	no effects	1.85E-02	7.01E-05	6.52E-02	8.38E-02
			Cobalt	NC	1.52E-09	NC	1.52E-09	Cobalt	--	1.28E-03	1.59E-04	1.13E-04	1.55E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.97E-02	NC	2.62E-03	3.24E-02
			Iron	NC	NC	NC	NC	Iron	--	5.67E-02	NC	4.99E-03	6.17E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	8.53E-02	9.83E-03	1.87E-01	2.83E-01
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	8.77E-04	1.08E-07	7.72E-05	9.54E-04
			Nickel	NC	NC	NC	NC	Nickel	body weight	1.81E-01	NC	3.98E-01	5.79E-01
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	3.69E-03	NC	3.25E-04	4.01E-03
			Thallium	NC	NC	NC	NC	Thallium	liver	1.01E-01	NC	8.92E-03	1.10E-01
			Vanadium	NC	NC	NC	NC	Vanadium	--	1.31E-01	NC	4.43E-01	5.74E-01
			Zinc	NC	NC	NC	NC	Zinc	blood system	2.32E-03	NC	2.04E-04	2.53E-03
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	8.06E-04	--	7.09E-04	1.51E-03
			Antimony	NC	--	NC	NC	Antimony	blood system	5.93E-03	--	3.48E-02	4.07E-02
			Arsenic	8.14E-07	--	7.16E-07	1.53E-06	Arsenic	skin discoloration	1.06E-02	--	9.29E-03	1.98E-02
			Barium	NC	--	NC	NC	Barium	no effects	6.75E-04	--	8.48E-03	9.15E-03
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	2.13E-04	--	2.68E-02	2.70E-02
			Chromium	NC	--	NC	NC	Chromium	no effects	6.40E-05	--	4.33E-03	4.40E-03
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	4.78E-03	--	3.37E-01	3.42E-01
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	9.33E-04	--	8.21E-04	1.75E-03
			Iron	NC	--	NC	NC	Iron	--	1.47E-02	--	1.30E-02	2.77E-02
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	5.74E-03	--	1.26E-01	1.32E-01
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	1.87E-04	--	1.65E-04	3.52E-04
			Nickel	NC	--	NC	NC	Nickel	body weight	1.01E-03	--	4.44E-03	5.45E-03
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	7.23E-04	--	6.36E-04	1.36E-03
			Thallium	NC	--	NC	NC	Thallium	liver	6.85E-02	--	6.03E-02	1.29E-01
			Vanadium	NC	--	NC	NC	Vanadium	--	3.99E-03	--	1.35E-01	1.39E-01
			Zinc	NC	--	NC	NC	Zinc	blood system	1.24E-04	--	6.57E-05	1.90E-04

TABLE B.3.2.RME

SUMMARY OF CURRENT/FUTURE TRESPASSER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Sediment	Sediment	--	Arsenic	2.41E-06	--	6.37E-07	3.05E-06	Arsenic	skin discoloration	3.13E-02	--	8.25E-03	3.95E-02
			Barium	NC	--	NC	NC	Barium	no effects	4.90E-03	--	6.16E-03	1.11E-02
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	2.21E-04	--	2.78E-03	3.00E-03
			Cadmium	NC	--	NC	NC	Cadmium	kidney	1.27E-03	--	2.24E-04	1.50E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	4.77E-04	--	3.23E-03	3.71E-03
			Copper	NC	--	NC	NC	Copper	gastrointestinal disease	2.25E-03	--	1.98E-04	2.45E-03
			Iron	NC	--	NC	NC	Iron	--	5.58E-02	--	4.91E-03	6.07E-02
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	3.71E-04	--	3.26E-05	4.03E-04
			Nickel	NC	--	NC	NC	Nickel	body weight	4.93E-03	--	1.08E-02	1.58E-02
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	1.80E-03	--	1.58E-04	1.96E-03
			Zinc	NC	--	NC	NC	Zinc	blood system	8.13E-04	--	7.15E-05	8.84E-04

Total Risk Across Surface Soil and Slag	4.1E-06
Total Risk Across Surface Soil	1.8E-06
Total Risk Across Slag	3.2E-06
Total Risk Across Surface Water	1.5E-06
Total Risk Across Sediment	3.0E-06

Total Risk Across All Media and All Exposure Routes (surface soil and slag)	8.7E-06
Total Risk Across All Media and All Exposure Routes (surface soil)	6.4E-06
Total Risk Across All Media and All Exposure Routes (slag)	7.8E-06

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	2.0E+00
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	1.6E+00
Total Hazard Index Across All Media and All Exposure Routes (slag)	3.9E+00

Surface Soil and Slag

Total [blood system] HI =	1.5E-01
Total [skin discoloration] HI =	1.1E-01
Total [chronic beryllium disease] HI =	3.6E-02
Total [kidney] HI =	4.5E-02
Total [gastrointestinal system] HI =	2.9E-02
Total [central nervous system] HI =	4.0E-01
Total [autoimmune system] HI =	7.1E-03
Total [body weight] HI =	1.4E-01
Total [clinical selenosis] HI =	4.3E-03
Total [liver] HI =	1.7E-01

Note:
NC = Not Calculated

TABLE B.3.3.CT

SUMMARY OF FUTURE INDUSTRIAL/ COMMERCIAL WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil and Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	1.54E-02	7.53E-04	1.02E-04	1.63E-02
			Arsenic	1.15E-06	5.60E-10	2.27E-08	1.17E-06	Arsenic	skin discoloration	1.98E-02	NC	3.93E-04	2.02E-02
			Barium	NC	NC	NC	NC	Barium	no effects	1.77E-03	4.33E-05	1.67E-07	1.82E-03
			Beryllium	NC	3.46E-11	NC	3.46E-11	Beryllium	chronic beryllium disease	3.28E-04	5.63E-06	3.10E-04	6.44E-04
			Cadmium	NC	8.17E-11	NC	8.17E-11	Cadmium	kidney	4.13E-03	1.77E-06	5.45E-05	4.19E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	7.07E-04	NC	3.59E-04	1.07E-03
			Chromium VI (Hexavalent)	NC	3.84E-09	NC	3.84E-09	Chromium VI (Hexavalent)	no effects	4.86E-03	2.54E-05	1.28E-03	6.16E-03
			Cobalt	NC	9.39E-10	NC	9.39E-10	Cobalt	--	7.63E-04	1.31E-04	5.03E-06	8.99E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.48E-03	NC	1.64E-05	2.50E-03
			Iron	NC	NC	NC	NC	Iron	--	6.55E-02	NC	4.32E-04	6.59E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	2.62E-02	4.18E-03	4.32E-03	3.47E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	1.03E-03	1.75E-07	6.79E-06	1.04E-03
			Nickel	NC	NC	NC	NC	Nickel	body weight	7.46E-03	NC	1.23E-03	8.69E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	7.37E-04	NC	4.87E-06	7.42E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	4.59E-02	NC	3.03E-04	4.62E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	4.34E-02	NC	1.10E-02	5.45E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	4.85E-04	NC	3.20E-06	4.88E-04
Soil	Surface Soil/ Ambient Air	--	Arsenic	1.02E-06	4.97E-10	2.02E-08	1.04E-06	Arsenic	skin discoloration	1.76E-02	NC	3.48E-04	1.79E-02
			Barium	NC	NC	NC	NC	Barium	no effects	1.81E-03	4.42E-05	1.71E-07	1.85E-03
			Beryllium	NC	3.12E-11	NC	3.12E-11	Beryllium	chronic beryllium disease	2.96E-04	5.07E-06	2.79E-04	5.80E-04
			Cadmium	NC	4.14E-11	NC	4.14E-11	Cadmium	kidney	2.09E-03	8.96E-07	2.76E-05	2.12E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	9.43E-05	NC	4.79E-05	1.42E-04
			Cobalt	NC	9.44E-10	NC	9.44E-10	Cobalt	--	7.67E-04	1.31E-04	5.06E-06	9.04E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	7.15E-04	NC	4.72E-06	7.20E-04
			Iron	NC	NC	NC	NC	Iron	--	6.92E-02	NC	4.57E-04	6.96E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	--	1.93E-02	3.07E-03	3.18E-03	2.55E-02
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	1.26E-03	2.14E-07	8.30E-06	1.27E-03
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	1.12E-03	NC	1.85E-04	1.31E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	4.03E-04	NC	2.66E-06	4.06E-04
			Zinc	NC	NC	NC	NC	Zinc	blood system	4.67E-04	NC	3.08E-06	4.70E-04

TABLE B.3.3.CT

SUMMARY OF FUTURE INDUSTRIAL/ COMMERCIAL WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	1.55E-02	7.57E-04	1.02E-04	1.64E-02
			Arsenic	1.05E-06	5.15E-10	2.09E-08	1.08E-06	Arsenic	skin discoloration	1.82E-02	NC	3.61E-04	1.86E-02
			Barium	NC	NC	NC	NC	Barium	no effects	1.58E-03	3.85E-05	1.49E-07	1.62E-03
			Beryllium	NC	2.74E-11	NC	2.74E-11	Beryllium	chronic beryllium disease	2.60E-04	4.46E-06	2.45E-04	5.10E-04
			Cadmium	NC	1.15E-10	NC	1.15E-10	Cadmium	kidney	5.83E-03	2.50E-06	7.69E-05	5.91E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.31E-03	NC	6.67E-04	1.98E-03
			Chromium VI (Hexavalent)	NC	7.12E-09	NC	7.12E-09	Chromium VI (Hexavalent)	no effects	9.00E-03	4.71E-05	2.38E-03	1.14E-02
			Cobalt	NC	6.82E-10	NC	6.82E-10	Cobalt	--	5.54E-04	9.49E-05	3.66E-06	6.53E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	3.77E-03	NC	2.49E-05	3.80E-03
			Iron	NC	NC	NC	NC	Iron	--	4.68E-02	NC	3.09E-04	4.71E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	6.34E-02	1.01E-02	1.04E-02	8.39E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	2.26E-04	3.84E-08	1.49E-06	2.27E-04
			Nickel	NC	NC	NC	NC	Nickel	body weight	1.84E-02	NC	3.04E-03	2.14E-02
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	9.94E-04	NC	6.56E-06	1.00E-03
			Thallium	NC	NC	NC	NC	Thallium	liver	6.99E-02	NC	4.61E-04	7.04E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	5.63E-02	NC	1.43E-02	7.06E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	3.67E-04	NC	2.42E-06	3.70E-04
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	5.12E-05	--	3.38E-05	8.50E-05
			Antimony	NC	--	NC	NC	Antimony	blood system	8.04E-04	--	3.54E-03	4.34E-03
			Arsenic	8.08E-08	--	5.34E-08	1.34E-07	Arsenic	skin discoloration	1.40E-03	--	9.22E-04	2.32E-03
			Barium	NC	--	NC	NC	Barium	no effects	5.81E-05	--	5.48E-04	6.06E-04
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	3.26E-05	--	3.07E-03	3.10E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	4.00E-06	--	2.03E-04	2.07E-04
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	4.50E-04	--	2.38E-02	2.42E-02
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	2.25E-05	--	1.49E-05	3.74E-05
			Iron	NC	--	NC	NC	Iron	--	3.79E-04	--	2.50E-04	6.28E-04
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	3.30E-04	--	5.45E-03	5.78E-03
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	2.57E-05	--	1.70E-05	4.27E-05
			Nickel	NC	--	NC	NC	Nickel	body weight	2.57E-05	--	8.49E-05	1.11E-04
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	9.86E-05	--	6.51E-05	1.64E-04
			Thallium	NC	--	NC	NC	Thallium	liver	8.88E-03	--	5.86E-03	1.47E-02
			Vanadium	NC	--	NC	NC	Vanadium	--	4.50E-04	--	1.14E-02	1.19E-02
			Zinc	NC	--	NC	NC	Zinc	blood system	7.09E-06	--	2.81E-06	9.90E-06

TABLE B.3.3.CT

SUMMARY OF FUTURE INDUSTRIAL/ COMMERCIAL WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Sediment	Sediment		Arsenic	1.31E-06	--	2.60E-08	1.34E-06	Arsenic	skin discoloration	2.27E-02	--	4.49E-04	2.31E-02
			Barium	NC	--	NC	NC	Barium	no effects	2.35E-03	--	2.22E-04	2.58E-03
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	2.17E-04	--	2.04E-04	4.21E-04
			Cadmium	NC	--	NC	NC	Cadmium	kidney	1.29E-03	--	1.70E-05	1.31E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	2.34E-04	--	1.19E-04	3.53E-04
			Copper	NC	--	NC	NC	Copper	gastrointestinal disease	1.16E-03	--	7.67E-06	1.17E-03
			Iron	NC	--	NC	NC	Iron	--	5.37E-02	--	3.55E-04	5.41E-02
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	2.79E-04	--	1.84E-06	2.80E-04
			Nickel	NC	--	NC	NC	Nickel	body weight	2.49E-03	--	4.11E-04	2.90E-03
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	1.73E-03	--	1.14E-05	1.74E-03
			Zinc	NC	--	NC	NC	Zinc	blood system	5.58E-04	--	3.68E-06	5.62E-04

Total Risk Across Soil and Slag	1.2E-06
Total Risk Across Soil	1.0E-06
Total Risk Across Slag	1.1E-06
Total Risk Across Surface Water	1.3E-07
Total Risk Across Sediment	1.3E-06

Total Risk Across All Media and All Exposure Routes (soil and slag)	2.6E-06
Total Risk Across All Media and All Exposure Routes (soil)	2.5E-06
Total Risk Across All Media and All Exposure Routes (slag)	2.6E-06

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	4.2E-01
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	2.8E-01
Total Hazard Index Across All Media and All Exposure Routes (slag)	5.1E-01

Surface Soil and Slag

Total [blood system] HI =	5.4E-03
Total [skin discoloration] HI =	4.6E-02
Total [chronic beryllium disease] HI =	4.2E-03
Total [kidney] HI =	5.5E-03
Total [gastrointestinal system] HI =	3.7E-03
Total [central nervous system] HI =	4.0E-02
Total [autoimmune system] HI =	1.4E-03
Total [body weight] HI =	1.2E-02
Total [clinical selenosis] HI =	2.6E-03
Total [liver] HI =	1.3E-01

Note:
NC = Not Calculated

TABLE B.3.3.RME

SUMMARY OF FUTURE INDUSTRIAL/ COMMERCIAL WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil and Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	2.83E-02	1.38E-03	1.87E-03	3.15E-02
			Arsenic	5.07E-06	2.48E-09	1.00E-06	6.08E-06	Arsenic	skin discoloration	3.16E-02	NC	6.25E-03	3.78E-02
			Barium	NC	NC	NC	NC	Barium	no effects	2.38E-03	5.81E-05	2.24E-06	2.44E-03
			Beryllium	NC	1.39E-10	NC	1.39E-10	Beryllium	chronic beryllium disease	4.75E-04	8.14E-06	4.48E-03	4.96E-03
			Cadmium	NC	1.44E-09	NC	1.44E-09	Cadmium	kidney	2.62E-02	1.12E-05	3.46E-03	2.97E-02
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.04E-03	NC	5.27E-03	6.31E-03
			Chromium VI (Hexavalent)	NC	4.17E-08	NC	4.17E-08	Chromium VI (Hexavalent)	no effects	1.90E-02	9.93E-05	5.01E-02	6.92E-02
			Cobalt	NC	9.53E-09	NC	9.53E-09	Cobalt	--	2.79E-03	4.78E-04	1.84E-04	3.45E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	1.31E-02	NC	8.67E-04	1.40E-02
			Iron	NC	NC	NC	NC	Iron	--	9.24E-02	NC	6.10E-03	9.85E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	3.80E-02	6.06E-03	6.26E-02	1.07E-01
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	1.16E-02	1.98E-06	7.66E-04	1.24E-02
			Nickel	NC	NC	NC	NC	Nickel	body weight	3.02E-02	NC	4.98E-02	8.00E-02
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.06E-03	NC	6.98E-05	1.13E-03
			Thallium	NC	NC	NC	NC	Thallium	liver	7.55E-02	NC	4.98E-03	8.04E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	5.72E-02	NC	1.45E-01	2.02E-01
			Zinc	NC	NC	NC	NC	Zinc	blood system	6.79E-04	NC	4.48E-05	7.24E-04
Soil	Surface Soil/ Ambient Air	--	Arsenic	3.70E-06	1.81E-09	7.33E-07	4.44E-06	Arsenic	skin discoloration	2.30E-02	NC	4.56E-03	2.76E-02
			Barium	NC	NC	NC	NC	Barium	no effects	4.70E-03	1.15E-04	4.43E-06	4.82E-03
			Beryllium	NC	1.13E-10	NC	1.13E-10	Beryllium	chronic beryllium disease	3.87E-04	6.62E-06	3.65E-03	4.04E-03
			Cadmium	NC	1.64E-10	NC	1.64E-10	Cadmium	kidney	2.98E-03	1.28E-06	3.93E-04	3.37E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.68E-04	NC	8.55E-04	1.02E-03
			Cobalt	NC	1.49E-08	NC	1.49E-08	Cobalt	--	4.35E-03	7.45E-04	2.87E-04	5.38E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	1.14E-03	NC	7.55E-05	1.22E-03
			Iron	NC	NC	NC	NC	Iron	--	1.26E-01	NC	8.29E-03	1.34E-01
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	--	9.40E-02	1.50E-02	1.55E-01	2.64E-01
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	2.75E-03	4.69E-07	1.82E-04	2.93E-03
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	1.38E-03	NC	2.28E-03	3.66E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	5.65E-04	NC	3.73E-05	6.02E-04
			Zinc	NC	NC	NC	NC	Zinc	blood system	6.78E-04	NC	4.48E-05	7.23E-04

TABLE B.3.3.RME

SUMMARY OF FUTURE INDUSTRIAL/ COMMERCIAL WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Slag	Surface Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	3.37E-02	1.65E-03	2.23E-03	3.76E-02
			Arsenic	5.66E-06	2.76E-09	1.12E-06	6.78E-06	Arsenic	skin discoloration	3.52E-02	NC	6.97E-03	4.22E-02
			Barium	NC	NC	NC	NC	Barium	no effects	2.40E-03	5.86E-05	2.26E-06	2.46E-03
			Beryllium	NC	1.16E-10	NC	1.16E-10	Beryllium	chronic beryllium disease	3.96E-04	6.78E-06	3.73E-03	4.13E-03
			Cadmium	NC	7.92E-10	NC	7.92E-10	Cadmium	kidney	1.44E-02	6.18E-06	1.90E-03	1.63E-02
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.97E-03	NC	9.99E-03	1.20E-02
			Chromium VI (Hexavalent)	NC	7.65E-08	NC	7.65E-08	Chromium VI (Hexavalent)	no effects	3.48E-02	1.82E-04	9.19E-02	1.27E-01
			Cobalt	NC	3.18E-09	NC	3.18E-09	Cobalt	--	9.30E-04	1.59E-04	6.14E-05	1.15E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	2.39E-02	NC	1.57E-03	2.54E-02
			Iron	NC	NC	NC	NC	Iron	--	8.28E-02	NC	5.46E-03	8.83E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	3.87E-01	6.17E-02	6.38E-01	1.09E+00
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	3.04E-04	5.18E-08	2.01E-05	3.24E-04
			Nickel	NC	NC	NC	NC	Nickel	body weight	5.37E-02	NC	8.85E-02	1.42E-01
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.64E-03	NC	1.08E-04	1.75E-03
			Thallium	NC	NC	NC	NC	Thallium	liver	1.22E-01	NC	8.08E-03	1.31E-01
			Vanadium	NC	NC	NC	NC	Vanadium	--	7.98E-02	NC	2.03E-01	2.82E-01
			Zinc	NC	NC	NC	NC	Zinc	blood system	7.01E-04	NC	4.63E-05	7.47E-04
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	2.81E-04	--	1.85E-04	4.67E-04
			Antimony	NC	--	NC	NC	Antimony	blood system	2.07E-03	--	9.09E-03	1.12E-02
			Arsenic	5.92E-07	--	3.90E-07	9.82E-07	Arsenic	skin discoloration	3.68E-03	--	2.43E-03	6.11E-03
			Barium	NC	--	NC	NC	Barium	no effects	2.35E-04	--	2.22E-03	2.45E-03
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	7.44E-05	--	7.01E-03	7.09E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	2.23E-05	--	1.13E-03	1.16E-03
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	1.67E-03	--	8.81E-02	8.98E-02
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	3.25E-04	--	2.15E-04	5.40E-04
			Iron	NC	--	NC	NC	Iron	--	5.14E-03	--	3.39E-03	8.54E-03
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	2.00E-03	--	3.30E-02	3.50E-02
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	6.52E-05	--	4.31E-05	1.08E-04
			Nickel	NC	--	NC	NC	Nickel	body weight	3.52E-04	--	1.16E-03	1.51E-03
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	2.52E-04	--	1.66E-04	4.19E-04
			Thallium	NC	--	NC	NC	Thallium	liver	2.39E-02	--	1.58E-02	3.97E-02
			Vanadium	NC	--	NC	NC	Vanadium	--	1.39E-03	--	3.53E-02	3.67E-02
			Zinc	NC	--	NC	NC	Zinc	blood system	4.34E-05	--	1.72E-05	6.06E-05

TABLE B.3.3.RME

SUMMARY OF FUTURE INDUSTRIAL/ COMMERCIAL WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Industrial/Commercial Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*			
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*
Sediment	Sediment		Arsenic	7.01E-06	--	1.39E-06	8.40E-06
			Barium	NC	--	NC	NC
			Beryllium	NC	--	NC	NC
			Cadmium	NC	--	NC	NC
			Chromium	NC	--	NC	NC
			Copper	NC	--	NC	NC
			Iron	NC	--	NC	NC
			Mercury	NC	--	NC	NC
			Nickel	NC	--	NC	NC
			Selenium	NC	--	NC	NC
			Zinc	NC	--	NC	NC

Chemical	*Non-Carcinogenic Hazard Quotient*				
	Primary Target Organ	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Arsenic	skin discoloration	4.36E-02	--	8.63E-03	5.22E-02
Barium	no effects	6.84E-03	--	6.45E-03	1.33E-02
Beryllium	chronic beryllium disease	3.08E-04	--	2.91E-03	3.21E-03
Cadmium	kidney	1.78E-03	--	2.35E-04	2.01E-03
Chromium	no effects	6.65E-04	--	3.38E-03	4.04E-03
Copper	gastrointestinal disease	3.14E-03	--	2.07E-04	3.35E-03
Iron	--	7.79E-02	--	5.14E-03	8.30E-02
Mercury	autoimmune system	5.17E-04	--	3.41E-05	5.51E-04
Nickel	body weight	6.88E-03	--	1.14E-02	1.82E-02
Selenium	clinical selenosis	2.51E-03	--	1.66E-04	2.68E-03
Zinc	blood system	1.13E-03	--	7.48E-05	1.21E-03

Total Risk Across Soil and Slag	6.1E-06
Total Risk Across Soil	4.5E-06
Total Risk Across Slag	6.9E-06
Total Risk Across Surface Water	9.8E-07
Total Risk Across Sediment	8.4E-06

Total Risk Across All Media and All Exposure Routes (soil and slag)	1.6E-05
Total Risk Across All Media and All Exposure Routes (soil)	1.4E-05
Total Risk Across All Media and All Exposure Routes (slag)	1.6E-05

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	1.2E+00
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	8.8E-01
Total Hazard Index Across All Media and All Exposure Routes (slag)	2.4E+00

Surface Soil and Slag

Total [blood system] HI =	1.3E-02
Total [skin discoloration] HI =	9.6E-02
Total [chronic beryllium disease] HI =	1.5E-02
Total [kidney] HI =	3.2E-02
Total [gastrointestinal system] HI =	1.8E-02
Total [central nervous system] HI =	1.4E-01
Total [autoimmune system] HI =	1.3E-02
Total [body weight] HI =	1.0E-01
Total [clinical selenosis] HI =	4.2E-03
Total [liver] HI =	2.5E-01

Note:
NC = Not Calculated

TABLE B.3.4.CT

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil and Slag	Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	2.32E-03	9.91E-04	2.32E-05	3.34E-03
			Arsenic	1.92E-08	8.19E-11	5.76E-10	1.99E-08	Arsenic	skin discoloration	2.99E-03	NC	8.96E-05	3.08E-03
			Barium	NC	NC	NC	NC	Barium	no effects	2.67E-04	5.69E-05	3.82E-08	3.24E-04
			Beryllium	NC	5.06E-12	NC	5.06E-12	Beryllium	chronic beryllium disease	4.95E-05	7.40E-06	7.07E-05	1.28E-04
			Cadmium	NC	1.19E-11	NC	1.19E-11	Cadmium	kidney	6.23E-04	2.33E-06	1.25E-05	6.37E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.07E-04	NC	8.20E-05	1.89E-04
			Chromium VI (Hexavalent)	NC	5.62E-10	NC	5.62E-10	Chromium VI (Hexavalent)	no effects	7.32E-04	3.34E-05	2.93E-04	1.06E-03
			Cobalt	NC	1.37E-10	NC	1.37E-10	Cobalt	--	1.15E-04	1.72E-04	1.15E-06	2.88E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	3.74E-04	NC	3.74E-06	3.78E-04
			Iron	NC	NC	NC	NC	Iron	--	9.87E-03	NC	9.87E-05	9.97E-03
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	3.95E-03	5.49E-03	9.85E-04	1.04E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	1.55E-04	2.30E-07	1.55E-06	1.57E-04
			Nickel	NC	NC	NC	NC	Nickel	body weight	1.12E-03	NC	2.81E-04	1.40E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.11E-04	NC	1.11E-06	1.12E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	6.92E-03	NC	6.92E-05	6.99E-03
			Vanadium	NC	NC	NC	NC	Vanadium	--	6.55E-03	NC	2.52E-03	9.06E-03
			Zinc	NC	NC	NC	NC	Zinc	blood system	7.30E-05	NC	7.30E-07	7.38E-05
Soil	Soil/ Ambient Air	--	Arsenic	1.70E-08	7.27E-11	5.11E-10	1.76E-08	Arsenic	skin discoloration	2.65E-03	NC	7.96E-05	2.73E-03
			Barium	NC	NC	NC	NC	Barium	no effects	2.73E-04	5.81E-05	3.89E-08	3.31E-04
			Beryllium	NC	4.56E-12	NC	4.56E-12	Beryllium	chronic beryllium disease	4.46E-05	6.67E-06	6.37E-05	1.15E-04
			Cadmium	NC	6.05E-12	NC	6.05E-12	Cadmium	kidney	3.15E-04	1.18E-06	6.30E-06	3.23E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.42E-05	NC	1.09E-05	2.52E-05
			Cobalt	NC	1.38E-10	NC	1.38E-10	Cobalt	--	1.16E-04	1.73E-04	1.16E-06	2.90E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	1.08E-04	NC	1.08E-06	1.09E-04
			Iron	NC	NC	NC	NC	Iron	--	1.04E-02	NC	1.04E-04	1.05E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	--	2.90E-03	4.04E-03	7.25E-04	7.67E-03
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	1.89E-04	2.82E-07	1.89E-06	1.92E-04
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	1.69E-04	NC	4.23E-05	2.11E-04
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	6.07E-05	NC	6.07E-07	6.13E-05
			Zinc	NC	NC	NC	NC	Zinc	blood system	7.04E-05	NC	7.04E-07	7.11E-05

TABLE B.3.4.CT

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*
Slag	Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	2.34E-03	9.95E-04	2.34E-05	3.35E-03
			Arsenic	1.77E-08	7.53E-11	5.30E-10	1.83E-08	Arsenic	skin discoloration	2.75E-03	NC	8.24E-05	2.83E-03
			Barium	NC	NC	NC	NC	Barium	no effects	2.38E-04	5.07E-05	3.40E-08	2.88E-04
			Beryllium	NC	4.01E-12	NC	4.01E-12	Beryllium	chronic beryllium disease	3.92E-05	5.86E-06	5.60E-05	1.01E-04
			Cadmium	NC	1.68E-11	NC	1.68E-11	Cadmium	kidney	8.78E-04	3.28E-06	1.76E-05	8.99E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	1.98E-04	NC	1.52E-04	3.50E-04
			Chromium VI (Hexavalent)	NC	1.04E-09	NC	1.04E-09	Chromium VI (Hexavalent)	no effects	1.36E-03	6.19E-05	5.42E-04	1.96E-03
			Cobalt	NC	9.96E-11	NC	9.96E-11	Cobalt	--	8.35E-05	1.25E-04	8.35E-07	2.09E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	5.68E-04	NC	5.68E-06	5.74E-04
			Iron	NC	NC	NC	NC	Iron	--	7.06E-03	NC	7.06E-05	7.13E-03
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	9.55E-03	1.33E-02	2.38E-03	2.52E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	3.40E-05	5.06E-08	3.40E-07	3.44E-05
			Nickel	NC	NC	NC	NC	Nickel	body weight	2.77E-03	NC	6.94E-04	3.47E-03
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.50E-04	NC	1.50E-06	1.51E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	1.05E-02	NC	1.05E-04	1.06E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	8.48E-03	NC	3.26E-03	1.17E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	5.53E-05	NC	5.53E-07	5.59E-05
Groundwater	Groundwater	--	Aluminum	NC	--	NC	NC	Aluminum	--	1.80E-05	--	1.19E-05	2.99E-05
			Antimony	NC	--	NC	NC	Antimony	blood system	4.89E-05	--	2.15E-04	2.64E-04
			Arsenic	9.27E-10	--	6.12E-10	1.54E-09	Arsenic	skin discoloration	1.44E-04	--	9.51E-05	2.39E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	6.65E-08	--	3.38E-06	3.44E-06
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	1.63E-05	--	8.61E-04	8.77E-04
			Iron	NC	--	NC	NC	Iron	--	6.20E-05	--	4.09E-05	1.03E-04
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	2.00E-05	--	3.29E-04	3.49E-04
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	1.08E-05	--	7.16E-06	1.80E-05
			Thallium	NC	--	NC	NC	Thallium	liver	4.42E-04	--	2.92E-04	7.33E-04
			Vanadium	NC	--	NC	NC	Vanadium	--	4.52E-05	--	1.15E-03	1.19E-03
			Zinc	NC	--	NC	NC	Zinc	blood system	1.40E-06	--	5.53E-07	1.95E-06

TABLE B.3.4.CT

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	4.68E-06	--	3.09E-06	7.76E-06
			Antimony	NC	--	NC	NC	Antimony	blood system	7.34E-05	--	3.23E-04	3.96E-04
			Arsenic	8.20E-10	--	5.41E-10	1.36E-09	Arsenic	skin discoloration	1.28E-04	--	8.42E-05	2.12E-04
			Barium	NC	--	NC	NC	Barium	no effects	5.31E-06	--	5.00E-05	5.53E-05
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	2.97E-06	--	2.80E-04	2.83E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	3.66E-07	--	1.86E-05	1.89E-05
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	4.11E-05	--	2.17E-03	2.21E-03
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	2.05E-06	--	1.36E-06	3.41E-06
			Iron	NC	--	NC	NC	Iron	--	3.46E-05	--	2.28E-05	5.74E-05
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	3.01E-05	--	4.97E-04	5.27E-04
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	2.35E-06	--	1.55E-06	3.90E-06
			Nickel	NC	--	NC	NC	Nickel	body weight	2.35E-06	--	7.75E-06	1.01E-05
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	9.00E-06	--	5.94E-06	1.49E-05
			Thallium	NC	--	NC	NC	Thallium	liver	8.11E-04	--	5.35E-04	1.35E-03
			Vanadium	NC	--	NC	NC	Vanadium	--	4.11E-05	--	1.04E-03	1.08E-03
			Zinc	NC	--	NC	NC	Zinc	blood system	6.47E-07	--	2.56E-07	9.04E-07
Sediment	Sediment		Arsenic	2.20E-08	--	6.59E-10	2.26E-08	Arsenic	skin discoloration	3.42E-03	--	1.03E-04	3.52E-03
			Barium	NC	--	NC	NC	Barium	no effects	3.55E-04	--	5.07E-05	4.06E-04
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	3.27E-05	--	4.67E-05	7.94E-05
			Cadmium	NC	--	NC	NC	Cadmium	kidney	1.94E-04	--	3.89E-06	1.98E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	3.52E-05	--	2.71E-05	6.23E-05
			Copper	NC	--	NC	NC	Copper	gastrointestinal disease	1.75E-04	--	1.75E-06	1.77E-04
			Iron	NC	--	NC	NC	Iron	--	8.10E-03	--	8.10E-05	8.18E-03
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	4.20E-05	--	4.20E-07	4.24E-05
			Nickel	NC	--	NC	NC	Nickel	body weight	3.75E-04	--	9.38E-05	4.69E-04
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	2.60E-04	--	2.60E-06	2.63E-04
			Zinc	NC	--	NC	NC	Zinc	blood system	8.41E-05	--	8.41E-07	8.50E-05

Total Risk Across Soil and Slag	2.1E-08
Total Risk Across Soil	1.8E-08
Total Risk Across Slag	1.9E-08
Total Risk Across Surface Water	1.4E-09
Total Risk Across Sediment	2.3E-08

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	7.1E-02
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	4.6E-02
Total Hazard Index Across All Media and All Exposure Routes (slag)	9.3E-02

Total Risk Across All Media and All Exposure Routes (soil and slag)	4.5E-08
Total Risk Across All Media and All Exposure Routes (soil)	4.2E-08
Total Risk Across All Media and All Exposure Routes (slag)	4.3E-08

Surface Soil and Slag

Total [blood system] HI =	8.2E-04
Total [skin discoloration] HI =	7.0E-03
Total [chronic beryllium disease] HI =	4.9E-04
Total [kidney] HI =	8.4E-04
Total [gastrointestinal system] HI =	5.6E-04
Total [central nervous system] HI =	1.1E-02
Total [autoimmune system] HI =	2.0E-04
Total [body weight] HI =	1.9E-03
Total [clinical selenosis] HI =	4.1E-04
Total [liver] HI =	9.1E-03

Note:

TABLE B.3.4.CT

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*

NC = Not Calculated

TABLE B.3.4.RME

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil and Slag	Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	7.46E-03	3.18E-03	2.24E-04	1.09E-02
			Arsenic	5.36E-08	2.28E-10	4.82E-09	5.86E-08	Arsenic	skin discoloration	8.33E-03	NC	7.50E-04	9.08E-03
			Barium	NC	NC	NC	NC	Barium	no effects	6.28E-04	1.34E-04	2.69E-07	7.63E-04
			Beryllium	NC	1.28E-11	NC	1.28E-11	Beryllium	chronic beryllium disease	1.25E-04	1.88E-05	5.38E-04	6.82E-04
			Cadmium	NC	1.33E-10	NC	1.33E-10	Cadmium	kidney	6.92E-03	2.59E-05	4.15E-04	7.36E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	2.74E-04	NC	6.33E-04	9.07E-04
			Chromium VI (Hexavalent)	NC	3.85E-09	NC	3.85E-09	Chromium VI (Hexavalent)	no effects	5.01E-03	2.29E-04	6.02E-03	1.13E-02
			Cobalt	NC	8.79E-10	NC	8.79E-10	Cobalt	--	7.36E-04	1.10E-03	2.21E-05	1.86E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	3.47E-03	NC	1.04E-04	3.57E-03
			Iron	NC	NC	NC	NC	Iron	--	2.44E-02	NC	7.32E-04	2.51E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	1.00E-02	1.40E-02	7.51E-03	3.15E-02
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	3.06E-03	4.56E-06	9.19E-05	3.16E-03
			Nickel	NC	NC	NC	NC	Nickel	body weight	7.97E-03	NC	5.98E-03	1.40E-02
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	2.79E-04	NC	8.38E-06	2.88E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	1.99E-02	NC	5.98E-04	2.05E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	1.51E-02	NC	1.74E-02	3.25E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	1.79E-04	NC	5.38E-06	1.85E-04
Soil	Soil/ Ambient Air	--	Arsenic	3.91E-08	1.67E-10	3.52E-09	4.28E-08	Arsenic	skin discoloration	6.08E-03	NC	5.47E-04	6.63E-03
			Barium	NC	NC	NC	NC	Barium	no effects	1.24E-03	2.65E-04	5.32E-07	1.51E-03
			Beryllium	NC	1.04E-11	NC	1.04E-11	Beryllium	chronic beryllium disease	1.02E-04	1.53E-05	4.37E-04	5.55E-04
			Cadmium	NC	1.51E-11	NC	1.51E-11	Cadmium	kidney	7.86E-04	2.94E-06	4.72E-05	8.36E-04
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	4.45E-05	NC	1.03E-04	1.47E-04
			Cobalt	NC	1.37E-09	NC	1.37E-09	Cobalt	--	1.15E-03	1.72E-03	3.44E-05	2.90E-03
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	3.02E-04	NC	9.06E-06	3.11E-04
			Iron	NC	NC	NC	NC	Iron	--	3.32E-02	NC	9.95E-04	3.42E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	--	2.48E-02	3.46E-02	1.86E-02	7.80E-02
			Mercury	NC	NC	NC	NC	Mercury	central nervous system	7.27E-04	1.08E-06	2.18E-05	7.50E-04
			Nickel	NC	NC	NC	NC	Nickel	autoimmune system	3.64E-04	NC	2.73E-04	6.38E-04
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	1.49E-04	NC	4.47E-06	1.54E-04
			Zinc	NC	NC	NC	NC	Zinc	blood system	1.79E-04	NC	5.37E-06	1.84E-04

TABLE B.3.4.RME

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Slag	Soil/ Ambient Air	--	Aluminum	NC	NC	NC	NC	Aluminum	--	8.91E-03	3.80E-03	2.67E-04	1.30E-02
			Arsenic	5.97E-08	2.55E-10	5.38E-09	6.54E-08	Arsenic	skin discoloration	9.29E-03	NC	8.36E-04	1.01E-02
			Barium	NC	NC	NC	NC	Barium	no effects	6.34E-04	1.35E-04	2.72E-07	7.69E-04
			Beryllium	NC	1.07E-11	NC	1.07E-11	Beryllium	chronic beryllium disease	1.04E-04	1.56E-05	4.48E-04	5.68E-04
			Cadmium	NC	7.30E-11	NC	7.30E-11	Cadmium	kidney	3.81E-03	1.42E-05	2.28E-04	4.05E-03
			Chromium Total	NC	NC	NC	NC	Chromium Total	no effects	5.20E-04	NC	1.20E-03	1.72E-03
			Chromium VI (Hexavalent)	NC	7.05E-09	NC	7.05E-09	Chromium VI (Hexavalent)	no effects	9.19E-03	4.20E-04	1.10E-02	2.06E-02
			Cobalt	NC	2.93E-10	NC	2.93E-10	Cobalt	--	2.46E-04	3.67E-04	7.37E-06	6.20E-04
			Copper	NC	NC	NC	NC	Copper	gastrointestinal system	6.30E-03	NC	1.89E-04	6.49E-03
			Iron	NC	NC	NC	NC	Iron	--	2.19E-02	NC	6.56E-04	2.25E-02
			Lead	NC	NC	NC	NC	Lead	--	NC	NC	NC	NC
			Manganese	NC	NC	NC	NC	Manganese	central nervous system	1.02E-01	1.42E-01	7.65E-02	3.21E-01
			Mercury	NC	NC	NC	NC	Mercury	autoimmune system	8.02E-05	1.19E-07	2.41E-06	8.27E-05
			Nickel	NC	NC	NC	NC	Nickel	body weight	1.42E-02	NC	1.06E-02	2.48E-02
			Selenium	NC	NC	NC	NC	Selenium	clinical selenosis	4.33E-04	NC	1.30E-05	4.46E-04
			Thallium	NC	NC	NC	NC	Thallium	liver	3.23E-02	NC	9.70E-04	3.33E-02
			Vanadium	NC	NC	NC	NC	Vanadium	--	2.11E-02	NC	2.43E-02	4.54E-02
			Zinc	NC	NC	NC	NC	Zinc	blood system	1.85E-04	NC	5.55E-06	1.91E-04
Groundwater	Groundwater	--	Aluminum	NC	--	NC	NC	Aluminum	--	1.83E-04	--	1.21E-04	3.03E-04
			Antimony	NC	--	NC	NC	Antimony	blood system	2.09E-04	--	9.18E-04	1.13E-03
			Arsenic	4.32E-09	--	2.85E-09	7.17E-09	Arsenic	skin discoloration	6.71E-04	--	4.43E-04	1.11E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	8.00E-07	--	4.06E-05	4.14E-05
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	9.18E-05	--	4.85E-03	4.94E-03
			Iron	NC	--	NC	NC	Iron	--	4.13E-04	--	2.73E-04	6.86E-04
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	1.18E-04	--	1.95E-03	2.07E-03
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	5.21E-05	--	3.44E-05	8.66E-05
			Thallium	NC	--	NC	NC	Thallium	liver	1.77E-03	--	1.17E-03	2.93E-03
			Vanadium	NC	--	NC	NC	Vanadium	--	5.04E-04	--	1.28E-02	1.33E-02
			Zinc	NC	--	NC	NC	Zinc	blood system	8.99E-06	--	3.56E-06	1.26E-05

TABLE B.3.4.RME

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	--	Aluminum	NC	--	NC	NC	Aluminum	--	4.50E-05	--	2.97E-05	7.46E-05
			Antimony	NC	--	NC	NC	Antimony	blood system	3.31E-04	--	1.46E-03	1.79E-03
			Arsenic	3.79E-09	--	2.50E-09	6.29E-09	Arsenic	skin discoloration	5.89E-04	--	3.89E-04	9.78E-04
			Barium	NC	--	NC	NC	Barium	no effects	3.76E-05	--	3.55E-04	3.93E-04
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	1.19E-05	--	1.12E-03	1.13E-03
			Chromium	NC	--	NC	NC	Chromium	no effects	3.57E-06	--	1.81E-04	1.85E-04
			Chromium VI (Hexavalent)	NC	--	NC	NC	Chromium VI (Hexavalent)	no effects	2.67E-04	--	1.41E-02	1.44E-02
			Copper	NC	--	NC	NC	Copper	gastrointestinal system	5.21E-05	--	3.44E-05	8.64E-05
			Iron	NC	--	NC	NC	Iron	--	8.23E-04	--	5.43E-04	1.37E-03
			Lead	NC	--	NC	NC	Lead	--	NC	--	NC	NC
			Manganese	NC	--	NC	NC	Manganese	central nervous system	3.20E-04	--	5.28E-03	5.60E-03
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	1.04E-05	--	6.89E-06	1.73E-05
			Nickel	NC	--	NC	NC	Nickel	body weight	5.63E-05	--	1.86E-04	2.42E-04
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	4.04E-05	--	2.66E-05	6.70E-05
			Thallium	NC	--	NC	NC	Thallium	liver	3.82E-03	--	2.52E-03	6.35E-03
			Vanadium	NC	--	NC	NC	Vanadium	--	2.22E-04	--	5.65E-03	5.87E-03
			Zinc	NC	--	NC	NC	Zinc	blood system	6.94E-06	--	2.75E-06	9.69E-06
Sediment	Sediment		Arsenic	7.40E-08	--	6.66E-09	8.07E-08	Arsenic	skin discoloration	1.15E-02	--	1.04E-03	1.25E-02
			Barium	NC	--	NC	NC	Barium	no effects	1.81E-03	--	7.74E-04	2.58E-03
			Beryllium	NC	--	NC	NC	Beryllium	chronic beryllium disease	8.14E-05	--	3.49E-04	4.30E-04
			Cadmium	NC	--	NC	NC	Cadmium	kidney	4.69E-04	--	2.82E-05	4.97E-04
			Chromium	NC	--	NC	NC	Chromium	no effects	1.76E-04	--	4.05E-04	5.81E-04
			Copper	NC	--	NC	NC	Copper	gastrointestinal disease	8.29E-04	--	2.49E-05	8.53E-04
			Iron	NC	--	NC	NC	Iron	--	2.06E-02	--	6.17E-04	2.12E-02
			Mercury	NC	--	NC	NC	Mercury	autoimmune system	1.36E-04	--	4.09E-06	1.41E-04
			Nickel	NC	--	NC	NC	Nickel	body weight	1.82E-03	--	1.36E-03	3.18E-03
			Selenium	NC	--	NC	NC	Selenium	clinical selenosis	6.63E-04	--	1.99E-05	6.83E-04
			Zinc	NC	--	NC	NC	Zinc	blood system	2.99E-04	--	8.98E-06	3.08E-04

Total Risk Across Soil and Slag	6.3E-08
Total Risk Across Soil	4.4E-08
Total Risk Across Slag	7.3E-08
Total Risk Across Surface Water	6.3E-09
Total Risk Across Sediment	8.1E-08

Total Hazard Index Across All Media and All Exposure Routes (surface soil and slag)	2.8E-01
Total Hazard Index Across All Media and All Exposure Routes (surface soil)	2.3E-01
Total Hazard Index Across All Media and All Exposure Routes (slag)	6.1E-01

Total Risk Across All Media and All Exposure Routes (soil and slag)	1.5E-07
Total Risk Across All Media and All Exposure Routes (soil)	1.3E-07
Total Risk Across All Media and All Exposure Routes (slag)	1.6E-07

Surface Soil and Slag

Total [blood system] HI =	3.4E-03
Total [skin discoloration] HI =	2.4E-02
Total [chronic beryllium disease] HI =	2.2E-03
Total [kidney] HI =	7.9E-03
Total [gastrointestinal system] HI =	4.5E-03
Total [central nervous system] HI =	3.9E-02
Total [autoimmune system] HI =	3.3E-03
Total [body weight] HI =	1.7E-02
Total [clinical selenosis] HI =	1.1E-03
Total [liver] HI =	3.0E-02

Note:

TABLE B.3.4.RME

SUMMARY OF FUTURE CONSTRUCTION/ UTILITY WORKER RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
OPERABLE UNIT 3
VANADIUM CORPORATION OF AMERICA
NIAGARA FALLS, NEW YORK

Scenario Timeframe: Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	*Exposure Medium*	*Exposure Point*	*Chemical*	*Carcinogenic Risk*				*Chemical*	*Non-Carcinogenic Hazard Quotient*				
				Ingestion	*Inhalation*	*Dermal*	*Exposure Routes Total*		*Primary Target Organ*	*Ingestion*	*Inhalation*	*Dermal*	*Exposure Routes Total*

NC = Not Calculated