N00164.AR.002149
NSA CRANE
5090.3a

FINAL RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FOR THE ILLUMINANT BUILDING 126 SOLID WASTE MANAGEMENT UNIT 27 (SWMU 27) NSA CRANE IN
09/01/2012
TETRA TECH

# Final
# Resource Conservation and Recovery Act Facility Investigation Report
## for the
# Illuminant Building 126 (SWMU 27)

## Naval Support Activity Crane
## Crane, Indiana

Naval Facilities Engineering Command Midwest

Contract Number N62470-08-D-1001

Contract Task Order F276

September 2012

REVISION 0
SEPTEMBER 2012

# FINAL
# RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION REPORT FOR ILLUMINANT BUILDING 126 (SWMU 27)

## NAVAL SUPPORT ACTIVITY, CRANE
## CRANE, INDIANA

## COMPREHENSIVE LONG-TERM ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

**Submitted to:**
**Naval Facilities Engineering Command Midwest**
**201 Decatur Avenue**
**Building 1A, Code EV**
**Great Lakes, Illinois 60088**

**Submitted by:**
**Tetra Tech**
**234 Mall Boulevard, Suite 260**
**King of Prussia, Pennsylvania 19406**

**CONTRACT NUMBER N62470-08-D-1001**
**CONTRACT TASK ORDER F276**

**SEPTEMBER 2012**


**PREPARED UNDER THE DIRECTION OF:**

RALPH R. BASINSKI
PROJECT MANAGER
TETRA TECH
PITTSBURGH, PENNSYLVANIA

**APPROVED FOR SUBMISSION BY:**

for JOHN TREPANOWSKI, PE
PROGRAM MANAGER
TETRA TECH
PITTSBURGH, PENNSYLVANIA

# TABLE OF CONTENTS

**SECTION** **PAGE NO.**

**ACRONYMS AND ABBREVIATIONS ..... 7**

**EXECUTIVE SUMMARY ..... ES-1**

**1.0 INTRODUCTION ..... 1-1**
1.1 PURPOSE OF THIS REPORT ..... 1-1
1.1.1 Project Objectives ..... 1-2
1.1.2 Project Problem Statement ..... 1-2
1.1.3 Organization of the Report ..... 1-2
1.2 BACKGROUND ..... 1-3
1.2.1 Facility Location and Description ..... 1-3
1.2.2 History of NSA Crane Ownership and Operations ..... 1-4
1.2.3 Operational History of the SWMU 27 ..... 1-5
1.2.4 Previous Investigations ..... 1-8

**2.0 FIELD INVESTIGATION ..... 2-1**
2.1 OVERVIEW ..... 2-1
2.2 MOBILIZATION/DEMOBILIZATION ..... 2-1
2.3 SITE INVESTIGATION METHODOLOGIES AND PROCEDURES ..... 2-2
2.3.1 Sample Collection Methods ..... 2-2
2.3.2 Sample Logging ..... 2-3
2.4 SAMPLING OPERATIONS ..... 2-3
2.4.1 Former PCB Transformer Sites ..... 2-4
2.4.2 Surface Ditches/Channels/Drainageways ..... 2-5
2.4.3 Flare Test/Fire Incident Areas ..... 2-6
2.4.4 Pits/Sumps ..... 2-6
2.5 FIELD SAMPLE DOCUMENTATION ..... 2-8
2.6 SAMPLE HANDLING, PACKAGING, AND SHIPPING ..... 2-8
2.7 QUALITY CONTROL SAMPLES ..... 2-8
2.8 GPS ..... 2-9
2.9 DECONTAMINATION ..... 2-9
2.10 INVESTIGATION-DERIVED WASTE (IDW) HANDLING ..... 2-10
2.11 SITE MANAGEMENT AND FACILITY SUPPORT ..... 2-10
2.12 RECORDKEEPING ..... 2-10

**3.0 DATA QUALITY REVIEW ..... 3-1**
3.1 DATA VALIDATION PROCESS ..... 3-1
3.2 DATA VALIDATION OUTPUTS ..... 3-2
3.3 DATA QUALITY REVIEW ..... 3-3
3.3.1 Completeness ..... 3-3
3.3.2 Sensitivity ..... 3-5
3.3.3 Laboratory Accuracy ..... 3-5
3.3.4 Laboratory Precision ..... 3-8
3.3.5 Comparability ..... 3-9
3.3.6 Representativeness ..... 3-10
3.3.7 Data usability ..... 3-10

# TABLE OF CONTENTS (Continued)

**SECTION** **PAGE NO.**

**4.0 SITE CHARACTERISTICS ..... 4-1**
4.1 PHYSIOGRAPHY AND TOPOGRAPHY ..... 4-1
4.2 CLIMATE AND METEOROLOGY ..... 4-1
4.3 GEOLOGY AND STRATIGRAPHY ..... 4-2
4.4 SURFACE HYDROLOGY AND DRAINAGE SYSTEM ..... 4-3
4.5 LAND USE AND DEMOGRAPHY ..... 4-3
4.6 ECOLOGY ..... 4-3

**5.0 NATURE AND EXTENT OF CONTAMINATION ..... 5-1**
5.1 BACKGROUND LOCATIONS ..... 5-3
5.1.1 NSA Crane Soil Background Data Set ..... 5-3
5.2 SOIL CONTAMINATION ..... 5-3
5.2.1 Investigation Area 1 ..... 5-3
5.2.2 Investigation Area 2 ..... 5-5
5.2.3 Sumps and Pits ..... 5-6
5.3 EXTENT OF CONTAMINATION SUMMARY ..... 5-6

**6.0 CONCEPTUAL SITE MODEL ..... 6-1**
6.1 PPA SITE ACTIVITY ..... 6-1
6.2 PPA FLARE TESTING ACTIVITIES ..... 6-1
6.3 PCB TRANSFORMERS ..... 6-1
6.4 METAL-PLATING OPERATIONS ..... 6-2
6.5 CONCLUSIONS ..... 6-2

**7.0 HUMAN HEALTH RISK ASSESSMENT ..... 7-1**
7.1 DATA EVALUATION ..... 7-2
7.1.1 Derivation of Screening Criteria ..... 7-3
7.1.2 Decision Rules for Establishing COPCs ..... 7-6
7.1.3 COPCs Selected for HHRA ..... 7-6
7.2 EXPOSURE ASSESSMENT ..... 7-10
7.2.1 Conceptual Site Model ..... 7-10
7.2.2 Central Tendency Exposure versus Reasonable Maximum Exposure ..... 7-13
7.2.3 Exposure Point Concentrations ..... 7-13
7.2.4 Chemical Intake Estimation ..... 7-14
7.3 TOXICITY ASSESSMENT ..... 7-20
7.3.1 Toxicity Criteria for Oral and Inhalation Exposures ..... 7-21
7.3.2 Toxicity Criteria for Dermal Exposure ..... 7-22
7.3.3 Toxicity of Chromium ..... 7-23
7.3.4 Mutagenic Chemicals ..... 7-23
7.4 RISK CHARACTERIZATION ..... 7-23
7.4.1 Quantitative Analysis ..... 7-23
7.4.2 Comparison of Quantitative Risk Estimates to Benchmarks ..... 7-24
7.4.3 Results of the Risk Characterization ..... 7-25
7.5 UNCERTAINTY ANALYSIS ..... 7-28
7.5.1 Uncertainty in Data Evaluation ..... 7-30

# TABLE OF CONTENTS (Continued)

**SECTION** **PAGE NO.**

7.5.2 Uncertainty in the Exposure Assessment ..... 7-30
7.5.3 Uncertainty in the Toxicological Evaluation ..... 7-32
7.5.4 Uncertainty in the Risk Characterization ..... 7-33
7.6 SUMMARY AND CONCLUSIONS ..... 7-34

**8.0 ECOLOGICAL RISK ASSESSMENT ..... 8-1**
8.1 INTRODUCTION ..... 8-1
8.2 TIER 1, STEP 1: SCREENING-LEVEL PROBLEM FORMULATION ..... 8-1
8.2.1 Environmental Setting ..... 8-2
8.2.2 Potential Sources of Contamination ..... 8-4
8.2.3 Physical and Chemical Characteristics ..... 8-4
8.2.4 Potential Exposure Pathways ..... 8-4
8.2.5 Assessment Endpoints and Measurement Endpoints ..... 8-5
8.2.6 Conceptual Site Model ..... 8-8
8.3 TIER 1, STEP 2: SCREENING-LEVEL EXPOSURE ESTIMATE AND RISK QUOTIENTS ..... 8-8
8.3.1 Ecological Effects Evaluation ..... 8-8
8.3.2 Exposure Characterization ..... 8-8
8.3.3 Risk Characterization ..... 8-10
8.3.4 Tier 1, Step 2: Selection of Contaminants of Potential Concern ..... 8-11
8.4 TIER 2, STEP 3A – COPC REFINEMENT ..... 8-13
8.4.1 Tier 2, Step 3a: Terrestrial Plants ..... 8-15
8.4.2 Tier 2, Step 3a: Soil Invertebrates ..... 8-16
8.4.3 Tier 2, Step 3a: Terrestrial Wildlife ..... 8-17
8.5 ECOLOGICAL RISK UNCERTAINTY ANALYSIS ..... 8-18
8.5.1 Uncertainty in Assessment Endpoints and Measurement Endpoints ..... 8-18
8.5.2 Uncertainty in Exposure Characterization ..... 8-19
8.5.3 Uncertainty in Ecological Effects Data ..... 8-20
8.5.4 Uncertainty in Risk Characterization ..... 8-20
8.6 ECOLOGICAL RISK SUMMARY AND CONCLUSIONS ..... 8-21
8.6.1 Terrestrial Plants and Soil Invertebrates ..... 8-21
8.6.2 Mammals and Birds ..... 8-21

**9.0 CONCLUSIONS AND RECOMMENDATIONS ..... 9-1**
9.1 REMEDIAL INVESTIGATION RESULTS ..... 9-1
9.1.1 Surface Soil – Investigation Area 1 ..... 9-1
9.1.2 Subsurface Soil – Investigation Area 1 ..... 9-2
9.1.3 Surface Soil – Investigation Area 2 ..... 9-2
9.1.4 Subsurface Soil – Investigation Area 2 ..... 9-3
9.1.5 Sumps and Pits ..... 9-3
9.2 SUMMARY ..... 9-4
9.3 HUMAN HEALTH RISK ASSESSMENT CONCLUSIONS ..... 9-4
9.4 ECOLOGICAL ASSESSMENT CONCLUSIONS ..... 9-5
9.5 RECOMMENDATIONS ..... 9-5

**REFERENCES ..... R-1**

# TABLE OF CONTENTS (Continued)

**APPENDICES**

**A** **A.1 SAMPLING LOG SHEETS**
**A.2 CHAIN-OF-CUSTODY FORMS**

**B** **FIELD NOTES**

**C** **PHOTOGRAPHS**

**D** **ANALYTICAL DATA**

**E** **SUMMARY OF BACKGROUND COMPARISONS**

**F** **SUPPORTING DOCUMENTATION FOR THE HUMAN HEALTH RISK ASSESSMENT**

**G** **SUPPORTING DOCUMENTATION FOR THE ECOLOGICAL RISK ASSESSMENT**

# TABLES

**NUMBER**

ES-1 Summary of Receptor-Specific Human Risks, and Hazards and Ecological Risks, and Recommendations
2-1 Sample Collection and Analysis Summary
5-1 Investigation Area 1 Surface Soil Sample Analysis Summary
5-2 Investigation Area 2 Surface Soil Sample Analysis Summary
5-3 Investigation Area 1 Subsurface Soil Sample Analysis Summary
5-4 Investigation Area 2 Subsurface Soil Sample Analysis Summary
5-5 Pit/Sump Sample Analysis Summary
7-1 Screening Criteria Used in Selection of COPCs - Soil
7-2 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Direct Contact with Surface Soil - Investigation Area 1
7-3 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Migration from Surface Soil to Groundwater - Investigation Area 1
7-4 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Direct Contact with Subsurface Soil - Investigation Area 1
7-5 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Migration from Subsurface Soil to Groundwater - Investigation Area 1
7-6 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Direct Contact - Investigation Area 1 - Sumps/Pits
7-7 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Direct Contact with Surface Soil - Investigation Area 2

# TABLES (Continued)

**NUMBER**

7-8 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Migration from Surface Soil to Groundwater - Investigation Area 2
7-9 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Direct Contact with Subsurface Soil - Investigation Area 2
7-10 Occurrence, Distribution and Selection of Chemicals of Potential Concern - Migration from Subsurface Soil to Groundwater - Investigation Area 2
7-11 Chemicals Retained as COPCs
7-12 Selection of Exposure Pathways
7-13 Receptors and Exposure Routes for Quantitative Evaluation
7-14 Exposure Point Concentrations - Surface and Subsurface Soil
7-15 Exposure Point Concentrations - Sumps/Pits
7-16 Summary of Exposure Input Parameters - Reasonable Maximum Exposures
7-17 Summary of Exposure Input Parameters - Central Tendency Exposures
7-18 Non-Cancer Toxicity Data - Oral/Dermal
7-19 Non-Cancer Toxicity Data - Inhalation
7-20 Cancer Toxicity Data - Oral/Dermal
7-21 Cancer Toxicity Data - Inhalation
7-22 Summary of Cancer Risks and Hazard Indices - Reasonable Maximum Exposures - Investigation Area 1
7-23 Summary of Cancer Risks and Hazard Indices - Central Tendency Exposures - Investigation Area 1
7-24 Summary of Cancer Risks and Hazard Indices - Investigation Area 1 - Sumps/Pits - Reasonable Maximum Exposures
7-25 Summary of Cancer Risks and Hazard Indices - Investigation Area 1 - Sumps/Pits - Central Tendency Exposures
7-26 Summary of Cancer Risks and Hazard Indices - Reasonable Maximum Exposures - Investigation Area 2
7-27 Summary of Background Cancer Risks and Hazard Indices - Central Tendency Exposures - Investigation Area 2
7-28 Summary of Background Cancer Risks and Hazard Indices - Central Tendency Exposures - Investigation Area 2
7-29 Summary of Background Cancer Risks and Hazard Indices - Reasonable Maximum Exposures - Investigation Area 1
7-30 Summary of Background Cancer Risks and Hazard Indices - Central Tendency Exposures - Investigation Area 1
7-31 Summary of Background Cancer Risks and Hazard Indices - Reasonable Maximum Exposures - Investigation Area 2
7-32 Summary of Background Cancer Risks and Hazard Indices - Central Tendency Exposures - Investigation Area 2
8-1 Assessment Endpoints and Measurement Endpoints
8-2 Soil Screening Levels
8-3 Surface Soil COPC Selection for IA 1
8-4 Surface Soil COPC Selection for IA 2
8-5 Terrestrial Food Chain Model - Tier 1 Scenario, Insectivorous and herbivorous Receptors, IA 1

# TABLES (Continued)

**NUMBER**

8-6 Terrestrial Food Chain Model - Tier 1 Scenario, Insectivorous and herbivorous Receptors, IA 2
8-7 Step 3A Evaluation for Risks to Plants and Invertebrates, Surface Soil COPCs
8-8 Terrestrial Food Chain Model - Tier 2, Step 3A Scenario, Insectivorous and Herbivorous Receptors - IA 1

# FIGURES

**NUMBER**

ES-1 Site Location Map
1-1 Site Location – IA 1 and IA 2
1-2 IA 1 – Pyrotechnic Production Area
1-3 IA 2 – Flare Test Area
2-1 Sample Locations – IA 1 and IA 2
4-1 Five Year Wind Rose Summary for Indianapolis, Indiana
4-2 Surface Water Drainage
5-1 Metals/Inorganics with Exceedances of Human Health and Ecological Screening Values, SWMU 27 – Investigation Area 1
5-2 Organics with Exceedances of Human Health and Ecological Screening Values, SWMU 27 – Investigation Area 1
5-3 Metals/Inorganics with Exceedances of Human Health and Ecological Screening Values, SWMU 27 – Investigation Area 2
6-1 Conceptual Site Model - Settling Basins, Sumps, Pits and Drainageways
6-2 Conceptual Site Model - Flare Testing Activities
6-3 Conceptual Site Model - Polychlorinated Biphenyls (PCBs) Transformers
6-4 Conceptual Site Model - Metal Plating Drainage
7-1 Conceptual Site Model - SWMU 27 Illuminant Building 126
7-2 Summary of Hazardous Indices - Reasonable Maximum Exposures, Investigation Area 1
7-3 Summary of Hazardous Indices - Central Tendency Exposures, Investigation Area 1
7-4 Summary of Cancer Risks - Reasonable Maximum Exposures, Investigation Area 1
7-5 Summary of Cancer Risks - Central Tendency Exposures, Investigation Area 1
7-6 Summary of Hazardous Indices - Reasonable Maximum Exposures, Investigation Area 2
7-7 Summary of Hazardous Indices - Central Tendency Exposures, Investigation Area 2
7-8 Summary of Cancer Risks - Reasonable Maximum Exposures Excluding Sump Sample, Investigation Area 1
7-9 Summary of Cancer Risks - Central Tendency Exposures, Investigation Area 1 - Sumps/Pits
7-10 Summary of Hazard Indices - Reasonable Maximum Exposures, Investigation Area 2
7-11 Summary of Hazard Indices - Central Tendency Exposures, Investigation Area 2
8-1 Navy Ecological Risk Assessment Tiered Approach
8-2 Ecological Conceptual Site Model

# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ºC | degrees Celsius |
| µg/L | microgram per liter |
| amsl | above mean sea level |
| A | Analytical |
| ADAF | age-dependent adjustment factors |
| ALM | Adult Lead Model |
| AR | Administrative Record |
| ATSDR | Agency for Toxic Substances and Disease Registry |
| AWQC | Ambient Water Quality Criterion |
| BAF | bioaccumulation factor |
| BERA | baseline ecological risk assessment |
| BFB | bromofluorobenzene |
| bgs | below ground surface |
| BRAC | Base Realignment and Closure |
| BTEX | benzene, toluene, ethylbenzene, and xylenes |
| CA | Corrective Action |
| CAAA | Crane Army Ammunition Activity |
| CAS | Chemical Abstracts Service |
| CCB | Continuing Calibration Blank |
| CCC | Calibration Check Compounds |
| CCV | Continuing Calibration Verification |
| CFR | Code of Federal Regulations |
| CLEAN | Comprehensive Long-Term Environmental Action Navy |
| CMS | Corrective Measures Study |
| COPC | chemical of potential concern |
| CSF | cancer slope factor |
| CSM | conceptual site model |
| CTE | central tendency exposure |
| CTO | Contract Task Order |
| CWAP | Comprehensive Work Approval Process |
| DCB | decachlorbiphenyl |
| DCE | dichloroethylene |
| DI | deionized |

| | |
|---|---|
| DL | Detection limit |
| DO | dissolved oxygen |
| DoD | Department of Defense |
| DPT | direct-push technology |
| DQI | Data Quality Indicator |
| DQR | data quality review |
| DQO | Data Quality Objective |
| DRMU | Defense Reutilization and Marketing Operations |
| DVM | Data Validation Manager |
| Eco-SSL | Ecological Soil Screening Level |
| EDD | Electronic Data Deliverable |
| EEQ | Ecological Effects Quotient |
| ELAP | Environmental Laboratory Accreditation Program |
| Empirical | Empirical Laboratories, Inc. |
| EMR | Environmental Monitoring Report |
| EPC | exposure point concentration |
| ERA | Ecological Risk Assessment |
| ERSM | Environmental Restoration Site Manager |
| ESL | Ecological Screening Level |
| EU | Exposure Unit |
| FID | flame ionization detector |
| FOL | Field Operations Leader |
| FTMR | Field Task Modification Request |
| GC/ECD | Gas Chromotography/Electron Capture Detector |
| GC/MS | Gas Chromotography/Mass Spectroscopy |
| GPS | Global Positioning System |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HEAST | Health Effects Assessment Summary Tables |
| HHRA | human health risk assessment |
| HI | hazard index |
| HPLC/ESI/MS | High Performance Liquid Chromotography/Electrospray Ionization/Mass Spectrometry |
| HQ | hazard quotient |
| HSM | Health and Safety Manager |
| IA | Investigation Area |
| IAS | Initial Assessment Study |

| | |
|---|---|
| ICAL | Initial Calibration |
| ICB | Initial Calibration Blank |
| ICS | Interference Check Standards |
| ICV | Initial Calibration Verification |
| ID | identification |
| I-DCL | Industrial Default Closure Level |
| IDEM | Indiana Department of Environmental Management |
| IDW | investigation-derived waste |
| IEUBK | Integrated Exposure Uptake Biokinetic |
| ILCR | incremental lifetime cancer risk |
| IR | Installation Restoration |
| IRIS | Integrated Risk Information System |
| IS | Internal Standards |
| IUR | inhalation unit risk |
| IUPPS | Indiana Underground Plant Protection Services |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| LOAEL | lowest observed adverse effects level |
| LOD | Limit of Detection |
| LODV | Limit of Detection Verification |
| LOQ | Limit of Quantitation |
| MCL | Maximum Contaminant Level |
| MDL | Method Detection Limit |
| mg/kg | milligram per kilogram |
| MPC | Measurement Performance Criterion |
| MRP | Munitions Response Program |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| MSDS | Material Data Safety Sheet |
| msl | mean sea level |
| NA | Not Applicable |
| NAD | Naval Ammunition Depot |
| NAVFAC | Naval Facilities Engineering Command |
| NCEA | National Center for Environmental Assessment |
| NEESA | Naval Energy and Environmental Support Activity |
| NELAP | National Environmental Laboratory Accreditation Program |

| | |
|---|---|
| NFA | No Further Action |
| NIRIS | Naval Installation Restoration Information Solution |
| NOAA | National Oceanic and Atmospheric Administration |
| NOAEL | no observed adverse effects level |
| NPDES | National Pollution Discharge Elimination System |
| NRWQC | National Recommended Water Quality Criterion |
| NSA | Naval Support Activity |
| NTU | Nephelometric Turbidity Unit |
| NWSC | Naval Weapons Support Center |
| ORNL | Oak Ridge National Laboratory |
| ORP | oxidation-reduction potential |
| OSHA | Occupational Safety and Health Administration |
| OSWER | Office of Solid Waste and Emergency Response |
| PAL | Project Action Limit |
| PEF | particulate emissions factor |
| PR | Preliminary Review |
| PR/VSI | Preliminary Review/Visual Site Inspection |
| PCB | polychlorinated biphenyl |
| PCE | perchloroethylene |
| PID | photoionization detector |
| PM | Project Manager |
| POC | Point of Contact |
| PPA | Pyrotechnic Production Area |
| PPE | personal protective equipment |
| ppm | part per million |
| PPRTVs | Provisional Peer Reviewed Toxicity Values |
| PQLG | Project Quantitation Limit Goal |
| PQO | Project Quality Objective |
| PSL | Project Screening Level |
| PWD | Public Works Department |
| QA | quality assurance |
| QAM | Quality Assurance Manager |
| QAMS | Quality Assurance Management System |
| QAO | Quality Assurance Officer |
| QC | quality control |
| QL | Quantitation Limit |

| | |
|---|---|
| QSM | Quality Systems Manual |
| %R | percent recovery |
| RA | Removal Action |
| RAGS | Risk Assessment Guidance for Superfund |
| RBSSL | Risk-Based Soil Screening Level |
| RCRA | Resource Conservation and Recovery Act |
| RDA | recommended daily allowance |
| R-DCL | Residential Default Closure Level |
| RDI | recommended daily intake |
| RF | Response Factor |
| RfC | reference concentration |
| RfD | reference dose |
| RFI | RCRA Facility Investigation |
| RISC | Risk Integrated System Closure |
| RME | reasonable maximum exposure |
| RPD | Relative Percent Difference |
| RPM | Remedial Project Manager |
| R RSL | USEPA Regions 3, 6, and 9 Residential Regional Screening Level |
| RRT | Relative Retention Time |
| RSD | Relative Standard Deviation |
| RSL | Regional Screening Level |
| S | Sampling |
| S&A | Sampling and Analytical |
| SAP | Sampling and Analysis Plan |
| SCS | Soil Conservation Service |
| SDG | Sample Delivery Group |
| SERA | screening-level ecological risk assessment |
| SOP | Standard Operating Procedure |
| SPCC | Systems Performance Check Compound |
| SRCR | Systems Receipt Condition Report |
| SSL | soil screening level |
| SSO | Site Safety Officer |
| SV | Screening Value |
| SWMU | Solid Waste Management Unit |
| TBD | to be determined |
| TCE | trichloroethylene |

| | |
|---|---|
| TCMX | Tetra-chloro-meta-xylene |
| Tetra Tech | Tetra Tech, Inc. |
| TOM | Task Order Manager |
| TRV | toxicity reference value |
| TRW | Technical Review Workgroup |
| UCL | Upper Confidence Limit |
| UFP-QAPP | Uniform Federal Policy Quality Assurance Project Plan |
| UFP-SAP | Uniform Federal Policy Sampling and Analysis Plan |
| USCS | Unified Soil Classification System |
| USDA | U.S. Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| UTL | upper tolerance limit |
| VC | vinyl chloride |
| VOA | Volatile Organic Analyte |
| VOC | volatile organic compound |
| VSI | Visual Site Inspection |
| WWTP | waste water treatment plant |

# EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) presents the results of the surface soil and subsurface soil investigation conducted at Solid Waste Management Unit (SWMU) 27 located at Naval Support Activity (NSA) Crane, Indiana (Figure ES-1). Tetra Tech prepared this report for the United States Navy, Naval Facilities Engineering Command (NAVFAC) Midwest under Contract Task Order (CTO) F276, Contract N62470-08-D-1001, Comprehensive Long-Term Environmental Action Navy (CLEAN). The investigation was focused on the industrial process area in the general vicinity of Illuminant Building 126, including two discrete Investigation Areas (IAs): IA 1 - the Pyrotechnic Production Area (PPA), and IA 2 - the former Flare Test Area.

## PURPOSE OF REPORT

The primary purpose of the RFI is to determine the nature and extent of potential contaminants associated with industrial activities and operations performed at SWMU 27 and the potential impacts to human health and ecological receptors. The initial field sampling event included surface and subsurface soil sampling, and sampling of sump/pit residue to determine if contamination in site media is present at concentrations above regulatory and risk-based screening criteria. The report summarizes RFI field activities conducted in 2011, describes the nature and extent of contamination, and presents human health and ecological risk assessments. All RFI fieldwork and the development of the baseline human health and screening-level ecological risk evaluations were conducted in accordance with the Indiana Department of Environmental Management (IDEM)-approved Sampling and Analysis Plan (SAP) for the RFI at SWMU 27 at NSA Crane, Indiana (TtNUS, 2011a).

## SITE DESCRIPTION

### IA 1 - PPA

Since the early years of World War II, the PPA has produced pyrotechnic devices including signal flares, smoke and dye markers, ground and aircraft signals, submarine signals, and illuminating projectiles such as the 5-inch (star shell) illuminating parachute flare. IA 1 covers approximately 31-acres, and the majority is located within restricted access fencing. Although much of NSA Crane is forested, the PPA has been cleared of trees and has been developed as a highly industrialized pyrotechnic production center (see Figure 1-1). Building 126 is the primary building in the PPA, and a number of other specialized storage buildings and bunkers, red phosphorus mixing and loading buildings, various curing buildings for pyrotechnic items, and other pyrotechnic production support buildings have been

constructed in the PPA as shown on Figure 1-1. A metal-plating shop utilizing metals, caustics, acids, and cyanides has been operating on the eastern edge of the PPA (Building 1884).

Drainage swales and ditches convey surface water within the PPA to the south and west (near the point where the railroad track R-1 crosses Highway 99), and throughout the PPA. Additionally, drainage swales adjacent to several concrete basins/pits allowed for collection of surface water overflow if it occurred. In the past, process wastewaters and rinsates from the metal-plating building were discharged to open ditches. Currently, treated wastewater from metal-plating operations is discharged to the sanitary sewer system under a National Pollution Discharge Elimination System (NPDES) permit.

**IA 1 - Polychlorinated Biphenyl (PCB)Transformer Sites**

IA 1 RFI sampling was conducted at the former electrical transformer substation that was located on the western side of the PPA, near a replacement transformer located by the north entrance to IA 1, and near transformers still in use at the SWMU that are labeled as containing PCBs.

**IA 1 - Other Areas of Concern within the PPA**

IA 1 RFI sampling was conducted at locations where fires and explosions have occurred in the past that may have released pyrotechnic compounds to the local environment.

**IA 2 - Former Flare Test Area**

Little documentation was available regarding the exact location and operation of flare testing activities. Based on historical photographs and personnel interviews during the September 2009 NSA Crane site visit, three potential flare testing locations north of Highway 5 were identified, and these were the areas investigated during the RFI. This triangular area that contains the three suspected locations covers approximately 7.4 acres. Surface water from the former Flare Test Area drains into surface channels along the northern side of Highway 5 or into a culvert north of IA 2.

## FIELD AND ANALYTICAL PROGRAM

The primary constituents of concern for the analytical program for surface and subsurface soil are VOCs, perchlorate, cyanide, metals and PCBs.

A total of 49 surface soil, 13 subsurface soil, and 10 pit/sump sediment samples were collected.

## HUMAN HEALTH RISK ASSESSMENT

The human receptors evaluated for SWMU 27 were the construction worker, industrial worker, child and adult recreational user, and future adult and child residents. Surface and subsurface soil and pit/sump soil are the media evaluated for SWMU 27.

No significant potential human health risks are expected for exposures to surface or subsurface soil under current or future land use at SWMU 27.

Unacceptable risks were identified for construction workers exposed to the soil within the sumps/pits. Manganese and lead were the major contributors to the risk.

## ECOLOGICAL RISK ASSESMENTS

A screening-level ecological risk assessment (SERA) was conducted for the drainageways outside of the PPA fence line at SWMU 27. The ecological receptors evaluated in the screening assessment include those directly exposed to chemicals in surface soil (i.e., plants, soil invertebrates, herbivorous birds and mammals, soil invertebrate-eating birds and mammals).

No chemicals were retained as COPCs for potential risks to terrestrial plants and soil invertebrates. No chemicals were retained as COPCs for mammals and birds.

## CONCLUSIONS

Table ES-1 contains a summary of receptor-specific human health risks and hazards and ecological risks and identifies critical pathways and chemicals of concern for SWMU 27, and presents recommendations for further actions.

Upon evaluation of the data obtained during this investigation, the consideration of site operational history, the data generated during past investigations, and the development of baseline HHRA and SERA for SWMU 27, the following conclusions were reached:

- The soil data collected during the RFI were adequate to support the development of baseline human health and screening-level ecological risk assessments for SWMU 27.

- VOCs, cyanide, and metals, the primary constituents of concern in soil at SWMU 27, were detected at concentrations greater than screening levels in surface soil. Select metals and VOCs were detected at concentrations greater than screening levels in subsurface soil.

- Ethylbenzene, total xylenes, aluminum, cadmium, chromium, copper, lead, manganese, and zinc, the primary constituents of concern in sump/pit soils at SWMU 27, were detected at concentrations greater than screening levels.

- SWMU 27 incremental cumulative cancer risks for all human receptor surface and subsurface soil pathways were estimated to be within, or less than, the EPA risk range of $1x10^{-6}$ to $1x10^{-4}$; therefore, the risk is acceptable, and No Further Action is warranted for surface and subsurface soil.

- Unacceptable risks were identified for construction workers exposed to the sump/pit soils. Manganese and lead were the major contributors to the risk. The pits and sumps at SWMU 27 are to be addressed under a Correct Measures Study (CMS) or Interim Measures.

- Risks to terrestrial plants, invertebrates, birds and mammals from organic and inorganic chemicals in surface soil at SWMU 27 were estimated to be low to negligible, and No Further Action is warranted.

**TABLE ES-1**

**SUMMARY OF RECEPTOR-SPECIFIC HUMAN HEALTH RISKS AND HAZARDS, ECOLOGICAL RISKS, AND RECOMMENDATIONS**
**SWMU 27 - RFI REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| Receptor Population | Environmental Medium | Overall Carcinogenic Risk (Human) | Overall Hazard Index (Human) | Lead Exposure (Human) | Overall Risk (Ecological) | Critical Pathways and Chemicals of Concern | Recommendations |
|---|---|---|---|---|---|---|---|
| **Investigation Area 1** | | | | | | | |
| Construction Workers (future land use) | Surface Soil | 3E-06 | 0.3 | No unacceptable exposures to lead. | NA | NA | NFA |
| Industrial Workers (current and future land use) | Surface Soil | 4E-06 | 0.03 | No unacceptable exposures to lead. | NA | NA | NFA |
| Small Child (0 to 6 years) Recreational User (future land use) | Surface Soil | 4E-06 | 0.02 | No unacceptable exposures to lead. | NA | NA | NFA |
| Adult Recreational User (future land use) | Surface Soil | 7E-07 | 0.003 | No unacceptable exposures to lead. | NA | NA | NFA |
| Lifelong Recreational User (future land use) | Surface Soil | 5E-06 | NA | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Children) (future land use) | Surface Soil | 6E-05 | 0.3 | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Adult) (future land use) | Surface Soil | 9E-06 | 0.04 | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Lifelong) (future land use) | Surface Soil | 7E-05 | NA | No unacceptable exposures to lead. | NA | NA | NFA |
| Construction Workers (future land use) | Subsurface Soil | 5E-06 | 1 | No unacceptable exposures to lead. | NA | NA | NFA |
| Industrial Workers (current and future land use) | Subsurface Soil | 7E-06 | 0.04 | No unacceptable exposures to lead. | NA | NA | NFA |
| Small Child (0 to 6 years) Recreational User (future land use) | Subsurface Soil | 9E-06 | 0.04 | No unacceptable exposures to lead. | NA | NA | NFA |
| Adult Recreational User (future land use) | Suburface Soil | 1E-06 | 0.004 | No unacceptable exposures to lead. | NA | NA | NFA |
| Lifelong Recreational User (future land use) | Suburface Soil | 1E-05 | NA | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Children) (future land use) | Subsurface Soil | 1E-04 | 0.5 | No unacceptable exposures to lead. | NA | NA | NFA |

**TABLE ES-1**

**SUMMARY OF RECEPTOR-SPECIFIC HUMAN HEALTH RISKS AND HAZARDS, ECOLOGICAL RISKS, AND RECOMMENDATIONS**
**SWMU 27 - RFI REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| Receptor Population | Environmental Medium | Overall Carcinogenic Risk (Human) | Overall Hazard Index (Human) | Lead Exposure (Human) | Overall Risk (Ecological) | Critical Pathways and Chemicals of Concern | Recommendations |
|---|---|---|---|---|---|---|---|
| On-base Residents (Adult) (future land use) | Subsurface Soil | 2E-05 | 0.06 | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Lifelong) (future land use) | Subsurface Soil | 1E-04 | NA | No unacceptable exposures to lead. | NA | NA | NFA |
| Construction Worker (future land use) | Sump/Pit - 27SB029 | 1E-06 | 0.08 | No unacceptable exposures to lead. | NA | NA | NFA |
| Construction Worker (future land use) | Sump/Pit - 27SB030 | 8E-08 | 0.05 | No unacceptable exposures to lead. | NA | NA | NFA |
| Construction Worker (future land use) | Sump/Pit - 27SB031 | 2E-07 | 3 | No unacceptable exposures to lead. | NA | Incidential ingestion of manganese | Proceed to CMS or Interim Measures |
| Construction Worker (future land use) | Sump/Pit - 27SB032 | No carcinogenic COPCs | 5 | No unacceptable exposures to lead. | NA | Incidential ingestion of manganese | Proceed to CMS or Interim Measures |
| Construction Worker (future land use) | Sump/Pit - 27SB033 | 4E-13 | 3 | No unacceptable exposures to lead. | NA | Incidential ingestion of manganese | Proceed to CMS or Interim Measures |
| Construction Worker (future land use) | Sump/Pit - 27SB034 | 2E-07 | 0.08 | No unacceptable exposures to lead. | NA | NA | NFA |
| Construction Worker (future land use) | Sump/Pit - 27SB035 | 6E-08 | 0.03 | No unacceptable exposures to lead. | NA | NA | NFA |
| Construction Worker (future land use) | Sump/Pit - 27SB056 | 6E-12 | 2 | No unacceptable exposures to lead. | NA | Incidential ingestion of manganese | Proceed to CMS or Interim Measures |
| Construction Worker (future land use) | Sump/Pit - 27SB057 | 8E-12 | 7 | No unacceptable exposures to lead. | NA | Incidential ingestion of manganese | Proceed to CMS or Interim Measures |
| Construction Worker (future land use) | Sump/Pit - 27SB066 | 3E-06 | 0.2 | Unacceptable exposures to lead. | NA | Incidential ingestion of lead | Proceed to CMS or Interim Measures |
| Terrestrial Plants and Invertebrates | Surface Soil | NA | NA | NA | Acceptable | NA | NFA |
| Mammals and Birds | Surface Soil | NA | NA | NA | Acceptable | NA | NFA |
| **Investigation Area 2** | | | | | | | |
| Construction Workers (future land use) | Surface Soil | No carcinogenic COPCs | 0.3 | No unacceptable exposures to lead. | NA | NA | NFA |

**TABLE ES-1**

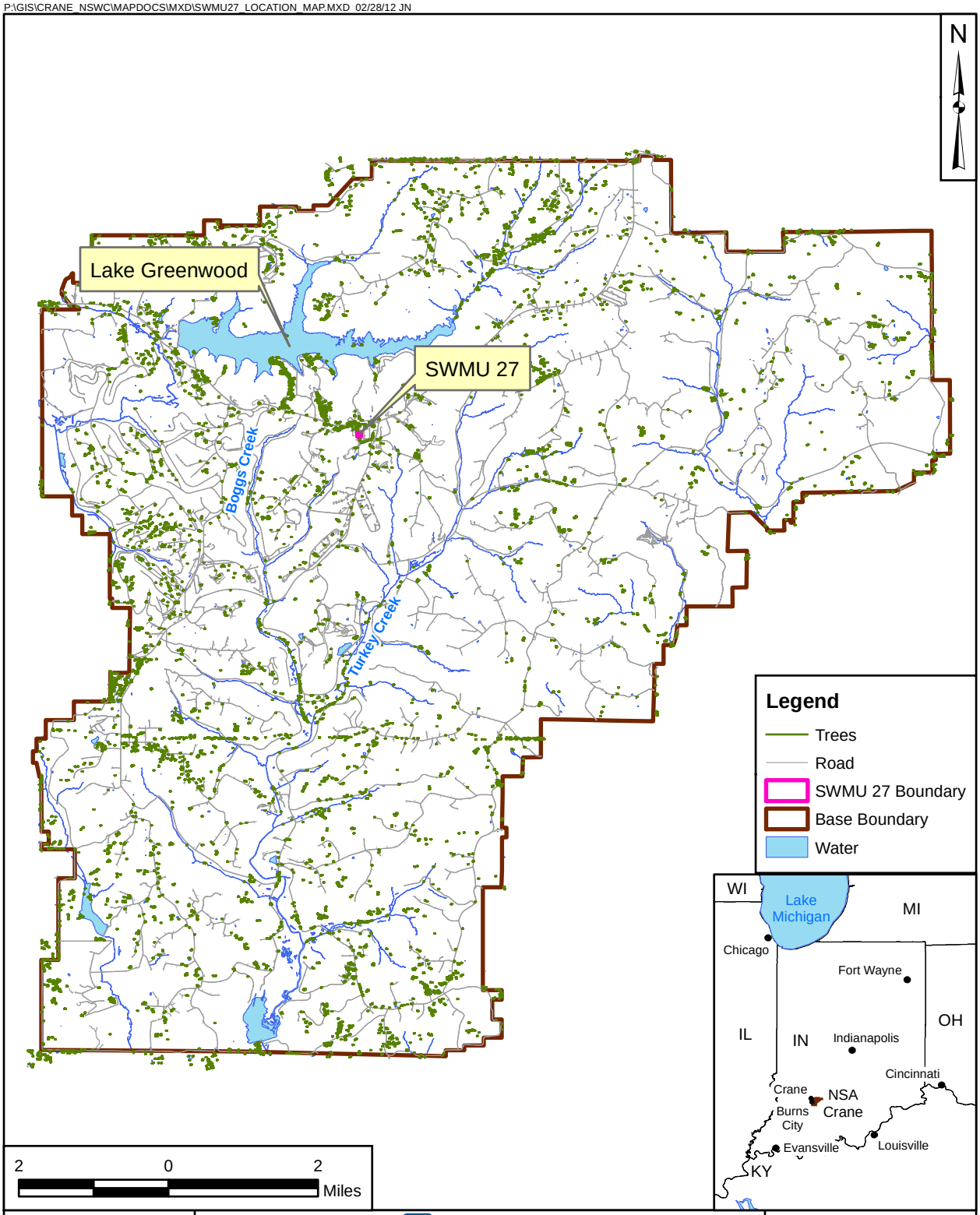
**SUMMARY OF RECEPTOR-SPECIFIC HUMAN HEALTH RISKS AND HAZARDS, ECOLOGICAL RISKS, AND RECOMMENDATIONS**
**SWMU 27 - RFI REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| Receptor Population | Environmental Medium | Overall Carcinogenic Risk (Human) | Overall Hazard Index (Human) | Lead Exposure (Human) | Overall Risk (Ecological) | Critical Pathways and Chemicals of Concern | Recommendations |
|---|---|---|---|---|---|---|---|
| Industrial Workers (current and future land use) | Surface Soil | No carcinogenic COPCs | 0.02 | No unacceptable exposures to lead. | NA | NA | NFA |
| Small Child (0 to 6 years) Recreational User (future land use) | Surface Soil | No carcinogenic COPCs | 0.01 | No unacceptable exposures to lead. | NA | NA | NFA |
| Adult Recreational User (future land use) | Surface Soil | No carcinogenic COPCs | 0.002 | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Children) (future land use) | Surface Soil | No carcinogenic COPCs | 0.2 | No unacceptable exposures to lead. | NA | NA | NFA |
| On-base Residents (Adult) (future land use) | Surface Soil | No carcinogenic COPCs | 0.02 | No unacceptable exposures to lead. | NA | NA | NFA |
| Terrestrial Plants and Invertebrates | Surface Soil | NA | NA | NA | Acceptable | NA | NFA |
| Mammals and Birds | Surface Soil | NA | NA | NA | Acceptable | NA | NFA |

NA = Not applicable.
NFA = No further action.

CMS = Corrective Measures Study.
COPC = Chemical of potential concern.

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU27_LOCATION_MAP.MXD 02/28/12 JN




| | | | |
|---|---|---|---|
| DRAWN BY K. MOORE | DATE 09/26/08 | TETRA TECH | CONTRACT NUMBER CTO F276 |
| CHECKED BY J. DUCAR | DATE 02/28/12 | SITE LOCATON MAP<br>SWMU 27 - ILLUMINATION BUILDING 126<br>NSA CRANE<br>CRANE, INDIANA | OWNER NO. ___ |
| REVISED BY J. NOVAK | DATE 02/28/12 | | APPROVED BY ___ / DATE ___ |
| SCALE AS NOTED | | | FIGURE NO. FIGURE ES-1 / REV 0 |

# 1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) of Solid Waste Management Unit (SWMU) 27 (Illuminant Building 126) at the Naval Support Activity (NSA) Crane facility, located in Crane, Indiana, was performed through the United States Naval Facilities Engineering Command Midwest (NAVFMW) under Contract Task Order (CTO) F276, for the Comprehensive Long-Term Environmental Action Navy (CLEAN), Contract Number N62470-08-D-1001.

SWMU 27 is contained within the boundary of NSA Crane and is located in the central-northwest portion of the base. SWMU 27 is designated as RCRA SWMU 27/00. SWMU 27 consists of the industrial process area in the general vicinity of Illuminant Building 126 (see Figure 1-1). For the purpose of the RFI two discrete Investigation Areas (IAs): IA 1, the Pyrotechnic Production Area (PPA); and IA 2, the former Flare Test Area were established. IA 1 encompasses all of SWMU 27, and IA 2 consists of a smaller area north of SWMU 27.

No previous RFI reports have been prepared for SWMU 27. However, a voluntary interim measure was performed at UXO 8, which is contained within the footprint of the PPA (Tetra Tech, 2011a).

## 1.1 PURPOSE OF THIS REPORT

The purpose of this RFI Report is to present and interpret the results of the investigation of the PPA and former Flare Test Area; evaluate the potential human health risk associated with these two areas; and evaluate the potential ecological risk associated with the drainageways outside the fenced area of the PPA. The risk assessments were performed using the data collected during the April and August 2011 field investigations.

This RFI was conducted in accordance with applicable RCRA corrective action requirements, including the need for RFIs to be conducted at the NSA Crane. Investigation requirements are specified in the NSA Crane RCRA hazardous waste management permit, originally issued by the United States Environmental Protection Agency (USEPA) on December 29, 1989 and renewed in September 2009 (USEPA, 2009a). This current investigation provides data on select organic and inorganic chemical concentrations in surface soils and subsurface soils in IA 1 and IA 2. The investigation was conducted in accordance with the Sampling and Analysis Plan (SAP) for SWMU 27 (Tetra Tech, 2011), which was approved by the Indiana Department of Environmental Management (IDEM).

### 1.1.1 Project Objectives

The objectives of this RFI were to: conduct site characterization and environmental sampling activities to determine if contamination is present, and if present, determine the nature and extent of contamination, complete a baseline human health risk assessment (HHRA) for IA 1 and IA 2, complete a screening-level ecological risk assessment (SERA) for the drainageways outside of the PPA fenceline, and to use this information to draw conclusions about whether further activities are warranted at the site.

### 1.1.2 Project Problem Statement

Because operationally-related chemical releases occurred at SWMU 27, human receptors within the SWMU boundary and ecological receptors outside the fenceline could be exposed to unacceptable risks. The risks are expected to be confined primarily to solid media because only minimal airborne release pathways (e.g., occasional minor resuspension of dust or release of volatile chemicals) are anticipated. Contamination within the catch basins/pits was not considered in the risk assessments because only inactive catch basins/pits were sampled to determine whether they required any remedial action.

The degree of risk to a human or ecological receptor is based on the nature of contamination and the frequency, duration, and nature of exposure to contaminants. Consequently, it is important to understand where receptors could be exposed to the contaminants. This requires that the extent of contamination be established. In this context, extent was established relative to numerical risk-based criteria. Risk evaluations were conducted for humans within IA 1 and IA 2, and for ecological receptors in contaminated areas within the drainageways outside the PPA fenceline to determine whether risks posed by exposure of those receptors to site contaminants are unacceptable. Plausible land use scenarios were considered when identifying the receptors that could be at risk.

### 1.1.3 Organization of the Report

This report was prepared following the standard RFI Report format. Section 1.0 of the report is the introduction, including the project scope, objectives, and background information. Section 2.0 describes field sampling activities and procedures associated with the data collection described in the approved Uniform Federal Policy Sampling and Analysis Plan (UFP-SAP) (Tetra Tech, 2011b). Section 3.0 is a summary of the data evaluation procedures and a summary of data quality for the data collected as part of this investigation. Section 4.0 describes the site characteristics, including topography, climate, geology, hydrology, ecology, etc. Section 5.0 presents an evaluation of the nature and extent of contamination detected at IA 1 and IA 2. Section 6.0 presents the conceptual site model. Sections 7.0

and 8.0 present the human health and ecological risk evaluations, respectively. Supporting documentation for this report is attached as Appendices A through G.

## 1.2 BACKGROUND

### 1.2.1 Facility Location and Description

NSA Crane is located in a rural, sparsely populated region of south-central Indiana, approximately 75 miles southwest of Indianapolis, 60 miles northwest of Louisville, Kentucky, and immediately east of Burns City and Crane Village, Indiana (Figure ES-1). NSA Crane encompasses approximately 62,463 acres or approximately 98 square miles of the northern portion of Martin County, and smaller portions of Greene and Lawrence Counties.

The PPA (IA 1) is trapezoid shape (see Figure 1-1) that is bounded by Highway 5 on the north and Highway 99 on the south. The PPA is an active production facility with a chain link fence bordering the area. Access is controlled by two locked gates: one on the north and the other on the east side of the fence. The PPA produces pyrotechnics devices such as flares. IA 1 covers approximately 31 acres. The majority of the area is located within a restricted access fence (see Figure 1-2). While most of NSA Crane is forested, IA 1 is industrialized. This industrialized area does not support ecological receptors; therefore, this RFI only evaluated affected human receptors within the fenced area of the PPA. The southern, western, and northwestern portions of IA 1 are grassland (see Figure 1-2). As shown on Figure 1-2, the highest elevation within the PPA [800 feet above mean sea level (msl)] is the manmade mound for the PPA Wastewater Treatment Plant (WWTP) (Building 3064). Surface water in this area flows towards Highway 99. The nearest streams are to the west and drain into the Boggs Creek Watershed. Turkey Creek is east of the PPA, but drain swales and local topography convey surface flow in the PPA to the south and west (near the point where the railroad track crosses Highway 99).

The former Flare Test Area (IA 2) is a triangle-shaped area (see Figure 1-1) that is located north of Highway 5. IA 2 covers approximately 7.4 acres and is not a fenced area (See Figure 1-3). Approximately half of IA 2 is currently used for vehicle parking, approximately one-fourth of the area is wooded, and the remaining one-fourth is grass and/or gravel. The exact location of former flare testing activities is unknown; therefore, three potential flare test areas were investigated. Surface water from IA 2 drains into channels that parallel the north side of Highway 5 or down the culvert north of the area.

Physical structures including buildings and concrete catch basins/pits are present throughout the PPA (see Figure 1-2). The buildings include: pyrotechnic production (Buildings 122, 123, 126, 130, and 2697),

red phosphorous pressing house (Building 133), laboratory (Building 127), plating and maintenance building (Building 1884), phosphorous mixing buildings (Buildings 1885 and 1886), a WWTP (Building 3064), numerous storage magazines/buildings, curing buildings, and miscellaneous inactive buildings. The process water from various concrete basins/pits located throughout the PPA previously flowed to surface water drainage channels that are known to have overflowed onto surface soil. Additionally, empty containers are stored west, east, and southeast of Buildings 1885 and 1886.

Condensate from steam traps and condensate collection systems flows onto surface soil west of Building 126, north of Building 2697, south of Building 3296, and west of Building 122. Various surface drains with unknown discharge points exist throughout the PPA (north of Building 122, southwest of Building 1884, north of Building 127, southeast of Building 3297, and west of Building 133.

Four electrical transformer areas are located throughout the PPA (see Figure 1-2). An electrical transformer labeled as containing PCBs is located on a concrete pad north of Building 126; a second electrical transformer labeled as containing PCBs and Wecosol (a perchloroethylene coolant used in certain Westinghouse transformers) is located on a concrete pad west of Building 124. A former electric substation that contained PCB transformers was located in the current fenced area across the road west of Building 133. A transformer located near the north entrance to IA 1 is suspected to be a replacement for a transformer that may have contained PCBs.

### 1.2.2 History of NSA Crane Ownership and Operations

NSA Crane provides materiel, technical, and logistical support to the Navy for equipment, weapons systems, and expendable and non-expendable ordnance items. Early in 1940, Congress passed the first supplemental National Defense Appropriation Act. This act provided 5 million dollars for new inland ammunition production facilities, 3 million dollars of which were earmarked to build a Navy ammunition depot at Burns City on the site of the White River Project. Factors weighing in favor of the Burns City site were that it was a remote location that was free of congested areas, it had hilly terrain ideal for magazine construction and camouflage, it was near Lake Greenwood that could supply water for the facility, and that it was a far distance from the eastern seaboard, which minimized the danger of enemy attack.

The facility was commissioned on December 1, 1941 as the Naval Ammunition Depot (NAD), Burns City. Its initial mission was to prepare, load, renovate, receive, store, and issue all types of ammunition, including pyrotechnics and illuminating projectiles; and act as a principal supply source at a most critical time during the early days of World War II. In May 1943, the depot was renamed the Naval Ammunition Depot, Crane, in honor of Commodore William Montgomery Crane, the Navy's first chief of the Bureau of

Ordnance. The name changed again in 1975 to the Naval Weapons Support Center (NWSC) Crane to reflect the facility's growing involvement in high-technology weapons systems. In 1977, the Secretary of Defense combined all conventional ammunition acquisition under the responsibility of a single service. The ammunition production and storage function was given to the Army, and the Crane Army Ammunition Activity (CAAA) was established as a Crane tenant to accomplish this task for Naval ammunition. In 1992, based on changing missions and alignment, the facility name was changed back to NWSC Crane.

The Army has assumed ordnance production, storage, and related responsibilities under the single-service management directive. All environmental activities on the installation, including permitting activities, remain the responsibility of the Navy. Although ordnance production and storage are still on base, Crane serves a modern and sophisticated Navy as a recognized leader in diverse and highly technical product lines, such as microwave devices, acoustic sensors, small arms, microelectronics technology, and more. The Army currently exists as a tenant activity on the base, as do other major branches of the Department of Defense, the U.S. Coast Guard (Department of Transportation), and the Defense Reutilization and Marketing Operations (DRMO).

### 1.2.3 Operational History of the SWMU 27

The PPA consists of a complex of buildings, the majority of which were designed and built during World War II for the exclusive purpose of loading, assembling, and packing star shell ammunition to supply both the Atlantic and Pacific fleets with a variety of pyrotechnic devices including illuminating projectiles, parachute flares, and star shells (see Figure 1-2). The star shell, primarily a 5-inch illuminating round with a parachute, required significant support facilities. The various steps of the star shell production process were performed in the following buildings:

- Building 121 (second floor) was used for parachute fabrication.
- Buildings 123, 124, and 125 were used for metal part generation (machining and assembly).
- Building 126 (Illuminant Building) was used for preparation of the illumination composition and its pressing into "candles".

- Building 122 was the final assembly building where the candle (pyrotechnic package) was inserted into the projectile, the parachute was attached and packed, and the whole round was packed out for rail shipment from the plant.

- Several smaller buildings that surround Building 126 were used for chemical storage, candle curing, ready magazines, and inert support warehouses necessary to maintain the process.

Additional buildings were constructed in the PPA after 1942 to support the war effort and later operations, and were used for the production of:

- Marker flares, rescue flares, parachute flares.
- Illuminating projectiles, incendiaries.
- Smoke signals, spotting charges.
- Ground and aircraft signals, submarine signals.
- Aircraft signal cartridges and depth charge markers.

The majority of Naval experimental work associated with pyrotechnic devices was conducted at the NSA Crane PPA.

Illuminant Building 126 is classified as an Installation Restoration (IR) program site by the Navy. According to descriptions of this IR site, red phosphorus was discharged to sump pits where it would overflow to tributaries of Boggs Creek. Heavy metal contamination from zinc and cadmium has also been identified in open ditches that eventually drain into Boggs Creek. No remedial investigations have been performed at this IR site; therefore, the extent and location of potential contamination have not been delineated. One outdoor burning area was located near Building 126, and another area was located north of Highway 5. Open burning operations at SWMU 27 ceased in 1971. These “open burning” areas were testing areas for specific pyrotechnic devices to verify burning times for illumination flares, to confirm the produced colors, relative opacity, and burning times for smoke-generating pyrotechnics, and to check the performance of ignition devices as related to the military specifications for the tested pyrotechnic items.

A metal-plating shop utilizing metals, caustics, acids, and cyanides has been operating on the eastern edge of the PPA (Building 1884). Process wastewaters and rinsates were at one time discharged to open ditches and later to building sumps that may have overflowed into ditches that drain to the south and west into the Boggs Creek watershed. Heavy metal contamination (zinc and cadmium) has been detected in

wastewater that was previously discharged into open ditches. Currently, the treated wastewater from metal-plating operations is discharged to the sanitary sewer system under a National Pollution Discharge Elimination System (NPDES) permit.

The following summarizes the site-specific information in the Navy's NORM (normalized) database and other relevant SWMU 27 information from NAVFAC:

- Contamination at this site included red phosphorus, chlorate, dyes, oxidizers, and fuels for flares and smoke munitions. Although red phosphorus is probably the most significant contaminant, it is not of concern because red phosphorus does not linger in the environment and is assigned to the unproblematic environmental category.

- Building 126 used sump pits that were pumped out by trucks, and the pumped materials were taken to the burning grounds.

- All sump overflows from Building 1884 (and Building 126) drained into the Boggs Creek watershed.

- A metal-plating shop that used heavy metals, caustics, acids, and cyanide-based processes is present at the site, and significant heavy metal contamination (zinc and calcium) has been detected in wastewater being discharged into open ditches. Since November 1992, the plating shop has not used cyanide.

- Two previous burn areas have been identified: one behind Building 126, and one across Highway 5 (PPA). Burning in those areas ceased about 1971.

**Historic Fire/Incidents**

Building 127 was initially used as a supporting laboratory for the work in Building 126. In the 1960s, the northern end of Building 127 housed a burn chamber where experiments were conducted to evaluate the relationship of candle density to illuminating round performance. An explosion occurred when a burn was being conducted with a very low density press loaded candle, and the explosion destroyed the burn chamber.

A Former Curing Building was located north of Building 126 where candles were cooked off and cured. The Former Curing Building was destroyed by a fire in the late 1980s that was traced to a malfunctioning

heating unit that overheated. Building 3298 is located in the same general location as the destroyed curing building.

A flash fire occurred in Building 130 (phosphorus weighing building) sometime in the 1960s when an employee attempted to empty red phosphorus from a barrel. The post-incident investigation indicated that although the plastic bag lining the barrel was not conductive, the red phosphorus fines inside the bag generated a spark that ignited the red phosphorus.

A flash fire occurred in Building 1886 sometime in the 1960s during experimental procedures to improve the mixing effort. Red phosphorus, boron, lead dioxide, and a binder material were added into a mixer bowl in an order that differed from the test procedure.

### 1.2.4 Previous Investigations

One environmental investigation was conducted within the fenced area of SWMU 27 at UXO 8 under the Munitions Response Program (MRP) by Tetra Tech in August 2010. Based on the investigation, an interim remedial action was conducted in August 2011 to remove two small (6 feet by 6 feet by 4 feet deep) concrete basins near Building 126 (Tetra Tech, 2011a).

Twelve soil samples collected outside the basins and inside residues were tested for perchlorate, explosives, and dyes. The highest detected perchlorate concentration was 5.5 µg/kg, which is well below a residential human health exposure screening criteria developed by the Indiana Department of Environmental Management (IDEM). All twelve samples had detections of explosive constituents, but all were well below applicable exposure criteria. Solvent Green 3 dye was detected at significant concentrations in the residues of both basins, and at a concentration above the Project Action Limit (PAL) in one soil sample.

An interim removal action was performed in August 2011 in which the basins and the residues were removed and/or recycled, and IDEM accepted the finding of No Further Action for UXO 8. IDEM agreed with the conclusion that following the removal of the pits (concrete basins and the contained residues), the single sample detection of dye in soil would not represent a meaningful concern. UXO 8 has now been closed.

In addition, in 1987, a Preliminary Review/ Visual Site Inspection (PR/VSI) Report by A.T. Kearney stated that potential releases to the soil for SWMU 27 may: (1) present complete exposure pathways to human receptors; and/or (2) serve as a source of contamination to groundwater and present complete exposure

pathways to human receptors through those routes. However, the PR/VSI Report concluded that there are low release potentials to surface water because of the sanitary sewer system discharge (A.T. Kearney, 1987).

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU_27_SITE_MAP.MXD 03/08/12 JN




SITE LOCATION
IA 1 AND IA 2
SWMU 27 - ILLUMINANT BUILDING 126
NSA CRANE
CRANE, INDIANA

CONTRACT NUMBER
F276

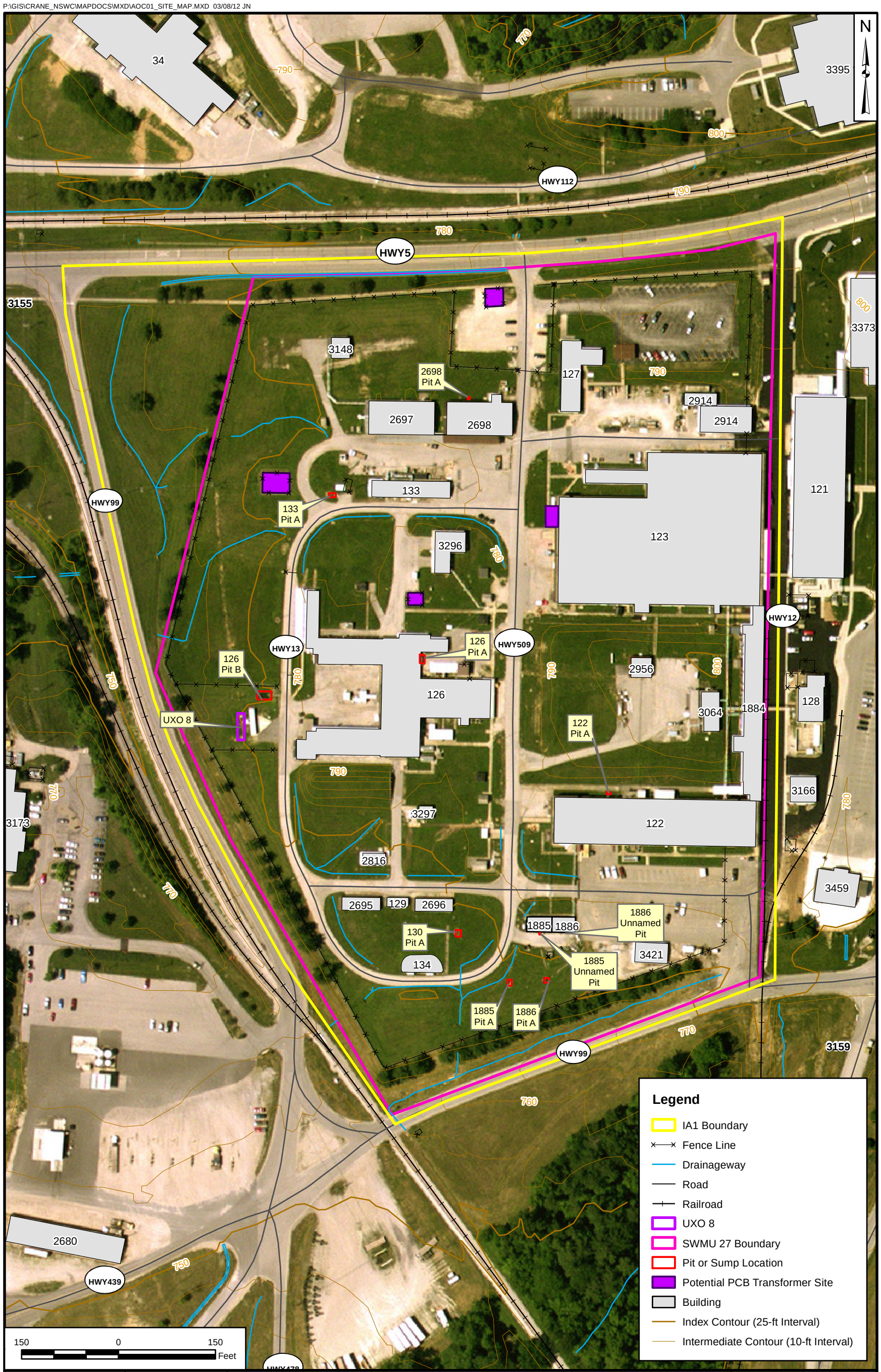
APPROVED BY — DATE —
APPROVED BY — DATE —

FIGURE NO. FIGURE 1-1 REV 0

NAVFAC

DRAWN BY T. WHEATON DATE 10/16/09
CHECKED BY J. DUCAR DATE 03/08/12
COST/SCHEDULE-AREA —
SCALE AS NOTED

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\AOC01_SITE_MAP.MXD 03/08/12 JN




| DRAWN BY | DATE |
|---|---|
| T. WHEATON | 10/16/09 |
| CHECKED BY | DATE |
| J. DUCAR | 03/08/12 |
| REVISED BY | DATE |
| J. NOVAK | 03/08/12 |
| SCALE | |
| AS NOTED | |

NAVFAC

IA 1 - PYROTECHNIC PRODUCTION AREA

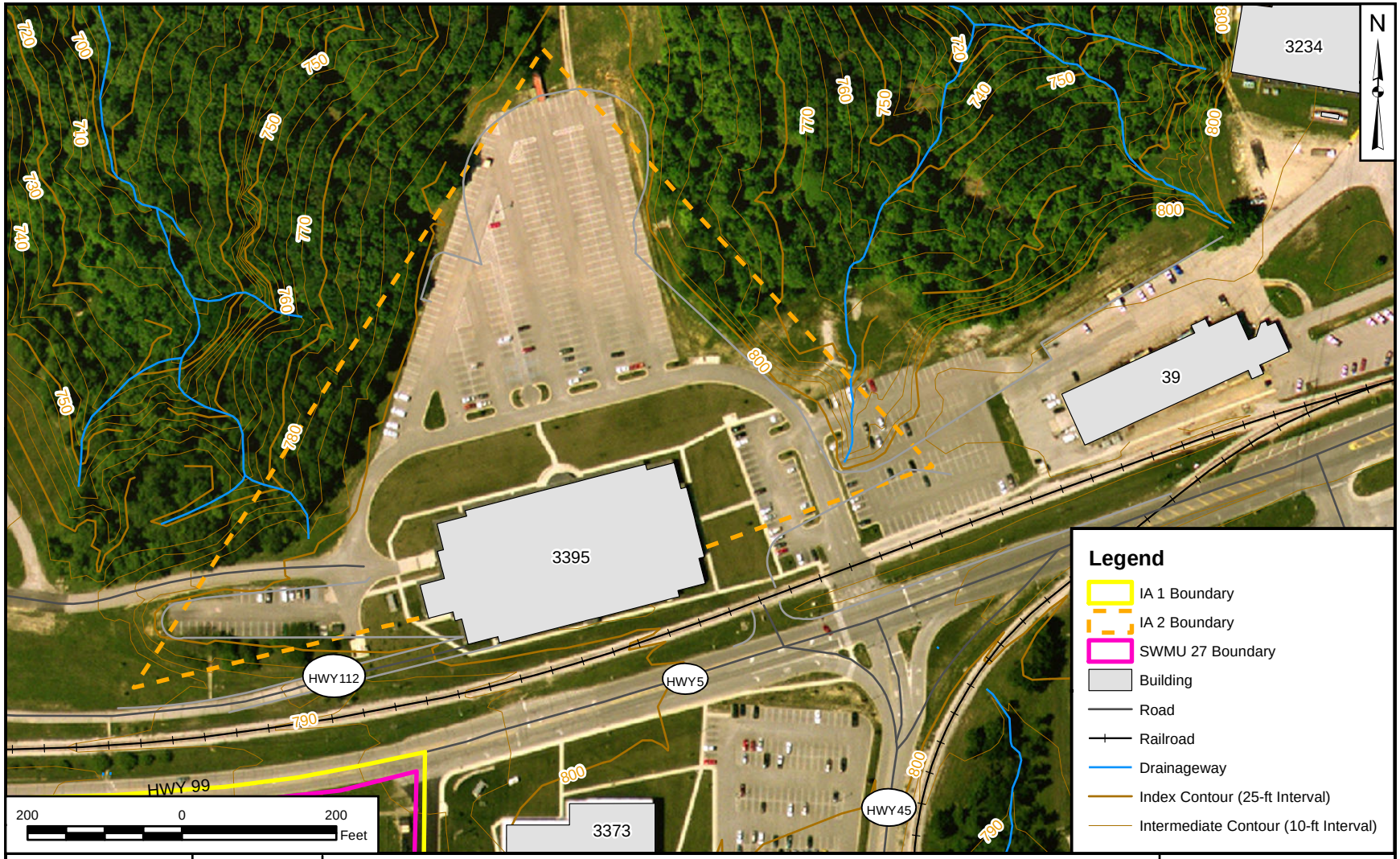
SWMU 27 - ILLUMINANT BUILDING 126

NSA CRANE

CRANE, INDIANA

| CONTRACT NUMBER | |
|---|---|
| F276 | |
| APPROVED BY | DATE |
| ___ | ___ |
| APPROVED BY | DATE |
| ___ | ___ |
| FIGURE NO. | REV |
| FIGURE 1-2 | 0 |

P:\GIS\CRANE\NSWC\MAPDOCS\MXD\SWMU27_NORTH.MXD 03/08/12 JN




| DRAWN BY | DATE |
|---|---|
| J. ENGLISH | 09/28/09 |
| CHECKED BY | DATE |
| J. DUCAR | 03/08/12 |
| REVISED BY | DATE |
| J. NOVAK | 03/08/12 |
| SCALE | |
| AS NOTED | |

NAVFAC

SWMU 27 - ILLUMINANT BUILDING 126
IA 2 - FLARE TEST AREA
NSA CRANE
CRANE, INDIANA

| CONTRACT NUMBER | |
|---|---|
| F276 | |
| APPROVED BY | DATE |
| ___ | ___ |
| APPROVED BY | DATE |
| ___ | ___ |
| FIGURE NO. | REV |
| FIGURE 1-3 | 0 |

# 2.0 FIELD INVESTIGATION

This section describes the sampling activities, procedures, and documentation utilized during the field activities performed in April and August 2011 at NSA Crane, SWMU 27.

## 2.1 OVERVIEW

SWMU 27 (Illuminant Building 126) is contained within the boundary of NSA Crane and is located in the central-northwest portion of the base. SWMU 27 is located within the industrial process area in the general vicinity of Illuminant Building 126, including two discrete IAs: IA 1 - the PPA, and IA 2 - the former Flare Test Area. IA-1 consists of: former PCB transformer sites, various concrete basins/pits that previously flowed to surface water and may have overflowed onto surface soil, and other areas of concern where fires and explosions have occurred in the past and where PCBs may have been released into the local environment. IA-2 consists of former flare test areas. The field sampling events included surface and subsurface soil sampling and interior sump or pit residue sampling. Samples were collected via hand auger, hand trowel or stainless steel beaker, and direct-push technology (DPT). Table 2-1 presents the collection method and lab analysis summary for each sample. A temporary groundwater monitoring well was proposed for installation at SWMU 27; however, because bedrock was encountered at the site at a very minimal depth [approximately 5 feet below ground surface (bgs)], the well was not installed.

All work performed for this field investigation was conducted in accordance with the procedures and methodologies described in the IDEM-approved SAP (Tetra Tech, 2011b). Standard Operating Procedures (SOPs) that governed the field work are included in Appendix B of the approved SAP. Sample log sheets, field documentation, and photographs associated with this field investigation are provided in Appendices A through C of this document.

## 2.2 MOBILIZATION/DEMOBILIZATION

Following approval of the SAP, Tetra Tech personnel began mobilization activities on April 7, 2011. All field team members reviewed the approved SAP, associated appendices, and Health and Safety Plan (HASP) prior to the start of project activities. In addition, the Field Operations Leader (FOL) held a field team orientation meeting to ensure that personnel were familiar with the scope of the field activities.

Prior to the initiation of fieldwork, the FOL arrived at the site and began on-site mobilization activities. These activities included coordination with NSA Crane personnel, and utility clearance of all proposed boring locations through the Indiana Underground Plant Protection Service (IUPPS). The equipment

required for the field activities was shipped to the site. At the conclusion of field activities, the FOL completed the decontamination and demobilization of all equipment.

## 2.3 SITE INVESTIGATION METHODOLOGIES AND PROCEDURES

### 2.3.1 Sample Collection Methods

Samples from SWMU 27 were collected by hand auger, hand trowel/stainless steel beaker, or DPT during this field investigation.

**Hand Auger**

Hand augering involves manually turning a 2.5-inch stainless steel auger bucket into the ground surface to the desired sample depth. All hand augered soil borings at SWMU 27 were advanced to the desired depth unless refusal was encountered prior to that depth. If refusal was encountered, the auger was removed and repositioned nearby until the desired depth was obtained. The auger bucket was decontaminated in the field between each sample location.

**Hand Trowel/Stainless Steel Beaker**

Sampling of the residue within the sumps/pits was accomplished by use of a plastic disposable hand trowel or a stainless steel beaker depending on the depth of the basin. For basins only a few feet deep, the hand trowel was utilized to collect the sample; and for basins greater than a few feet deep, a stainless steel beaker attached to a metal pipe was utilized for scooping up the sample material. A new disposable hand trowel was used at each sample location, and the stainless steel beaker was decontaminated in the field between each sample location.

**DPT**

DPT was utilized to collect samples at depth from all other areas where access permitted its use. A new acetate liner was pushed into the soil to the desired depth. Upon removing the sample sleeve, it was cut open to allow access to the sample. The field collection team scanned the length of the core for VOCs utilizing a photoionization detector (PID). The sample core was also visually inspected for any visible signs of contamination (i.e., staining). If soil staining was encountered or elevated PID readings were recorded, the VOC sample was collected from this area; otherwise, the VOC sample was collected from the liner as stated below.

- From 0 to 1 foot bgs, if neither the PID readings were greater than background nor any visible discoloration was observed, the VOC sample was collected at 6 inches from the top of the soil core.

- From 0 to 2 feet bgs, if neither the PID readings were greater than background nor any visible discoloration was observed, the VOC sample was collected from three-fourths the distance from the top of the soil core.

- From greater than 2 feet bgs (e.g., subsurface samples), if neither the PID readings were greater than background nor any visible discoloration was observed, then the VOC sample was collected from three-fourths the distance from the top of the soil core.

For samples other than VOCs, the material from the sleeve was initially placed in a disposable plastic bag where it was thoroughly homogenized prior to collecting the sample and placing it in the appropriate sample container.

### 2.3.2 Sample Logging

A soil sample log sheet was maintained for each sample collected during the SWMU 27 RFI. The sample log sheets contained the following information as appropriate:

- Sample location and sample ID.
- Name of person(s) collecting the sample.
- Sample depth, date, and time.
- Brief soil or residue material description.

All soil sample log sheets and chain-of-custody forms are included in Appendix A of this report.

## 2.4 SAMPLING OPERATIONS

A total of 71 samples were collected at SWMU 27 in accordance with SOP-07 (Soil Coring and Sampling Using Hand Auger Techniques) and SOP-11 (Subsurface Soil Sampling Using DPT) of the approved SAP (Tetra Tech, 2011b). Typically, surface soil samples (from 0 to 2 feet bgs) were collected with a hand auger and the sample material was placed in the appropriate sample jars. Soil from drainageways/channels (from 0 to 1 feet bgs) was collected with a hand auger, and sample jars were filled using a dedicated disposable plastic trowel. Subsurface soil samples were collected using a DPT rig. The subsurface soil borings were described by the Site Geologist in accordance with SOP-08 (Soil Sample

Logging) of the approved SAP (Tetra Tech, 2011b), and were screened for evidence of contamination with a PID. Use of the PID was in accordance with the manufacturer's instructions. Any qualitative visual signs of potential contamination (such as soil staining) were noted on the soil sample log.

**Composite vs. Grab Samples**

All collected soil samples at SWMU 27 were categorized as either a composite sample or a grab sample. A composite sample consisted of 2 to 6 aliquots from a single area (i.e., catch basin). The number of aliquots was dependent on the size of the catch basin or PCB transformer concrete pad. Each aliquot was initially placed into a 1-gallon disposable plastic bag and thoroughly homogenized. A portion of each aliquot was then placed into a single 1-gallon disposable plastic bag and again thoroughly homogenized. A portion of the sample material was then placed into the appropriate sample jar. Composite samples were typically collected from within and around the catch basins. A grab sample consisted of an individual sample collected at a single location. The sample material was placed into a 1-gallon disposable plastic bag and thoroughly homogenized. A portion of the sample material was then placed into the appropriate sample jar. Grab samples were typically collected down gradient from the catch basins and in the drainage channels.

Excess sample material was returned to the area from which it was collected. For soil borings, the material was placed back in the boring and then topped off with bentonite chips, as necessary.

A Global Positioning System (GPS) unit was used to locate sample locations not associated with a specific catch basin. Upon completion of the SWMU 27 sampling event, all sample locations were re-visited and GPS coordinates were collected. All sample locations are presented on Figure 2-1.

### 2.4.1 Former PCB Transformer Sites

Fourteen composite and four grab PCB samples were collected from 17 locations at SWMU 27 around four separate PCB transformer areas. The composite samples consisted of 2 to 6 individual aliquots collected along each available side of the concrete transformer pad. All samples were collected at a depth of 2 feet bgs, except 27SB055G0406, which was collected at 4 to 6 feet bgs.

Composite surface soil samples 27SS043C0002, 27SS044C0002, 27SS045C0002, 27SS046C0002, 27SS047C0002, and 27SS048C0002 were collected around a fenced area of SWMU 27 that formerly contained PCB transformers. This former transformer storage area is located west of and across the road from Building 133 (see Figure 2-1). Two composite samples were collected from both the northern and

southern sides, and one composite sample was collected from both the eastern and western sides of the fenced area. Each composite sample consisted of four aliquots. The samples were shipped to Empirical Laboratories, Inc. (Empirical) for PCB analysis.

Composite surface soil samples 27SS049C0002, 27SS050C0002, 27SS051C0002, and 27SS052C0002 were collected from the PCB-labeled transformer located east of Building 3298 and north of Building 126 (see Figure 2-1). One composite sample was collected from each side of the concrete transformer pad. Three of the samples consisted of four aliquots, and the fourth consisted of 3 aliquots because of a large electrical line running from the transformer pad. The samples were shipped to Empirical for PCB analysis.

Grab samples 27SS053G0002, 27SS054G0002, and 27SS055G0002 were collected around the PCB-labeled transformer located west of Building 124 (see Figure 2-1). The east side of the concrete pad sits adjacent to Building 124; therefore, no sample was collected on that side. The individual discrete samples were collected from the north, south, and west sides of the concrete pad. Per the approved SAP (Tetra Tech, 2011b), a temporary groundwater monitoring well was proposed in the area southwest of this transformer pad; however, bedrock was encountered at approximately 5 feet bgs. Therefore, the temporary well was not installed, but an additional sample (27SS055G0406) was collected at the soil/bedrock interface at 4 to 6 feet bgs. The samples were shipped to Empirical for PCB and chlorinated solvents analysis.

Composite surface soil samples 27SS059C0002, 27SS060C0002, 27SS061C0002, and 27SS062C0002 were collected from the area around the new transformer at the western side of the main entrance to IA 1 (see Figure 2-1). Each composite sample location consisted of two aliquots. The samples were shipped to Empirical for PCB analysis.

### 2.4.2 Surface Ditches/Channels/Drainageways

Eleven discrete surface soil samples were collected from 11 locations within surface ditches, channels, and drainageways at SWMU 27. All samples were collected at a depth of 0 to 1 foot bgs.

Surface soil samples 27SS0001G0001 through 27SS008G0001 were all collected within surface ditches, channels, and drainageways at SWMU 27 in the area south of Highway 5 (see Figure 2-1). Surface soil samples 27SS058G0001 and 27SS063G0001 were collected in drainageways at SWMU 27 within IA 2 (see Figure 2-1). Surface soil sample 27SS009G0001 was initially collected in an incorrect location; therefore, sample 27SS063G0001 was added in the correct location. The samples were shipped to the lab for VOCs, perchlorate, and metals analysis. Sample 27SS002G0001 was also analyzed for cyanide.

### 2.4.3 Flare Test/Fire Incident Areas

One composite and 12 discrete soil samples were collected from nine locations within former and suspected flare test areas and historical fire incident areas at SWMU 27.

Composite surface soil sample 27SS010C0001 was collected in the area of the former laboratory flare test pad located north of Building 127 (see Figure 2-1). The composite sample consisted of three aliquots collected from the northern, western, and eastern sides of the former pad location. As shown on Figure 2-1, discrete surface soil samples 27SS011G0002 and 27SS012G0002 were collected from two locations north of Building 3297 where a fire incident reportedly occurred. Discrete surface soil samples 27SS013G0002 and 27SS014G0002 were collected from two locations northeast of Building 3395, and discrete surface soil samples 27SS015G0002 and 27SS016G0002 were collected from two locations north of Building 3395 in IA 2. Discrete surface and subsurface samples were collected at sample locations 27SS017 and 27SS018 in the parking lot southwest of Building 3395. Sample depths were 0 to 2, 2 to 4, and 4 to 6 feet bgs. All samples were shipped to Empirical for perchlorate and metals analysis.

### 2.4.4 Pits/Sumps

Nineteen composite and 10 discrete residue/soil samples were collected in and around the pits/sumps from former and suspected historical locations where overflows are suspected to have occurred at SWMU 27.

Composite surface soil samples were collected around the Building 130 Pit A (27SS019C0002), the Building 133 Pit A (27SS020C0002), the Building 1885 Pit A (27SS021C0002), and the Building 1886 Pit A (27SS022C0002) (see Figure 2-1). Each composite sample consisted of four aliquots collected from the northern, southern, eastern, and western sides of these pits. The samples were shipped to Empirical for analysis as shown in Table 2-1.

Composite surface soil samples were collected around the Building 2698 Pit A (27SS023C0002) and the Building 122 Pit A (27SS024C0002) (see Figure 2-1). Sample 27SS023C0002 was initially collected around a structure adjacent to the Building 2698 Pit A; therefore, sample 27SS064C0002 was added and collected within the Building 2698 Pit A. Each composite sample consisted of three aliquots collected from the northern, eastern, and western sides of these pits. The samples were shipped to Empirical for analysis as shown in Table 2-1.

Four composite surface soil samples (27SS025C0002 through 27SS028C0002) were collected around the Building 126 Pit B (see Figure 2-1). The composite samples collected on the northern, southern, and western sides of the pit consisted of four aliquots; while the composite sample collected on the eastern side of the pit consisted of 2 aliquots because of large rocks placed along this side for erosion control. The samples were shipped to Empirical for VOCs, perchlorate, and metals analysis as shown in Table 2-1.

Seven composite samples were collected from the chambers in the Building 122 Pit A (27SS029C0002), the Building 126 Pit A (27SS030C0002), the Building 130 Pit A (27SS031C0002), the Building 133 Pit A (27SS032C0002), the Building 1885 Pit A (27SS033C0002), the Building 1886 Pit A (27SS034C0002), and the Building 2698 Pit A (27SS035C0002). Sample 27SS035C0002 was initially collected incorrectly from a structure adjacent to the Building 2698 Pit A; therefore, sample 27SS066C0002 was added and collected within the Building 2698 Pit A. Each composite sample consisted of 4 to 6 aliquots. The aliquots were collected from each chamber within the pit, if possible; otherwise, the aliquots were collected from areas representative of the entire structure. The samples were shipped to Empirical for analysis as shown in Table 2-1.

Discrete subsurface soil samples were collected from each sump/pit/catch basin (e.g., structure) at a vertical boundary on the down gradient side that extended 2 feet below its identified depth. The depth of each sample was determined in the field, and was the difference between the internal sidewall height and external sidewall height plus 2 feet (i.e., 2 feet below the bottom of the structure). Samples were collected from the Building 122 Pit A (27SB036G0406), the Building 126 Pit B (27SB037G0507), the Building 130 Pit A (27SB038G0406), the Building 133 Pit A (27SB039G0709), the Building 1885 Pit A (27SB040G0406), the Building 1886 Pit A (27SB041G0406), and the Building 2698 Pit A (27SB042G0406) (see Figure 2-1). Sample 27SB042G0406 was initially collected downgradient of a structure adjacent to the Building 2698 Pit A; therefore, sample 27SB065G0406 was added and collected downgradient of the Building 2698 Pit A. The samples were shipped to Empirical for analysis as shown in Table 2-1.

Two grab samples were collected from the interior of the two small sumps south of Building 1885 (27SS056G0002) and Building 1886 (27SS057G0002) (see Figure 2-1). The samples were shipped to Empirical for VOCs, perchlorate, and metals analysis as shown in Table 2-1.

## 2.5 FIELD SAMPLE DOCUMENTATION

Sample documentation consisted of the completion of sample log sheets, chain-of-custody records, field logbooks, and health and safety documentation. The sample log sheets contain information such as sample location and sample identification number, container requirements and analyses to be performed, and sample type, time, and date. Any unusual circumstances encountered during sample collection were noted on the form. Sample log sheets can be found in Appendix A.1 of this document. Chain-of-custody forms (see Appendix A.2) were used to track each sample from collection to receipt and analysis at Empirical.

## 2.6 SAMPLE HANDLING, PACKAGING, AND SHIPPING

Sample handling activities included field-related considerations concerning the selection of sample containers, allowable holding times, sample custody, and maintaining samples at the appropriate storage temperature. All sample containers shipped to Empirical were sealed in plastic bags to minimize the possibility of breakage during transport. The sample containers were then placed in a cooler lined with a large plastic garbage bag and covered with ice. A temperature blank was placed in each cooler prior to shipment. Coolers containing samples for VOC analysis also contained a trip blank. The plastic garbage bag was sealed with a knot, and the chain-of-custody form was sealed in a Ziploc bag and taped to the inside of the cooler lid. A signed and dated custody seal was applied to each end of the cooler and then covered with strapping tape to provide a tamper-evident seal. A Federal Express air bill was applied to the shipping cooler. Tetra Tech maintained custody of the samples until they were relinquished to Federal Express. The Federal Express tracking number (air bill number) was recorded on the chain-of-custody form, and the sender's copy of the airbill was maintained for shipment tracking, if needed. All samples were shipped to Empirical for overnight delivery and were received within sample holding times.

## 2.7 QUALITY CONTROL SAMPLES

Quality Assurance/Quality Control (QA/QC) samples were generated and collected during sampling activities to monitor both field and lab procedures, in accordance with the approved SAP (Tetra Tech, 2011b). QA/QC samples consisted of field duplicates, equipment rinsate blanks, trip blanks, and temperature blanks, and are described below. Field duplicate results are tabulated in Appendix D of this document.

- Field Duplicates - consisted of a single sample split into two portions. Field duplicates were collected at the rate of 1 in 20 during this field investigation to assess the overall precision of the sampling and analysis program.

- Equipment Rinsate Blanks - obtained under representative field conditions by collecting the rinse water generated by running analyte-free water through or over sample collection equipment after decontamination and before use. When pre-cleaned, dedicated, or disposable sampling equipment was used (no decontamination was required), one equipment rinsate blank was collected as a batch blank. Equipment rinsate blanks were analyzed for the same chemical constituents as the associated environmental samples.

- Trip blanks - used to determine whether contamination of VOC samples had occurred during transit or storage. Trip blanks consisted of analyte-free water taken from the laboratory to the site and returned to the laboratory. One trip blank was submitted to the laboratory in each cooler that contained samples for VOC analyses and was analyzed for VOCs only.

- Temperature Blanks - used to determine if samples were adequately cooled during shipment. Temperature blanks consisted of analyte-free water poured into a clean sample container at the site or supplied by the fixed-based laboratory. One temperature blank was submitted to the laboratory in each cooler, and the temperature was checked upon receipt at the laboratory.

## 2.8 GPS

Each sample location at SWMU 27 was marked with a brightly covered pin flag pushed into the ground next to the boring. Northing and easting coordinates for each sample location were then logged by Tetra Tech personnel utilizing a Trimble XH GPS unit. This information is retained in the Tetra Tech main database and can be used as a reference if repeat sampling is required at any of the sample locations.

## 2.9 DECONTAMINATION

The non-dedicated, non-disposable equipment (i.e., hand augers) involved in field sampling activities was decontaminated before beginning work, between sample locations, and at the completion of field activities.

The following were the decontamination steps:

- Potable water and phosphate-free detergent wash (scrub if necessary)
- Potable water rinse
- Deionized (DI) water rinse

- Air dry (if possible)
- Wrap in aluminum foil (if not used immediately)

## 2.10 INVESTIGATION-DERIVED WASTE (IDW) HANDLING

The field investigation generated potentially contaminated wastes including personal protective equipment (PPE) and decontamination fluids. Management of each residue was performed as follows:

PPE – All PPE were double bagged and placed in NSA Crane trash receptacles (i.e., dumpsters).

Sampling Equipment Decontamination Fluids – All equipment decontamination fluids were collected and discharged to the NSA Crane permitted waste treatment plant.

Soil - All soil removed from a sample location that was not used as part of that sample was returned to its original boring.

## 2.11 SITE MANAGEMENT AND FACILITY SUPPORT

The FOL was designated as the lead in coordinating all day-to-day activities during the investigation. The FOL was responsible for ensuring that all field team members (including subcontractors) were familiar with the approved SAP and the HASP in effect during this field investigation. Additionally, the FOL was responsible for all sampling operations, QA/QC, field documentation requirements, and field change orders. The FOL reported to the Task Order Manager (TOM) on a daily basis regarding the status of fieldwork.

All site preparation, mobilization/demobilization, and sampling activities were coordinated through NSA Crane personnel through pre-visit communication, and meetings during the field work.

## 2.12 RECORDKEEPING

Records (i.e., field bog book) were maintained for the daily activities that took place during this field investigation. Other records including sample log sheets and chain-of-custody forms were also completed. Information recorded daily included field activities, weather conditions, identity and arrival and departure times of personnel, management issues, etc. Copies of daily activity records are included in Appendix B.

**TABLE 2-1**

**SAMPLE COLLECTION AND ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| SAMPLE LOCATION | SAMPLE IDENTIFICATION NUMBER | SAMPLE DATE | SAMPLE METHOD | SAMPLE DEPTH (feet bgs) | INVESTIGATION AREA | LABORATORY ANALYSIS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | VOCs (SW 846-8260B) | Perchlorate (SW 846-6850) | Cyanide (SW-846 9012A) | Metals (SW 846-6010C) | PCBs (SW 846-8082A) |
| 27SB001 | 27SS001G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB002 | 27SS002G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | X | X | |
| 27SB003 | 27SS003G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB004 | 27SS004G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB005 | 27SS005G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB006 | 27SS006G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB007 | 27SS007G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB008 | 27SS008G0001 | 4/7/2011 | HA | 0-1 | IA 1 | X | X | | X | |
| 27SB009 | 27SS009G0001 | 4/8/2011 | DPT | 0-1 | IA 2 | X | X | | X | |
| 27SB010 | 27SS010C0002 | 4/11/2011 | HA | 0-2 | IA 1 | | X | | X | |
| 27SB011 | 27SS011G0002 | 4/9/2011 | HA | 0-2 | IA 1 | | X | | X | |
| 27SB012 | 27SS012G0002 | 4/9/2011 | HA | 0-2 | IA 1 | | X | | X | |
| 27SB013 | 27SS013G0002 | 4/8/2011 | HA | 0-2 | IA 2 | | X | | X | |
| 27SB014 | 27SS014G0002 | 4/8/2011 | HA | 0-2 | IA 2 | | X | | X | |
| 27SB015 | 27SS015G0002 | 4/7/2011 | DPT | 0-2 | IA 2 | | X | | X | |
| 27SB016 | 27SS016G0002 | 4/7/2011 | DPT | 0-2 | IA 2 | | X | | X | |
| 27SB017 | 27SS017G0002 | 4/8/2011 | DPT | 0-2 | IA 2 | | X | | X | |
| | 27SB017G0204 | 4/8/2011 | DPT | 2-4 | IA 2 | | X | | X | |
| | 27SB017G0406 | 4/8/2011 | DPT | 4-6 | IA 2 | | X | | X | |
| 27SB018 | 27SS018G0002 | 4/8/2011 | DPT | 0-2 | IA 2 | | X | | X | |
| | 27SB018G0204 | 4/8/2011 | DPT | 2-4 | IA 2 | | X | | X | |
| | 27SB018G0406 | 4/8/2011 | DPT | 4-6 | IA 2 | | X | | X | |
| 27SB019 | 27SS019C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | | |
| 27SB020 | 27SS020C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB021 | 27SS021C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB022 | 27SS022C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |

**TABLE 2-1**

**SAMPLE COLLECTION AND ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| SAMPLE LOCATION | SAMPLE IDENTIFICATION NUMBER | SAMPLE DATE | SAMPLE METHOD | SAMPLE DEPTH (feet bgs) | INVESTIGATION AREA | LABORATORY ANALYSIS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | VOCs (SW 846-8260B) | Perchlorate (SW 846-6850) | Cyanide (SW-846 9012A) | Metals (SW 846-6010C) | PCBs (SW 846-8082A) |
| 27SB023 | 27SS023C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB024 | 27SS024C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | X | X | |
| 27SB025 | 27SS025C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB026 | 27SS026C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB027 | 27SS027C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB028 | 27SS028C0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB029 | 27SS029C0002 | 4/8/2011 | HA | 0-2 | IA 1 - Pit | X | X | X | X | |
| 27SB030 | 27SS030C0002 | 4/11/2011 | HT | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB031 | 27SS031C0002 | 4/8/2011 | HA | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB032 | 27SS032C0002 | 4/8/2011 | HA | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB033 | 27SS033C0002 | 4/8/2011 | HT | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB034 | 27SS034C0002 | 4/8/2011 | HT | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB035 | 27SS035C0002 | 4/8/2011 | HA | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB036 | 27SB036G0406 | 4/8/2011 | DPT | 4-6 | IA 1 | X | X | X | X | |
| 27SB037 | 27SB037G0507 | 4/8/2011 | DPT | 5-7 | IA 1 | X | X | | X | |
| 27SB038 | 27SB038G0406 | 4/8/2011 | DPT | 4-6 | IA 1 | X | X | | X | |
| 27SB039 | 27SB039G0709 | 4/7/2011 | DPT | 7-9 | IA 1 | X | X | | X | |
| 27SB040 | 27SB040G0406 | 4/8/2011 | DPT | 4-6 | IA 1 | X | X | | X | |
| 27SB041 | 27SB041G0406 | 4/8/2011 | DPT | 4-6 | IA 1 | X | X | | X | |
| 27SB042 | 27SB042G0406 | 4/7/2011 | DPT | 4-6 | IA 1 | X | X | | X | |
| 27SB043 | 27SS043C0002 | 4/7/2011 | DPT | 0-2 | IA 1 | | | | | X |
| 27SB044 | 27SS044C0002 | 4/7/2011 | DPT | 0-2 | IA 1 | | | | | X |
| 27SB045 | 27SS045C0002 | 4/7/2011 | DPT | 0-2 | IA 1 | | | | | X |
| 27SB046 | 27SS046C0002 | 4/7/2011 | DPT | 0-2 | IA 1 | | | | | X |
| 27SB047 | 27SS047C0002 | 4/7/2011 | DPT | 0-2 | IA 1 | | | | | X |
| 27SB048 | 27SS048C0002 | 4/7/2011 | DPT | 0-2 | IA 1 | | | | | X |

**TABLE 2-1**

**SAMPLE COLLECTION AND ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| SAMPLE LOCATION | SAMPLE IDENTIFICATION NUMBER | SAMPLE DATE | SAMPLE METHOD | SAMPLE DEPTH (feet bgs) | INVESTIGATION AREA | LABORATORY ANALYSIS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | VOCs (SW 846-8260B) | Perchlorate (SW 846-6850) | Cyanide (SW-846 9012A) | Metals (SW 846-6010C) | PCBs (SW 846-8082A) |
| 27SB049 | 27SS049C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB050 | 27SS050C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB051 | 27SS051C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB052 | 27SS052C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB053 | 27SS053G0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | | | | X |
| 27SB054 | 27SS054G0002 | 4/7/2011 | HA | 0-2 | IA 1 | X | | | | X |
| 27SB055 | 27SS055G0002 | 4/7/2011 | DPT | 0-2 | IA 1 | X | | | | X |
| | 27SB055G0406 | 4/8/2011 | DPT | 4-6 | IA 1 | X | | | | X |
| 27SB056 | 27SS056G0002 | 4/7/2011 | HT | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB057 | 27SS057G0002 | 4/7/2011 | HT | 0-2 | IA 1 - Pit | X | X | | X | |
| 27SB058 | 27SS058G0001 | 4/8/2011 | HA | 0-1 | IA 2 | X | X | | X | |
| 27SB059 | 27SS059C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB060 | 27SS060C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB061 | 27SS061C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB062 | 27SS062C0002 | 4/9/2011 | HA | 0-2 | IA 1 | | | | | X |
| 27SB063 | 27SS063G0002(1) | 4/11/2011 | HA | 0-2 | IA 2 | X | X | | X | |
| 27SB064 | 27SS064C0002(2) | 8/26/2011 | HA | 0-2 | IA 1 | X | X | | X | |
| 27SB065 | 27SS065G0406(2) | 4/27/2011 | HA | 4-6 | IA 1 | X | X | | X | |
| 27SB066 | 27SS066C0002(2) | 8/26/2011 | HA | 0-2 | IA 1 - Pit | X | X | | X | |

DPT = Direct-push technology
HA = Hand auger
HT = Hand trowel

IA 1 = Investigation Area 1
IA 2 = Investigation Area 2
SB = Soil boring

SS = Surface soil
C = Composite sample
G = Grab sample

(1) = Location added to replace SB009 which was incorrectly located in the field.
(2) = Locations added to replace SB023, SB035, and SB042 which had been collected from the wrong pit.

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU27_SAMPLE_LOCATION_MAP.MXD 03/08/12 JN

| DRAWN BY | DATE |
|---|---|
| S. PAXTON | 01/30/12 |
| CHECKED BY | DATE |
| J. DUCAR | 03/08/12 |
| REVISED BY | DATE |
| J. NOVAK | 03/08/12 |
| SCALE | |
| AS NOTED | |

NAVFAC

SAMPLE LOCATIONS
IA 1 AND IA 2
SWMU 27 - ILLUMINANT BUILDING 126
NSA CRANE
CRANE, INDIANA

| CONTRACT NUMBER | CTO NUMBER |
|---|---|
| | |
| APPROVED BY | DATE |
| APPROVED BY | DATE |
| FIGURE NO. FIGURE 2 - 1 | REV 0 |

# 3.0 DATA QUALITY REVIEW

A description of the data review processes used to determine whether laboratory analytical data were of acceptable technical quality for use in decision making is presented in this data quality review (DQR). The review began with data verification and validation. Verification is a process used to ensure that contractual requirements were satisfied. Validation is a comparison of data quality indicators (DQIs) against prescribed acceptance criteria to assess analytical method performance. DQIs are measures used to assess the bias and precision of the analytical calibrations and sample analyses, as well as other key quality characteristics of the data such as comparability, sensitivity, representativeness, and completeness. Together, verification and validation are the first steps in evaluating data completeness, accuracy, precision, sensitivity, comparability, and representativeness. The data review process culminates with a data usability assessment during which the final usability of the data is established relative to the intended data use.

## 3.1 DATA VALIDATION PROCESS

All of the results from analytical laboratory samples were validated in accordance with requirements prescribed in the project SAP (Tetra Tech, 2011b). If no qualifier flag is assigned to a result that has been validated, the data user is assured that no analytical performance deficiencies were identified during validation. If a significant performance deficiency was identified, one or more qualifier flags were assigned to the affected data. The qualifier flags used are defined below. These same flags accompany all qualified results in this report:

U – Indicates that the chemical was not detected at the numerical detection limit noted. Non-detected results are reported with a “U” qualifier when received from the laboratory. Additionally, a “U” qualifier is assigned to a result reported by the laboratory if the detected concentration is determined to be attributable to contamination introduced during field sampling or laboratory analysis. In these cases the reported non-detect value is the observed contaminant concentration multiplied by 10 (for common laboratory contaminants) or by 5 (for all other contaminants).

UJ – Indicates that the chemical was not detected. However, the detection limit (sample-specific quantitation limit) is considered to be estimated based on problems encountered during laboratory analysis. The associated numerical detection limit is regarded as inaccurate.

J – Indicates that the chemical was detected. However, the associated numerical result is not an accurate representation of the amount that is actually present in the sample. The laboratory reported concentration is considered to be an estimate of the true concentration.

UR – Indicates that the chemical may or may not be present. The non-detected analytical result reported by the laboratory is considered to be unreliable. The "UR" qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration noncompliances, and extremely low QC recoveries).

R – Indicates that the chemical may or may not be present. The analytical result reported by the laboratory is considered to be unreliable and unusable. The "R" qualifier is applied in cases of gross technical deficiencies (i.e., holding times missed by a factor of two times the specified time limit, severe calibration noncompliances, and extremely low QC recoveries).

The preceding data qualifiers may be categorized as indicative of major or minor problems. Major problems are defined as issues that result in the rejection of data and assignment of validation qualifier flags containing an "R." Rejected data are considered to be invalid and are not used for decision making purposes unless used in a qualitative way and the use is justified and documented. Less severe deficiencies, associated with "U," "J," and "UJ" data validation qualifiers, are defined as issues resulting in the estimation of data. Estimated analytical results are considered to be suitable for decision-making purposes unless the data use requirements are very stringent and the qualifier indicates a deficiency that is incompatible with the intended data use. It is noteworthy that a "U" qualifier does not necessarily indicate that a data deficiency exists because all non-detect values are flagged with the "U" qualifier regardless of whether a quality deficiency has been detected.

## 3.2 DATA VALIDATION OUTPUTS

After laboratory data were validated, a list was developed of non-conformities requiring data qualifier flags that were used to alert the data user to inaccurate or imprecise data. For situations in which several QC criteria were out of specification, the data validator made professional judgments and/or comments regarding the validity of the overall data package. The reviewer then prepared a technical memorandum presenting qualification of the data, if necessary, and the rationale for making such qualifications. The net result was a data package that had been carefully reviewed for its adherence to prescribed technical requirements. Data validators incorporated data qualifiers into the Tetra Tech electronic database and submitted the information to the Tetra Tech, Inc. data management group. A complete printout of the

data results with validation flags is presented in Appendix D. Pertinent quality estimates are summarized in a quantitative format in the following sections.

## 3.3 DATA QUALITY REVIEW

The DQR provided herein is designed to provide an overall quantitative measure of analytical performance not provided by data validation. The analytical performance quantitative evaluations are frequently analyte-specific and reflect deficiencies such as biases associated with the quantification of particular analytes in a particular sample matrix. Different chemicals in the same analytical fraction (e.g., lead and copper in the metals fraction) may exhibit different degrees of quality (e.g., different degrees of bias or imprecision).

In some cases, samples were analyzed after they were diluted. These dilutions translate into elevated detection limits and result in an elevated non-detect value being reported when the measured concentration of a target analyte was less than the elevated detection limit. These instances are noted in the descriptions below and the effect on data use is also noted. In some cases, laboratory method blank contamination was observed. If reported target analyte concentrations in samples of the same analytical batch exceeded 10 times the blank contamination level (for common laboratory contaminants) or five times the blank contamination level (for all other target analytes), and the data use was not adversely affected for other quality reasons, the situation is noted but the affected data use was generally considered to be uncompromised. If measured target analyte concentrations were less than the concentrations represented by these 5-fold or 10-fold adjusted contaminant levels, the situation is noted, and if data use is also compromised, the compromise is noted.

For all analyses, detections less than the limit of quantitation (LOQ) but greater than the method detection limit (MDL) were qualified as estimated, (J), to reflect the fact that concentration measurements in this concentration range are inherently less precise than at higher concentrations. All concentrations were measured down to the MDL, and results less than the MDL were reported as the limit of detection (LOD) value with a “U” validation qualifier.

### 3.3.1 <u>Completeness</u>

Completeness is a measure of the number of valid samples or measurements that are available relative to the number of samples or measurements that were intended to be generated. For this project, completeness was measured on two different bases: samples collected and laboratory measurements.

- Sample completeness was a measure of the usable samples collected as compared to those intended to be collected.

- Laboratory measurement completeness was a measure of the amount of usable, valid laboratory measurements per matrix obtained for each target analyte.

Usable, valid samples were those judged, after data assessment, to represent the sampling populations and to have not been disqualified for use through data validation or additional data review. Completeness was determined using the following equation:

$$\%C = \frac{V}{T} x 100$$

| | | | |
|---|---|---|---|
| where | %C | = | percent completeness |
| | V | = | number of samples (or results) determined to be valid |
| | T | = | total number of planned samples (or results) |

All scheduled samples were collected and all scheduled analyses were conducted on the collected samples, indicating that sample collection completeness is 100 percent, in so far as the samples were representative of the intended populations. As described in Section 2.4, some additional samples were collected and analyzed because a small number of scheduled samples were collected in the wrong places.

One result (for acetone in sample 27SB065G0406) was rejected out of a total of 42 acetone results for 42 samples, including two field duplicates. This constitutes approximately 2.5 percent of all acetone results and is yet a much smaller percentage of the total number of VOC results across all samples. Acetone was not detected (less than 0.0126 mg/kg) in sample 27SB065G0406, and the minimum project screening level (PSL) (2.5 mg/kg) is much greater than this. Therefore, this single rejection has no adverse effect on data usability, and project objectives were achieved for soil samples with regard to data completeness.

As described in Section 2.4.1, the scheduled groundwater sample was not collected because bedrock was encountered at 5 feet bgs, and there was no water available for sampling at the planned location. Therefore, all quality descriptions below are for soil and residue samples only.

### 3.3.2 Sensitivity

At the beginning of the project, several VOC target analytes had been identified for which the analytical sensitivity would be insufficient to support a direct comparison of VOC concentrations to PSLs to determine whether the analyte concentration exceeds PSLs. Those analytes, which are listed in the SAP, are not discussed here unless unusual circumstances caused the analytical detection limits to be more than three times the planned detection limits. Disregarding these analytes, the target analyte-specific LODs reported by the laboratory were less than the PSLs for most compounds with the following significant exceptions:

- Sample 27SS029C0002 required dilution by 1000-fold for VOC analysis because that sample contained a few high concentrations of VOCs. This increased the detection limits about 1000-fold. As a result, many VOCs in that sample were reported as non-detects, and it is not discernible whether these VOCs exceeded PSLs or not.

- For all VOCs, LODs reported for samples 27SS031C0002 and 27SS034C0002 were about three to five times greater than the LODs reported for other samples. These samples had a high moisture content (71.8 percent for 27SS034C0002, and 73.3 percent for 27SS031C0002). Such a high moisture content (low solids content) required qualification of detections with a “J” flag and non-detects with a “UJ” qualifier. The elevated detection limits represent detection limits under the assumption that all target analytes are associated with the solid portion of the sample.

- The LODs reported for all Aroclors in all samples were about three to five times greater than the targeted LODs. The targeted LODs are greater than the PSLs; therefore, the reported non-detect values for Aroclors exceed the PSLs, and a direct comparison of these results to PSLs will not help the data user understand whether the non-detected Aroclor site concentration exceeds PSLs or not.

In general, the elevated non-detect values interfere with the ability to definitively assess whether site concentrations for the affected target analytes are greater than PSLs or not.

### 3.3.3 Laboratory Accuracy

Accuracy in the laboratory was measured through the comparison of a spiked sample or laboratory control sample/laboratory control sample duplicate (LCS/LCSD) result to a known or calculated value, and is expressed as a percent recovery (%R). Accuracy was also assessed by monitoring the analytical recovery of select surrogate compounds added to samples that are analyzed by organic chromatographic

methods, and the analytical recovery of calibration standards for all analyses. LCSs were used to assess the accuracy of laboratory operations with minimal sample matrix effects. Matrix spike/matrix spike duplicate (MS/MSD) and surrogate compound analyses measure the combined accuracy effects of the sample matrix, sample preparation, and sample measurement. LCS and MS analyses were performed at a frequency of one per 20 associated samples of like matrix. Laboratory accuracy was assessed by comparing calculated %R values to accuracy control limits specified by the laboratory using the appropriate SW-846 Method.

Percent recovery is calculated using the following equation:

$$\%R = \frac{Ss - So}{S} \times 100$$

| | | | |
|---|---|---|---|
| where | %R | = | percent recovery |
| | Ss | = | result of spiked sample |
| | So | = | result of non-spiked sample |
| | S | = | concentration of spiked amount. |

Inorganic Target Analytes

Because of some minor calibration difficulties, including minor serial dilution non-compliances, results for chromium, lead, potassium, and sodium were qualified with a ”J” flag in several samples (see Appendix D for data with assigned qualifier flags). Laboratory contamination was observed for aluminum and zinc in sample delivery group (SDG) CTO276_001 and for manganese and zinc in SDG CTO276_005; however, these metals were detected in the site samples at concentrations greater than the contamination levels, so sample results were not qualified. The slightly low MS recovery (73.8 percent compared to a lower QC limit of 80 percent) for lead in sample 27SS028C002 caused lead results to be qualified with a “J” flag. High MS recoveries for chromium, potassium, and sodium caused detections of those target analytes to be qualified with a “J” flag as well. A low bias for an MS or MSD indicates a potential low bias in the reported results, and a high MS/MSD bias indicates a potential high bias in reported results. In these cases, the biases are marginal and not considered to be significant.

Perchlorate and cyanide accuracy indicators were generally satisfactory. However, one LCS recovery (124 percent) for perchlorate associated with sample 27SB065G0406, and the perchlorate MSD recovery (127 percent) for this sample were higher than the upper QC limit of 120 percent; however, perchlorate was not detected in site samples, so results were not qualified. No cyanide results were qualified.

All exceedances of QC limits for inorganic analytes are inconsequential to the planned data use.

Organic Target Analytes

LCS and surrogate compound recoveries were within acceptance limits for all analytical batches with two minor exceptions. The LCS percent recovery for bromomethane in analytical batch 1D14010 was 172 percent, whereas the upper acceptance limit was 160 percent; and the LCS percent recovery for styrene in analytical batch 1E05013 was 129 percent, and the upper acceptance limit was 125 percent. The LCSD recoveries for acetone (235 percent) and 2-butanone (174 percent) were also high compared to the 160 percent upper QC limit for acetone and the 2-butanone recovery (153 percent) exceeded its 145 percent upper limit. All other VOC LCS, LCSD, and surrogate compound recoveries were within QC acceptance limits for all analytical batches.

Matrix spike recoveries were low for several compounds but were generally greater than 35 percent, as documented in the data validation reports. Two exceptions are methyl acetate (MS and MSD recoveries of 20.6 and 26.6 percent, respectively), and 1,2,4-trichlorobenzene (MS and MSD recoveries of 26.6 and 19.4 percent, respectively) in batch 1D14007. No MS or MSD recovery was less than 19 percent. Matrix spikes and surrogate compounds represent analytical performance in the matrix of the samples (as opposed to LCSs, which represent a clean matrix unrelated to soil samples); therefore, greater weight is given to evaluating MS and surrogate compound recoveries than to LCS/LCSD recoveries. Together, the LCS, MS, and surrogate compound recoveries indicate that data users should expect no bias to a moderate low bias of as much as about 40 percent in the reported VOC results. This estimate, however, should be considered approximate because it represents a general statement based on select QC samples and surrogate compounds.

A “J” qualifier flag was assigned to several results because of accuracy indicators that indicated a potential high bias. Most VOC results, however, were non-detect values, so the “J” flags, which suggest a potential slight high bias, do not indicate any adverse effect on data use. The affected results are identified in the data validations reports.

The data validation reports describe various VOCs that were detected in analytical method blanks, depending on analytical batch. The presence of this contamination resulted in elevated non-detect values being reported for the affected VOCs in multiple samples. Affected contaminants were carbon disulfide, methylene chloride, and 1,2,4-trichlorobenzene. Methylene chloride is a common laboratory contaminant because it is used in large quantities in laboratories, and this is the VOC contaminant detected most

frequently in the method blanks. The elevated non-detect values preclude a direct comparison of sample VOC concentrations to PSLs for methylene chloride and 1,2,4-trichlorobenzene in the affected samples. Carbon disulfide contamination was not high enough to adversely affect data use.

### 3.3.4 Laboratory Precision

Precision is a measure of the degree to which two or more measurements are in agreement and describes the reproducibility of measurements of the same parameter for samples analyzed under similar conditions.

Precision for chemical parameters is expressed as a Relative Percent Difference (RPD), which is defined as the ratio of the difference to the mean of the two values being evaluated. RPDs, typically expressed as percentages, are used to evaluate both field and laboratory duplicate precision and are calculated as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

where RPD = relative percent difference
V1, V2 = two results obtained by analyzing duplicate samples

The precision estimates obtained from duplicate field samples encompass the combined uncertainty associated with sample collection, homogenization, splitting, handling, laboratory and field storage (as applicable), preparation for analysis, and analysis. In contrast, precision estimates obtained from analyzing duplicate laboratory samples incorporate only homogenization, sub sampling, preparation for analysis, laboratory storage (if applicable), and analysis uncertainties.

Inorganic Target Analytes

Precision quality indicators were generally satisfactory for inorganic analytes (metals, perchlorate and cyanide). Minor exceedances of QC acceptance limits caused a small number of results to be qualified with a “J” flag to indicate that the uncertainty is slightly greater than ideal. However, the slightly elevated uncertainty does not represent a significant deficiency relative to the intended data use.

Organic Target Analytes

LCS/LCSD RPD values exceeded acceptance limits for multiple analytes, but the exceedances were generally rare and minor. Similar performance was observed for MS/MSD pairs.

The continuing calibration verification (CCV) percent difference (26.5 percent) for bromoform exceeded the 20 percent QC limit for instrument MS-VOA6 on April 14, 2011 at 07:47 hrs. Non-detect results for bromoform in samples 27SS032C0002, 27SS033C0002, 27SS034C0002, 27SS035C0002, 27SB036G0406, 27SB037G0507, and 27SB038G0406 were qualified as estimated, (UJ). A continuing calibration difference greater than 20 percent for bromoform and 1,3-dichloroethane resulted in the data for these compounds in sample 27SB065G0406 being qualified as estimated (J flag) in that sample. Continuing calibration differences greater than 20 percent were also observed for acetone, bromoform, bromomethane, 2-butanone, carbon tetrachloride, chloroethane, dibromochloromethane, 1,2-dibromo-3-chloropropane, methyl acetate, 4-methyl-2-pentanone, tetrachloroethene, and 1,1,1-trichloroethane on instrument MS-VOA6, on April 23, 2011 at 10:42. Because all results for these compounds were reported as non-detects, the results were qualified as estimated non-detects (UJ), in the samples associated with the continuing calibration: samples 27SS030C0002 and 27SS063G0002. The continuing calibration %Ds for acetone, 2-butanone, 1,2-dibromo-3-chloropropane, 2-hexanone and 4-methyl-2-pentanone were greater than the 20 percent quality control limit on April 13, 2011 at 8:09 hours on instrument MS- VOA3 affecting all the soil samples. The detected and non-detected results of the aforementioned compounds were qualified as estimated (J) and (UJ), respectively, in the soil samples.

One PCB result (for sample 27SB055G0406) was qualified as estimated (J flag) because of a difference (50 percent RPD) between the result for the initial analysis and the required confirmation analysis. The QC acceptance limit is 40 percent RPD. Because this was a single exceedance, the exceedance is viewed to be minor.

Despite the observed imprecision associated with CCVs and LCS/LCSD, and MS/MSDs, the level of precision is comparable to what is typically observed in soils.

### 3.3.5 Comparability

Comparability is defined as the confidence with which one data set can be compared with another (e.g., among sampling points and among sampling events). Comparability was achieved by using standardized sampling and analysis methods, as well as standardized data reporting formats.

Comparability of laboratory measurements was achieved primarily through the use and documentation of standard sampling and analytical methods. Results were reported in units that ensured comparability with current state and federal standards and guidelines. Comparability of laboratory measurements was assessed primarily through the use of QC samples and through adherence to the QA plan. In general, the results of the data described in this review are comparable in quality to the data typically observed for soil sample VOCs, PCBs, metals, perchlorate, and cyanide analyses of soil samples. The analytical methods used and the observed analytical performance are typical of methods used throughout the environmental industry.

As indicated in Sections 3.3.3 and 3.3.4, the accuracy and precision are typical for soil sample analyses for the analytical methods that were used. If any overall bias is expected for organic analyses, the bias would be slightly low (negative). Biases, if present, are expected to be slightly low to moderate. For inorganic analyses, a data user should expect no bias or perhaps a slight high bias for some target analytes for which the MS/MSD or LCS/LCSD recoveries were high.

As described in Section 3.3.2, the greatest deficiency observed for these results is the inability to directly compare reported target analyte concentrations to PSLs for analytes with elevated non-detect values.

### 3.3.6 Representativeness

Representativeness is an expression of the degree to which data accurately and precisely depict the actual characteristics of a population or environmental condition existing at the site. The use of standardized sampling, sample handling, sample analysis, and data reporting procedures specified in the sampling plan (Tetra Tech, 2011b), and the selection of sampling locations were designed so that the final data would be accurate representations of actual site conditions germane to the decisions that need to be made for this project. All scheduled samples were collected from the intended locations or near enough to those locations, and the data were of acceptable quality; therefore, the collected data are representative of the targeted populations.

### 3.3.7 Data usability

Overall, the data quality for these analyses is typical of soil VOCs, aroclors, metals, perchlorate, and cyanide analyses. Accuracy and precision performance was compromised in relatively isolated cases, and the degree of compromise is inconsequential to the project. All samples were collected as scheduled and appear to represent the intended populations. The level of data quality is comparable to what is typical of environmental soil analyses. The most significant limitation on data use, however, is non-detect

values that exceed PSLs. When such non-detect values are reported, the data user will not be able to declare with certainty whether the site target analyte concentration exceeds the PSL or not. In these cases, the data user is limited to qualitative as well as quantitative data evaluations to assess whether target analyte concentrations exceed PSLs.

# 4.0 SITE CHARACTERISTICS

## 4.1 PHYSIOGRAPHY AND TOPOGRAPHY

NSA Crane is located in the nonglaciated area of the Crawford Uplands Physiographic Province. This province is a rugged, highly vegetated, dissected plateau bounded by the Mitchell Plain Physiographic Province to the east and the Wabash Lowland Physiographic Province to the west (Murphy and Wade, 1998). The Mitchell Plain is a low, dissected limestone plateau characterized by sinkholes and karst topographic features. The boundary between the Crawford Upland and the Mitchell Plain is marked by the highly irregular, eastward-facing Chester Escarpment. Springs, caverns, caves, and other solution-weathering features can be found along this escarpment and on the eastern edge of the NSA Crane facility. The boundary between the Crawford Upland and the Wabash Lowland near the western boundary of NSA Crane is gradual (Murphy and Wade, 1998). The terrain is predominantly rolling, with moderately incised stream valleys throughout and occasional flat areas in the central and northern portions of NSA Crane. The elevations across NSA Crane range from about 500 feet above mean sea level (amsl) to about 850 feet amsl. Topographic relief in the Crawford Upland generally ranges from 100 to 350 feet. Greater relief exists in the eastern part of NSA Crane near the Chester Escarpment (Murphy and Wade, 1998).

## 4.2 CLIMATE AND METEOROLOGY

NSA Crane is located in a warm, temperate climatic zone. In general, the summers are warm and humid, and winters are mild with occasional short cold periods. The temperature ranges from an average maximum July temperature of 89$^{o}$F to an average minimum January temperature of 26$^{o}$F. Precipitation is fairly evenly distributed throughout the calendar year; the maximum precipitation occurs during the spring and early summer. The average annual precipitation at the facility is 44 inches, consisting of 42 inches of rain and 15 inches of snow. The average humidity ranges from 40 to 90 percent in summer and 60 to 90 percent in winter. Long-term climatological records for the area indicate that the monthly prevailing wind direction is from the southwest from April through December and from the northwest during January through March [National Oceanic and Atmospheric Administration (NOAA), 1988]. The annual prevailing wind direction for the region is from the southwest, and the annual average wind speed for the area is about 9.6 miles per hour. Figure 4-1 is a wind rose diagram that summarizes the wind direction and mean wind speed distribution for the Indianapolis International Airport over a 5-year period (1985 through 1989).

## 4.3 GEOLOGY AND STRATIGRAPHY

NSA Crane is located on the eastern edge of the Illinois Structural Basin, where the Pennsylvanian and Mississippian age bedrock dips to the west-southwest and southwest at approximately 30 to 35 feet per mile (Kvale, 1992).

The unconsolidated overburden deposits at NSA Crane generally consist of two types: Quaternary and Pleistocene age alluvial and colluvial deposits near the floodplains of primary streams and unconsolidated residual soils and loess on sides and tops of ridges. Residual soils at NSA Crane were derived from the underlying sedimentary rocks of the Lower Pennsylvanian Raccoon Creek Group and the Upper Mississippian Stephensport and West Baden Groups. These soils consist of clay, silt, sand, and fragmented and/or partially weathered bedrock. The residual soils developed on the ridgetops and upper sideslopes of the ridges were derived from the weathering of Pennsylvanian strata.

Using the U.S. Department of Agriculture (USDA) Soil Conservation Service (SCS) soil classification system, the soil at NSA Crane has been classified into 23 different soil series. Each of these soil series is defined by various soil characteristics (e.g., grain size, erosion, slope, drainage, parent material, or depositional source, etc.) specific to each series. Within these soil series, various sub-classes or soil map units have been defined.

Chemical characteristics of soils at NSA Crane were evaluated during a basewide background soils investigation conducted by Tetra Tech in 2001 (Tetra Tech, 2001a). The objectives of the investigation were to identify and chemically characterize soils based on three factors: depositional environment, grain size, and depth. A total of 16 soil types were identified and evaluated in the report, based on combinations of these three factors. Four depositional environments were identified at NSA Crane, based on the mapped geologic parent material: Pennsylvanian bedrock, Mississippian bedrock, alluvium, and loess. Three predominant grain sizes (clay, silt, and sand) and two depths (surface and subsurface) were also identified as factors possibly contributing to soil chemical characteristics. Soil samples were collected to establish representative background metals concentrations for each of the 16 soil types.

Based on the classification scheme developed in the base-wide background soil study (Tetra Tech, 2001a), the soils encountered at SWMU 27 fall into two different soil groups. The surface soils (0 to 2 feet bgs) all belong to Soil Group 3 (Alluvial, Mississippian, and Pennsylvanian). The subsurface soils (2 to 10 feet bgs) belong to Soil Group 8 (Pennsylvanian subsurface Clay and Silt). These groupings are discussed further in Section 7.0.

## 4.4 SURFACE HYDROLOGY AND DRAINAGE SYSTEM

The surface drainage at NSA Crane has formed a dense, dendritic pattern throughout the installation. Most of the major streams flow in a general southward or southwestward direction. Seven primary creeks in five drainage basins carry surface water off the installation, where they eventually drain into the East Fork of the White River and then to the Wabash River to the southwest. Figure 4-2 shows the main drainage basins of NSA Crane. SWMU 27 lies within the Turkey Creek drainage basin. The Turkey Creek basin drains roughly 60 percent of NSA Crane.

Drainage swales and ditches convey surface water within the PPA to the south and west (near the point where the railroad track R-1 crosses Highway 99), and throughout the PPA (Figure 1-2). Surface water from the former Flare Test Area drains into surface channels along the northern side of Highway 5 or into a culvert north of IA 2 (Figure 1-3).

## 4.5 LAND USE AND DEMOGRAPHY

The economic base of communities surrounding NSA Crane is in transition from agriculture, mining, and quarrying to manufacturing and service industries. The patterns of settlement, population statistics, and median income are similar throughout the region (Tetra Tech, 2001). Because most of the region is covered by vegetation, the area is classified as rural (Tetra Tech, 2001).

There is no state or local planning within the vicinity of NSA Crane. The only zoning and land use regulations are in the municipalities in the region. None of the municipalities are close enough to impact NSA Crane. None of the areas adjacent to NSA Crane are zoned, and zoning is not anticipated in the near future. No known land use or community actions are being considered or proposed at this time (Tetra Tech, 2001).

## 4.6 ECOLOGY

NSA Crane is a heavily forested facility situated within the Western Mesophytic Forest Region, Hill Section, and Beech-Maple Forest Region (Braun, 1950). Lindsey et al. (1970) further subdivided the area of the installation into the south-central Oak and Mixed Woods Division, including the Beech-Maple and the Beech-Oak-Maple-Hickory sub-elements. Deam (1940) classified the portion of Martin County in which the facility is located as consisting of the Chestnut Oak Upland, based on the dominant floral components at that time. More recently, Kuchler (1964) mapped this portion of Indiana and classified it as belonging to two distinct vegetation classes, the Oak-Hickory and the Beech-Maple forest components

of the Broadleaf Forest Classification. This latter classification most closely resembles the current floristic components observed at the facility during the ecological studies conducted as part of this program.

The PPA is an industrial area that does not support ecological receptors. The suspected flare test areas of IA 2 are also in industrial areas that do not support ecological receptors.

The wildlife habitats and vegetation types present at NSA Crane (many stages of forest succession, streams, ponds, Greenwood Lake, and grassy open spaces) support a diverse terrestrial and aquatic fauna. The abundance of wildlife on the site is due in large measure to the mixture of land forms and vegetation types that occur over the installation. In addition, the lack of agricultural pressures has enhanced the wildlife abundance and served to provide an installation-wide "wildlife enclosure" condition. There is an adequate amount of forage materials, concealment opportunities, and shelter locations to support a highly diverse wildlife community at the site.

The white-tailed deer is the most conspicuous large wild mammal at the installation. Other mammals include opossum, raccoon, rabbits, mice, bats, chipmunks, squirrels, beaver, groundhogs, gray fox, and coyotes. Fox, coyotes, and hawks are carnivores whose presence indicates a healthy ecosystem because smaller mammals are present to provide a food source (NEESA, 1983). The threatened and endangered Indiana bat may be present in the vicinity of the Turkey Creek watershed.

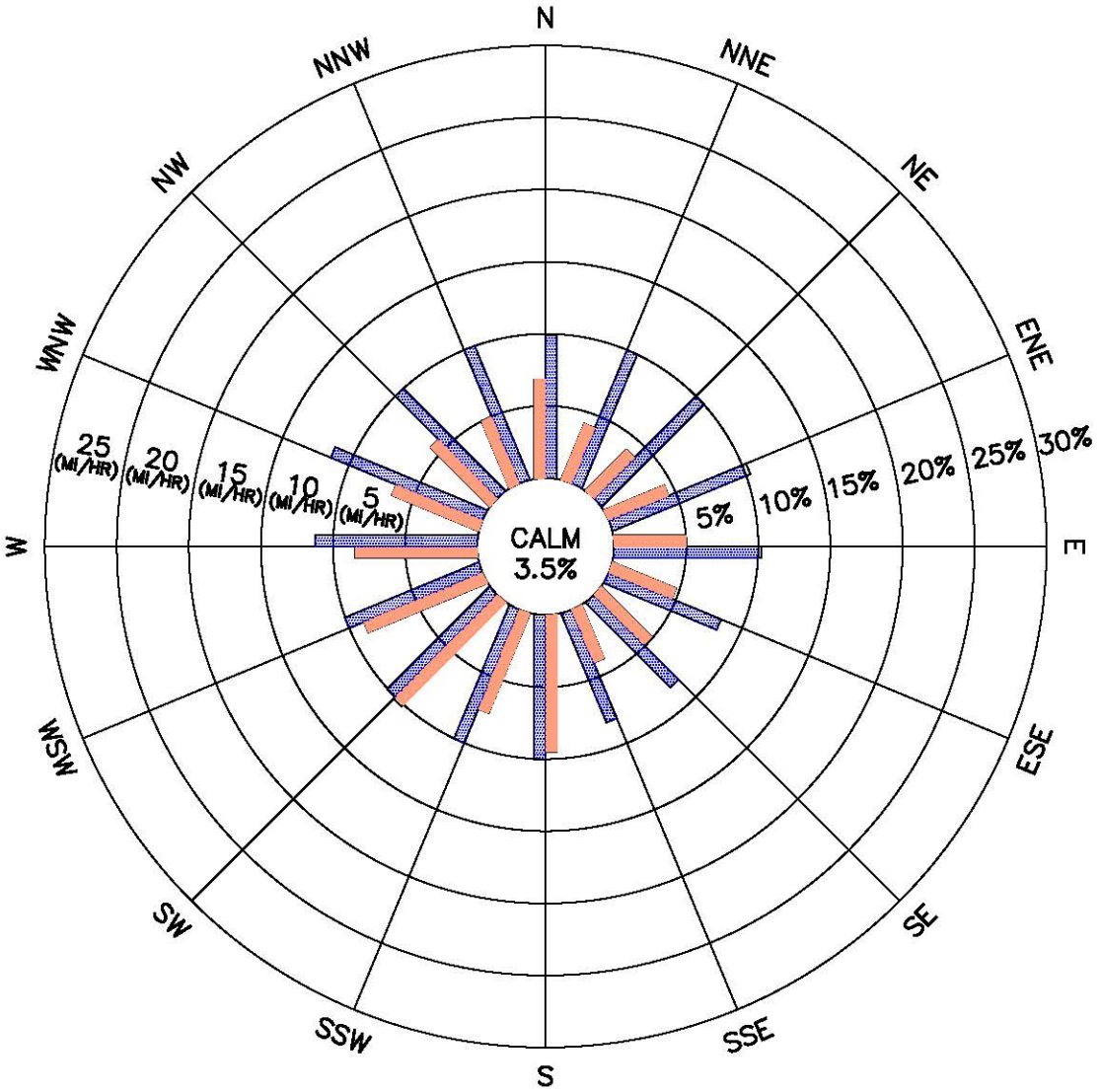
The birds at NSA Crane are diverse. Previous studies at the facility have identified over 100 species present at the site during breeding seasons (Hengeveld, 1987). Because the facility is largely forested, the species found at the site consist predominantly of those species that frequent wooded habitat types. There are also species of waterfowl that use the facility, especially in the vicinity of Lake Greenwood. A large number of bird species frequent the non-forested grassland, oldfield, and scrub/shrub vegetation present over portions of NSA Crane.

Previous studies conducted at NSA Crane (Nelson et al., 1987) identified 21 amphibian species and 22 reptile species (including skinks, lizards, snakes, and turtles).

A total of 46 distinct fish species were collected from the installation during a 1987 inventory of the fish fauna at NSA Crane. Other than Lake Greenwood, the 1987 study observed that the greatest number of individual fish species were recorded from the largest stream (Boggs Creek) and the smallest number of species were recorded from Turkey Creek. Boggs Creek contained 29 species, including eight species of fish characteristic of large river-type systems. This included long-nose gar, paddlefish, bowfin, gizzard shad, ribbon shiner, bigmouth buffalo, channel catfish and flathead catfish. By contrast, the Turkey Creek

survey yielded 16 species of fish, none of which were unusual. The Sulphur Creek drainage was surveyed and yielded a total of 19 species. Four species from this drainage were not found anywhere else on the installation, including southern redbelly dace, blacknose dace, black bullhead, and blackside darter.

R:\2126 – NSA Crane\Figures\2126FG01.dwg PIT NICHOLE.DILLA 1/30/2012 8:58:45 AM




**LEGEND:**

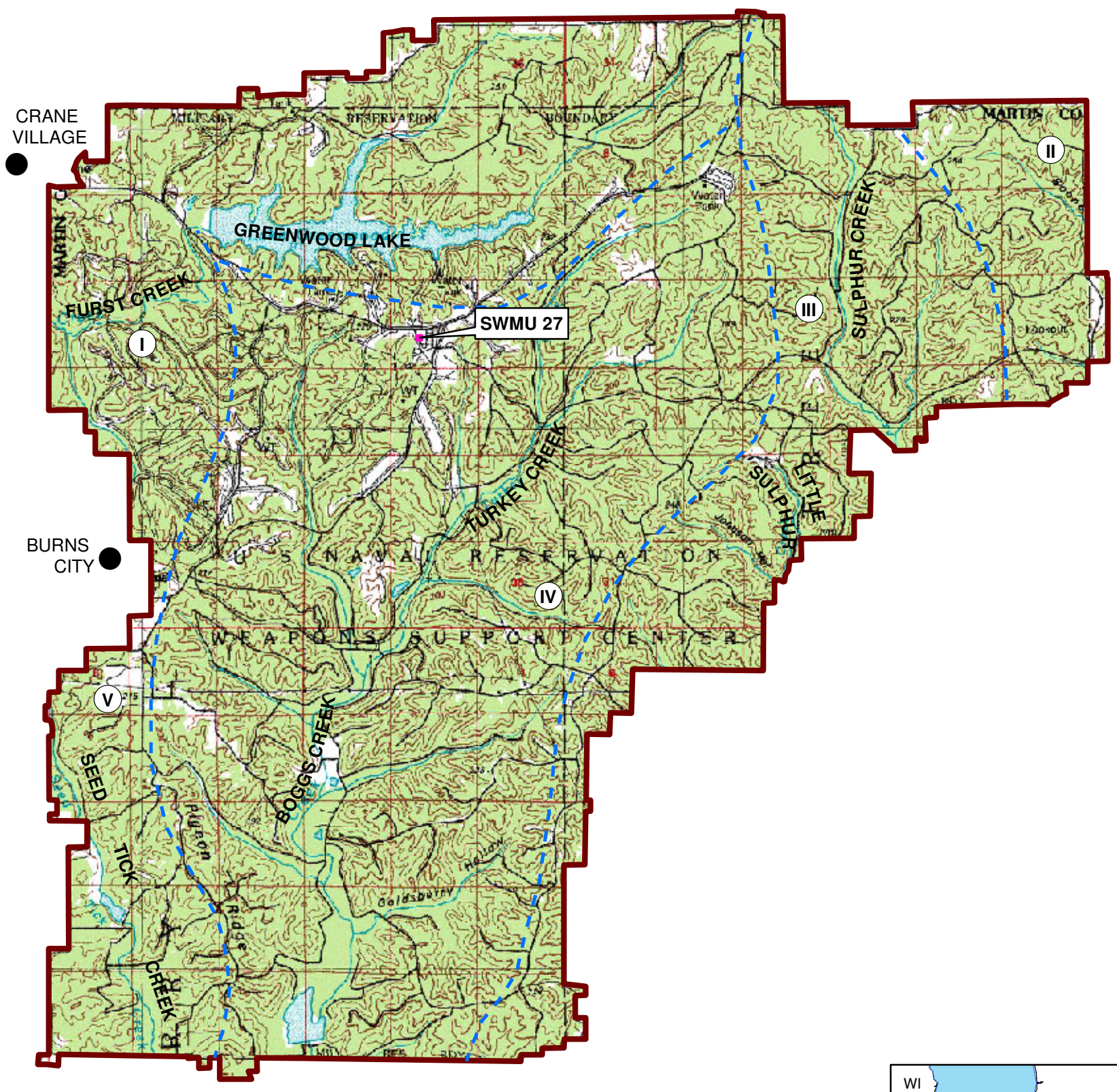
WIND DIRECTION FREQUENCY (PERCENT)
(DIRECTION FROM WHICH THE WIND IS BLOWING)

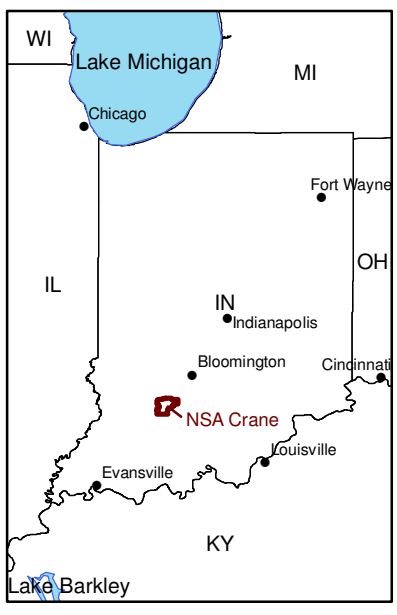
MEAN WIND SPEED (MI/HR)

DATA SOURCE: INDIANAPOLIS, INDIANA AIRPORT
PERIOD OF RECORD: 1985–1989
43,824 OBSERVATIONS

| | | | |
|---|---|---|---|
| DRAWN BY MF | DATE 6/4/07 | FIVE–YEAR WIND ROSE SUMMARY FOR INDIANAPOLIS, INDIANA SWMU 27–ILLIMINANT BUILDING 126 NSA CRANE CRANE, INDIANA | CONTRACT NO. F276 |
| CHECKED BY | DATE | | OWNER NO. |
| REVISED BY | DATE | | APPROVED BY / DATE |
| SCALE NOT TO SCALE | | | DRAWING NO. FIGURE 4–1 / SIZE A / REV. 0 |

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU27_DRAINAGE.MXD 01/30/12 SP




Major Surface Drainage Basins
I Furst Creek Drainage Basin
II Indiana Creek Drainage Basin
III Sulphur Creek Complex Drainage Basin
IV Boggs & Turkey Creek Drainage Basin
V Seed Tick Creek Drainage Basin

Source: "Initial Assessment of Study of Naval Weapons Support Center Crane, Indiana." Naval Energy and Environmental Support Activity, May 1983.

1.5 0 1.5 Miles

| DRAWN BY | DATE |
|---|---|
| S. PAXTON | 01/30/12 |
| CHECKED BY | DATE |
| J. DUCAR | 01/30/12 |
| REVISED BY | DATE |
| | |
| SCALE | |
| AS NOTED | |

NAVFAC

SWMU 27 - ILLUMINANT BUILDING 126
SURFACE WATER DRAINAGE
NSA CRANE
CRANE, INDIANA

| CONTRACT NUMBER | CTO NUMBER |
|---|---|
| F276 | |
| APPROVED BY | DATE |
| APPROVED BY | DATE |
| FIGURE NO. FIGURE 4 - 2 | REV 0 |

# 5.0 NATURE AND EXTENT OF CONTAMINATION

This section describes the locations, spatial patterns, chemical forms, and concentrations of organic and inorganic chemical contaminants detected in soil and pit/sump residue material at NSA Crane SWMU 27 during the RFI field sampling events conducted in April and August 2011. Where it is feasible to do so, an attempt is made to identify which chemicals appear to be site-related contaminants and which do not. No evidence was found for the presence of pure phase organic liquids or metals in soil. All references to chemical contamination in the text below are to contaminants that are most likely to be adsorbed to soil or sediment particulates, or that are dissolved in surface water or groundwater.

The analyses conducted during this RFI are documented in Section 2.0, and summarized in Table 2-1. Tables 5-1 through 5-5 present the data summary tables screened against appropriate screening criteria described in the SAP (Tetra Tech, 2011b). A complete data set for the RFI is presented in Appendix D.

SWMU 27 RFI data sets were subdivided into two discrete areas of concern (i.e., IA 1 and IA 2). These areas are identified in data tables and figures, where appropriate.

Organic chemical contamination is defined for this RFI as chemicals in soils within the industrialized areas of IA 1 and IA 2 whose concentrations exceed human health screening values (SVs), and therefore are considered to potentially result in unacceptable human health. In addition, a limited number of drainageway soil samples (i.e., 27SB001, 27SB003, 27SB008, 27SB058, and 27SB063) were also screened against ecological SVs. These sampling locations are to act as sentinel monitoring points to evaluate whether the more distant and topographically down slope (and outside the sampled RFI area) drainageway soils (nearest the perimeter of the sampled area) potentially contain contaminants at concentrations that could pose a risk to ecological receptors. Exceedances of SVs are highlighted in the data tables (Tables 5-1 through 5-5). Because organic chemicals were assumed not to occur naturally, detections of organic compounds at SWMU 27 were generally considered to be site-related, unless the site history and observed concentrations or concentration patterns indicate that the contaminants are from non-site-related sources. For example, chemicals such as methylene chloride or acetone are often detectable and attributable to laboratory contamination. Other lesser used chemicals such as freons (chlorofluorocarbons), chloroform, and xylenes may also fit this description, depending on the laboratory and time period in which the samples were analyzed. Laboratory contamination is often indicated by low concentrations of a chemical in field blanks or laboratory blanks and in multiple samples, regardless of the origin of the samples. When present as a laboratory contaminant, the concentrations of the contaminating chemical appear to be relatively uniform in magnitude regardless of the location of the

sample in which the contamination was reported. All organic target analyte concentrations were measured using routine methods.

Metals contamination was defined as an exceedance of SVs; however, consideration was given to the natural occurrence of metals in environmental media. Concentrations of metals that are within normal background or upgradient levels were not considered to represent site-related contamination, although they may be discussed for the sake of completeness. Background and upgradient data sets, which are used for these evaluations, are described in Section 5.1.

Multiple chemicals of environmental interest were detected in SWMU 27 at concentrations greater than SVs. The extent of contamination, however, is best described using representative chemicals whose extent encompasses that of other chemicals. This reduces the complication associated with trying to track multiple chemicals when all chemicals have similar distribution patterns. Therefore, emphasis was given to chemicals that:

- Exceed chemical of potential concern (COPC) SVs (described and evaluated further in Sections 7.0 and 8.0).
- Represent (based on chemical and physical properties) a particular group of chemicals (e.g., VOCs).
- Were detected multiple times and were generally pervasive, thus representing the greatest extent of contamination for similar chemicals.
- Were detected infrequently, but at environmentally significant concentrations. This may occur, for example, when multiple analytes of similar behavior or origin are detected at a small number of locations, but at elevated concentrations that are indicative of a chemical release or contamination pattern.
- May be used to show a connection or no connection among various environmental media.
- May be significant daughter products that demonstrate changes in contaminant concentrations over time as a result of chemical or biochemical degradation.
- Ultimately, were judged to adequately represent the nature and extent of similar contaminants at SWMU 27.

## 5.1 BACKGROUND LOCATIONS

The soil background data set and how it was established are described below.

### 5.1.1 NSA Crane Soil Background Data Set

The soil samples collected from SWMU 27 were determined to fall within the following soil categories:

- Surface Soil: Soil Group 3 - Alluvial, Mississippian, and Pennsylvanian.
- Subsurface Soil: Soil Group 8 - Pennsylvanian Subsurface Clay and Silt.

The background data for these soil groups were generated during the NSA Crane basewide background soil investigation. Derivation of the Soil Groups is described in detail in the report for that investigation (Tetra Tech, 2001). Soil Groups 3 and 8 represent all soil samples collected at SWMU 27.

NSA Crane background soil data (Tetra Tech, 2001) were used to estimate whether the concentrations of chemicals observed in SWMU 27 soils during the RFI represented site-related contamination or not. Upper Tolerance Limits (UTLs) were used as points of comparison to demonstrate that one soil data set was similar to another. These values represent a limit below which 95 percent of the reported concentrations would fall with 95 percent confidence if the soil data represent background concentrations.

In addition, a statistical background soil comparison was conducted as part of the human health risk assessment in Section 7.1.1.

## 5.2 SOIL CONTAMINATION

As discussed in Section 1.0, SWMU 27 consists of two main areas which were investigated during the RFI: IA 1 and IA 2. These areas are evaluated separately in the following sections. COPCs were selected for surface soil and subsurface soil using the screening levels described in the SAP (Tetra Tech, 2011b).

### 5.2.1 Investigation Area 1

**Surface Soil Inorganics (Metals and Cyanide) -** Several metals concentrations exceeded human health and ecological SVs in surface soils at IA 1 (see Table 5-1 and Figure 5-1). However, many of the concentrations greater than SVs are consistent with background soil concentrations. Furthermore, the

concentration distribution patterns suggest no evidence of a source of contamination consistent with site operations and contaminant migration mechanisms. Table 5-1 shows the metals concentrations at locations where SVs were exceeded. Few results exceeded the background soil concentrations.

Only one surface soil sample exhibited a concentration of cyanide in exceedance of a SV. The sample from location 27SB002, located near the southern portion of Building 1884, had a cyanide concentration of 1.37 mg/kg. The human health and ecological SVs for cyanide are 0.94 and 1.3 mg/kg, respectively.

**Surface Soil PCBs -** Aroclor-1260 was the only chemical in this category to be detected. Aroclor-1260 SV exceedances were limited to the surface soil interval of 0 to 2 foot bgs at location 27SB054 (129 µg/kg), located west of Building 124. The human health and ecological SVs are 220 and 0.332 µg/kg, respectively. Despite the observed SV exceedance, the concentration was less than the conservative cleanup level of 1,000 µg/kg total PCBs that is commonly used for PCB cleanup in soils. Therefore, PCBs are not considered to be significant site-related contaminants for purposes of the nature and extent discussion.

**Surface Soil Perchlorate** – No perchlorate concentrations exceeded human health or ecological SVs in surface soils for IA 1 (see Table 5-1).

**Surface Soil VOCs –** The only VOCs concentrations in surface soil that exceeded an SV were trichloroethene and methylene chloride. Trichloroethene exceeded the 0.0032 mg/kg human health SV at two locations, 27SB003 (0.00429 J mg/kg) and 27SB064 (0.00439 J mg/kg) (see Table 5-1 and Figure 5-2). Methylene chloride exceeded the 0.023 mg/kg human health SV at 27SB003 (0.0267 mg/kg) (see Table 5-1 and Figure 5-2). The methylene chloride concentration is comparable to those commonly observed as laboratory contamination levels, and is concluded not to be a significant site-related contaminant for the purpose of the nature and extent discussion.

**Subsurface Soil Inorganics (Metals and Cyanide)** - Three metals (aluminum, chromium, and manganese) exhibited concentrations which exceeded human health SVs in subsurface soils at IA 1 (see Table 5-3 and Figure 5-3). However, many of the concentrations greater than SVs are consistent with background soil concentrations. Furthermore, the concentration distribution patterns suggest no evidence of a source of contamination consistent with site operations and contaminant migration mechanisms. Table 5-3 shows the metals concentrations at locations where SVs were exceeded. Few results exceeded the background soil concentrations.

No subsurface soil samples in IA 1 exhibited concentrations of cyanide in exceedance of the SV.

**Subsurface Soil Perchlorate** - No subsurface soil samples in IA 1 exhibited concentrations of perchlorate above the laboratory detection limit.

**Subsurface Soil VOCs** - The only VOCs concentrations in subsurface soil that exceeded a SV were trichloroethene and vinyl chloride. Trichloroethene exceeded the 0.0032 mg/kg human health SV at two locations, 27SB036 (0.00521 mg/kg) and 27SB065 (0.0176 mg/kg) (see Table 5-3). Vinyl chloride exceeded the 0.000112 mg/kg human health SV at 27SB065 (0.00683 mg/kg) (see Table 5-3).

In summary, the only COPC in IA 1 soil are metals and the VOC trichlorethene, and its degradation product, vinyl chloride. This is consistent with site history.

### 5.2.2 Investigation Area 2

**Surface Soil Inorganics (Metals and Cyanide)** - Several metals concentrations exceeded human health and ecological SVs in surface soils at IA 2 (see Table 5-2 and Figure 5-3). However, many of the concentrations greater than SVs are consistent with background soil concentrations. Furthermore, the concentration distribution patterns suggest no evidence of a source of contamination consistent with site operations and contaminant migration mechanisms. Table 5-2 shows the metals concentrations at the locations where SVs were exceeded. Few results exceeded the background soil concentrations.

**Surface Soil Perchlorate** - No surface soil samples in IA 2 exhibited concentrations of perchlorate above the laboratory detection limit.

**Subsurface Soil Inorganics (Metals and Cyanide)** - Three metals (aluminum, chromium, and manganese) exhibited concentrations which exceeded human health SVs in subsurface soils at IA 2 (see Table 5-4 and Figure 5-3). However, many of the concentrations greater than SVs are consistent with background soil concentrations. Furthermore, the concentration distribution patterns suggest no evidence of a source of contamination consistent with site operations and contaminant migration mechanisms. Table 5-4 shows the metals concentrations at locations where SVs were exceeded. Few results exceeded the background soil concentrations.

**Subsurface Soil Perchlorate** - No subsurface soil samples in IA 2 exhibited concentrations of perchlorate above the laboratory detection limit.

In summary, the only COPC in soil of IA 2 are metals. This is consistent with site history.

### 5.2.3 Sumps and Pits

**Inorganics (Metals and Cyanide)** - Several metals concentrations exceeded human health and ecological SVs in the sump and pit samples (see Table 5-5 and Figure 5-4). However, the soil within these sumps and pits are contained within the concrete structures; therefore, under normal circumstances they would not be a potential source of contamination to human or ecological receptors.

The only sump/pit sample analyzed for cyanide (27SS029C0002) exhibited a concentration below human health and ecological SVs.

**Perchlorate** - No soil samples collected within sumps/pits exhibited concentrations of perchlorate above the laboratory detection limit.

**VOCs** - Several VOC concentrations exceeded human health and/or ecological SVs in the sump and pit samples (see Table 5-5 and Figure 5-4). However, as previously stated, the soils within the pits are contained within the concrete structures; therefore, under normal circumstances they would not be a potential source of contamination to human or ecological receptors.

## 5.3 EXTENT OF CONTAMINATION SUMMARY

The degree and extent of contamination at SWMU 27 is very limited and reasonably well bounded. The primary COPC are metals and select VOCs in surface and subsurface soils.

**TABLE 5-1**

**INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB001** | **27SB002** | **27SB002** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS001G0001** | **27SS002G0001** | **27SS002G0001-D** |
| SAMPLE DATE | | | | **20110407** | **20110407** | **20110407** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **DUP** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **1** | **1** | **1** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **21400** | 7490 | **7980** |
| BARIUM | 1500 | 211 | 1.04 | **192 J** | **105** | **93.7** |
| CADMIUM | 7 | 6.05 | 0.36 | 1.26 U | **8.41** | **6.9** |
| CHROMIUM | 0.0118 | 28.7 | 26 | **32.2** | **12.6 J** | **18.3 J** |
| COPPER | 310 | 17.6 | 28 | 15.2 | 17.8 | 16.5 |
| LEAD | 81 | 27 | 11 | **32 J** | **41.1 J** | **38.3 J** |
| MAGNESIUM | --- | 2800 | --- | 715 J | 853 | 818 |
| MANGANESE | 180 | 5700 | 220 | **5550 J** | **1200 J** | **851 J** |
| POTASSIUM | --- | 1970 | --- | 693 J | 494 J | 508 J |
| SODIUM | --- | 28 | --- | 189 U | 184 U | 181 U |
| STRONTIUM | 4700 | 46.4 | --- | 7.1 J | 6.76 | 6.84 |
| ZINC | 2300 | 65.6 | 46 | **53.8 J** | **81.8** | **73.3** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | **1.37** | 0.19 J |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 2.46 U | 2.49 U | 2.45 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00484 U | 0.00518 UJ | 0.00513 UJ |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.00242 U | 0.00259 UJ | 0.00256 UJ |
| ACETONE | 28 | --- | 2.5 | 0.00969 U | 0.0104 UJ | 0.0103 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00242 U | 0.00259 U | 0.00256 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00484 U | 0.00518 U | 0.00513 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00242 UJ | 0.00259 U | 0.00256 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | 27SB003 | 27SB004 | 27SB005 |
|---|---|---|---|---|---|---|
| AREA | | | | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | | | | 27SS003G0001 | 27SS004G0001 | 27SS005G0001 |
| SAMPLE DATE | | | | 20110407 | 20110407 | 20110407 |
| SAMPLE CODE | | | | NORMAL | NORMAL | NORMAL |
| MATRIX | | | | SO | SO | SO |
| SUBMATRIX | | | | SS | SS | SS |
| TOP DEPTH | | | | 0 | 0 | 0 |
| BOTTOM DEPTH | | | | 1 | 1 | 1 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | 6890 | **13800** | **7720** |
| BARIUM | 1500 | 211 | 1.04 | **80.9 J** | **80.4** | **99.8** |
| CADMIUM | 7 | 6.05 | 0.36 | **0.783** | 0.0786 J | **0.583** |
| CHROMIUM | 0.0118 | 28.7 | 26 | **24.4** | **20.8 J** | **12.7 J** |
| COPPER | 310 | 17.6 | 28 | 18.3 | 13.6 | 17.7 |
| LEAD | 81 | 27 | 11 | **25.7 J** | **14.6 J** | **38 J** |
| MAGNESIUM | --- | 2800 | --- | 4190 J | 1820 | 1280 |
| MANGANESE | 180 | 5700 | 220 | **374 J** | **271 J** | **331 J** |
| POTASSIUM | --- | 1970 | --- | 535 J | 701 J | 984 J |
| SODIUM | --- | 28 | --- | 216 J | 81.2 J | 126 J |
| STRONTIUM | 4700 | 46.4 | --- | 12.3 J | 10.5 | 10.6 |
| ZINC | 2300 | 65.6 | 46 | **60 J** | **46.8** | **77.5** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 2.67 U | 2.43 U | 2.86 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00542 U | 0.00518 UJ | 0.00784 UJ |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.00271 U | 0.00259 UJ | 0.00392 UJ |
| ACETONE | 28 | --- | 2.5 | 0.0108 U | 0.0104 UJ | 0.0157 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00179 J | 0.00259 U | 0.00392 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00542 U | 0.00518 U | 0.00784 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | **0.00429 J** | 0.00259 U | 0.00392 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | 27SB006 | 27SB007 | 27SB008 |
|---|---|---|---|---|---|---|
| AREA | | | | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | | | | 27SS006G0001 | 27SS007G0001 | 27SS008G0001 |
| SAMPLE DATE | | | | 20110407 | 20110407 | 20110407 |
| SAMPLE CODE | | | | NORMAL | NORMAL | NORMAL |
| MATRIX | | | | SO | SO | SO |
| SUBMATRIX | | | | SS | SS | SS |
| TOP DEPTH | | | | 0 | 0 | 0 |
| BOTTOM DEPTH | | | | 1 | 1 | 1 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **12700** | **10900** | **12600** |
| BARIUM | 1500 | 211 | 1.04 | **139** | **299** | **124 J** |
| CADMIUM | 7 | 6.05 | 0.36 | **1.64** | **2.28** | 0.312 J |
| CHROMIUM | 0.0118 | 28.7 | 26 | **17.3 J** | **21.4 J** | **17.2** |
| COPPER | 310 | 17.6 | 28 | **67** | **59.9** | 15.5 |
| LEAD | 81 | 27 | 11 | **31.2 J** | **72.5 J** | **20.8 J** |
| MAGNESIUM | --- | 2800 | --- | 1590 | 2440 | 1560 J |
| MANGANESE | 180 | 5700 | 220 | **256 J** | **949 J** | **449 J** |
| POTASSIUM | --- | 1970 | --- | 851 J | 725 J | 755 J |
| SODIUM | --- | 28 | --- | 132 J | 90.7 J | 191 U |
| STRONTIUM | 4700 | 46.4 | --- | 14.2 | 33.6 | 10 J |
| ZINC | 2300 | 65.6 | 46 | **125** | **387** | **73.7 J** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 4.1 U | 3.18 U | 2.61 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.0104 UJ | 0.0222 J | 0.00603 U |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.00521 UJ | 0.00525 UJ | 0.00302 U |
| ACETONE | 28 | --- | 2.5 | 0.0208 UJ | 0.122 J | 0.0121 U |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00521 U | 0.00525 U | 0.00302 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.0104 U | 0.0105 U | 0.00603 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00521 U | 0.00525 U | 0.00302 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | **27SB010** | **27SB011** | **27SB012** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS010C0002** | **27SS011G0002** | **27SS012G0002** |
| SAMPLE DATE | | | | **20110411** | **20110409** | **20110409** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **9960** | **12600** | **10400** |
| BARIUM | 1500 | 211 | 1.04 | **398** | **99.6** | **77.5** |
| CADMIUM | 7 | 6.05 | 0.36 | 0.126 U | 0.304 J | 0.137 U |
| CHROMIUM | 0.0118 | 28.7 | 26 | **13.1 J** | **19.3 J** | **14.4 J** |
| COPPER | 310 | 17.6 | 28 | 12 | **28.9** | 17 |
| LEAD | 81 | 27 | 11 | 11 | **31.5** | **14.7** |
| MAGNESIUM | --- | 2800 | --- | 1500 J | 1780 J | 1410 J |
| MANGANESE | 180 | 5700 | 220 | **346** | **374** | **373** |
| POTASSIUM | --- | 1970 | --- | 608 J | 616 J | 575 J |
| SODIUM | --- | 28 | --- | 71.7 J | 197 U | 206 U |
| STRONTIUM | 4700 | 46.4 | --- | 22.2 | 14.9 | 12.2 |
| ZINC | 2300 | 65.6 | 46 | 30.2 J | **153 J** | 41.5 J |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 2.55 U | 2.7 U | 2.76 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | -- | -- |
| ACETONE | 28 | --- | 2.5 | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | -- | -- | -- |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | -- | -- | -- |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

**TABLE 5-1**

**INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB019** | **27SB020** | **27SB021** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS019C0002** | **27SS020C0002** | **27SS021C0002** |
| SAMPLE DATE | | | | **20110407** | **20110407** | **20110407** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | 6960 | **16500** |
| BARIUM | 1500 | 211 | 1.04 | -- | **238** | **91.1** |
| CADMIUM | 7 | 6.05 | 0.36 | -- | 0.289 | 0.123 J |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | **13.4 J** | **20.2 J** |
| COPPER | 310 | 17.6 | 28 | -- | 13.2 | 19.2 |
| LEAD | 81 | 27 | 11 | -- | **13.9 J** | **20 J** |
| MAGNESIUM | --- | 2800 | --- | -- | 2920 | 2190 |
| MANGANESE | 180 | 5700 | 220 | -- | **264 J** | **468 J** |
| POTASSIUM | --- | 1970 | --- | -- | 747 J | 965 J |
| SODIUM | --- | 28 | --- | -- | 168 U | 182 U |
| STRONTIUM | 4700 | 46.4 | --- | -- | 53.6 | 17.5 |
| ZINC | 2300 | 65.6 | 46 | -- | **62.4** | **81.3** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 2.32 U | 2.33 U | 2.55 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00559 UJ | 0.00444 UJ | 0.00526 UJ |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.0028 UJ | 0.00222 UJ | 0.00263 UJ |
| ACETONE | 28 | --- | 2.5 | 0.0112 UJ | 0.00888 UJ | 0.0105 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.0028 U | 0.00222 U | 0.00263 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00559 U | 0.00444 U | 0.00526 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.0028 U | 0.00222 U | 0.00263 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | 27SB022 | 27SB023 | 27SB024 |
|---|---|---|---|---|---|---|
| AREA | | | | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | | | | 27SS022C0002 | 27SS023C0002 | 27SS024C0002 |
| SAMPLE DATE | | | | 20110407 | 20110407 | 20110407 |
| SAMPLE CODE | | | | NORMAL | NORMAL | NORMAL |
| MATRIX | | | | SO | SO | SO |
| SUBMATRIX | | | | SS | SS | SS |
| TOP DEPTH | | | | 0 | 0 | 0 |
| BOTTOM DEPTH | | | | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **18400** | **12400** | **7720** |
| BARIUM | 1500 | 211 | 1.04 | **80.9** | **112** | **80.2** |
| CADMIUM | 7 | 6.05 | 0.36 | 0.208 J | **0.919** | **0.754** |
| CHROMIUM | 0.0118 | 28.7 | 26 | **20.3 J** | **17.9 J** | **12.2 J** |
| COPPER | 310 | 17.6 | 28 | 23.8 | 16.3 | 11.5 |
| LEAD | 81 | 27 | 11 | **20.7 J** | **23.1 J** | **35.3 J** |
| MAGNESIUM | --- | 2800 | --- | 2640 | 1590 | 718 |
| MANGANESE | 180 | 5700 | 220 | **569 J** | **385 J** | **617 J** |
| POTASSIUM | --- | 1970 | --- | 1050 J | 641 J | 531 J |
| SODIUM | --- | 28 | --- | 171 J | 181 U | 174 U |
| STRONTIUM | 4700 | 46.4 | --- | 34.4 | 7.85 | 10 |
| ZINC | 2300 | 65.6 | 46 | **135** | **217** | **81.2** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | 0.288 U |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 2.47 U | 2.48 U | 2.42 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00531 UJ | 0.00515 UJ | 0.0051 UJ |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.00266 UJ | 0.00257 UJ | 0.00255 UJ |
| ACETONE | 28 | --- | 2.5 | 0.0106 UJ | 0.0103 UJ | 0.0102 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00266 U | 0.00257 U | 0.00255 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00531 U | 0.00515 U | 0.0051 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00266 U | 0.00257 U | 0.00255 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | 27SB025 | 27SB026 | 27SB027 |
|---|---|---|---|---|---|---|
| AREA | | | | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | | | | 27SS025C0002 | 27SS026C0002 | 27SS027C0002 |
| SAMPLE DATE | | | | 20110407 | 20110407 | 20110407 |
| SAMPLE CODE | | | | NORMAL | NORMAL | NORMAL |
| MATRIX | | | | SO | SO | SO |
| SUBMATRIX | | | | SS | SS | SS |
| TOP DEPTH | | | | 0 | 0 | 0 |
| BOTTOM DEPTH | | | | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | 9910 | 9010 | 14400 |
| BARIUM | 1500 | 211 | 1.04 | 2300 | 608 | 586 |
| CADMIUM | 7 | 6.05 | 0.36 | 0.554 J | 0.769 J | 1.58 |
| CHROMIUM | 0.0118 | 28.7 | 26 | 12 J | 14 J | 20.2 J |
| COPPER | 310 | 17.6 | 28 | 29.3 | 29.3 | 48.5 |
| LEAD | 81 | 27 | 11 | 54 J | 57.3 J | 91.6 J |
| MAGNESIUM | --- | 2800 | --- | 4890 J | 6030 J | 3760 |
| MANGANESE | 180 | 5700 | 220 | 806 J | 335 J | 343 J |
| POTASSIUM | --- | 1970 | --- | 642 J | 741 J | 1040 J |
| SODIUM | --- | 28 | --- | 935 U | 905 U | 185 U |
| STRONTIUM | 4700 | 46.4 | --- | 102 | 142 | 73.5 |
| ZINC | 2300 | 65.6 | 46 | 120 | 114 | 162 |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 0.841 J | 2.46 U | 1.75 J |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00523 UJ | 0.00477 UJ | 0.00486 UJ |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.00262 UJ | 0.00239 UJ | 0.00243 UJ |
| ACETONE | 28 | --- | 2.5 | 0.0105 UJ | 0.00955 UJ | 0.00971 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00262 U | 0.00239 U | 0.00243 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00523 U | 0.00477 U | 0.00486 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00262 U | 0.00239 U | 0.00243 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

**TABLE 5-1**

**INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB028** | **27SB043** | **27SB044** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS028C0002** | **27SS043C0002** | **27SS044C0002** |
| SAMPLE DATE | | | | **20110407** | **20110407** | **20110407** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **15600** | -- | -- |
| BARIUM | 1500 | 211 | 1.04 | **2260** | -- | -- |
| CADMIUM | 7 | 6.05 | 0.36 | **0.55** | -- | -- |
| CHROMIUM | 0.0118 | 28.7 | 26 | **17.5 J** | -- | -- |
| COPPER | 310 | 17.6 | 28 | **35** | -- | -- |
| LEAD | 81 | 27 | 11 | **38.4 J** | -- | -- |
| MAGNESIUM | --- | 2800 | --- | 3430 | -- | -- |
| MANGANESE | 180 | 5700 | 220 | **531 J** | -- | -- |
| POTASSIUM | --- | 1970 | --- | 846 J | -- | -- |
| SODIUM | --- | 28 | --- | 186 U | -- | -- |
| STRONTIUM | 4700 | 46.4 | --- | 86.8 | -- | -- |
| ZINC | 2300 | 65.6 | 46 | **67.1** | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | 0.835 J | -- | -- |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | -- | 9.58 U | 9.29 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00534 UJ | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | 0.00267 UJ | -- | -- |
| ACETONE | 28 | --- | 2.5 | 0.0107 UJ | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00267 U | -- | -- |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00534 U | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00267 U | -- | -- |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | **27SB045** | **27SB046** | **27SB047** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS045C0002** | **27SS046C0002** | **27SS047C0002** |
| SAMPLE DATE | | | | **20110407** | **20110407** | **20110407** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | -- | -- |
| BARIUM | 1500 | 211 | 1.04 | -- | -- | -- |
| CADMIUM | 7 | 6.05 | 0.36 | -- | -- | -- |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | -- | -- |
| COPPER | 310 | 17.6 | 28 | -- | -- | -- |
| LEAD | 81 | 27 | 11 | -- | -- | -- |
| MAGNESIUM | --- | 2800 | --- | -- | -- | -- |
| MANGANESE | 180 | 5700 | 220 | -- | -- | -- |
| POTASSIUM | --- | 1970 | --- | -- | -- | -- |
| SODIUM | --- | 28 | --- | -- | -- | -- |
| STRONTIUM | 4700 | 46.4 | --- | -- | -- | -- |
| ZINC | 2300 | 65.6 | 46 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | -- | -- | -- |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | 9.53 U | 9.44 U | 9.55 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | -- | -- |
| ACETONE | 28 | --- | 2.5 | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | -- | -- | -- |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | -- | -- | -- |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | **27SB048** | **27SB049** | **27SB050** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS048C0002** | **27SS049C0002** | **27SS050C0002** |
| SAMPLE DATE | | | | **20110407** | **20110409** | **20110409** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | -- | -- |
| BARIUM | 1500 | 211 | 1.04 | -- | -- | -- |
| CADMIUM | 7 | 6.05 | 0.36 | -- | -- | -- |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | -- | -- |
| COPPER | 310 | 17.6 | 28 | -- | -- | -- |
| LEAD | 81 | 27 | 11 | -- | -- | -- |
| MAGNESIUM | --- | 2800 | --- | -- | -- | -- |
| MANGANESE | 180 | 5700 | 220 | -- | -- | -- |
| POTASSIUM | --- | 1970 | --- | -- | -- | -- |
| SODIUM | --- | 28 | --- | -- | -- | -- |
| STRONTIUM | 4700 | 46.4 | --- | -- | -- | -- |
| ZINC | 2300 | 65.6 | 46 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | -- | -- | -- |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | 9.37 U | 10.3 U | 9.94 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | -- | -- |
| ACETONE | 28 | --- | 2.5 | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | -- | -- | -- |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | -- | -- | -- |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | **27SB051** | **27SB052** | **27SB053** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS051C0002** | **27SS052C0002** | **27SS053G0002** |
| SAMPLE DATE | | | | **20110409** | **20110409** | **20110407** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | -- | -- |
| BARIUM | 1500 | 211 | 1.04 | -- | -- | -- |
| CADMIUM | 7 | 6.05 | 0.36 | -- | -- | -- |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | -- | -- |
| COPPER | 310 | 17.6 | 28 | -- | -- | -- |
| LEAD | 81 | 27 | 11 | -- | -- | -- |
| MAGNESIUM | --- | 2800 | --- | -- | -- | -- |
| MANGANESE | 180 | 5700 | 220 | -- | -- | -- |
| POTASSIUM | --- | 1970 | --- | -- | -- | -- |
| SODIUM | --- | 28 | --- | -- | -- | -- |
| STRONTIUM | 4700 | 46.4 | --- | -- | -- | -- |
| ZINC | 2300 | 65.6 | 46 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | -- | -- | -- |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | 9.55 U | 9.32 U | 9.75 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | -- | -- |
| ACETONE | 28 | --- | 2.5 | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | -- | -- | 0.0029 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | -- | -- | 0.0029 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | **27SB053** | **27SB054** | **27SB055** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS053G0002-D** | **27SS054G0002** | **27SS055G0002** |
| SAMPLE DATE | | | | **20110407** | **20110407** | **20110407** |
| SAMPLE CODE | | | | **DUP** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | -- | -- |
| BARIUM | 1500 | 211 | 1.04 | -- | -- | -- |
| CADMIUM | 7 | 6.05 | 0.36 | -- | -- | -- |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | -- | -- |
| COPPER | 310 | 17.6 | 28 | -- | -- | -- |
| LEAD | 81 | 27 | 11 | -- | -- | -- |
| MAGNESIUM | --- | 2800 | --- | -- | -- | -- |
| MANGANESE | 180 | 5700 | 220 | -- | -- | -- |
| POTASSIUM | --- | 1970 | --- | -- | -- | -- |
| SODIUM | --- | 28 | --- | -- | -- | -- |
| STRONTIUM | 4700 | 46.4 | --- | -- | -- | -- |
| ZINC | 2300 | 65.6 | 46 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | -- | -- | -- |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | 9.29 U | **129** | 8.63 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | -- | -- |
| ACETONE | 28 | --- | 2.5 | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00253 U | 0.00296 U | 0.00211 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00253 U | 0.00296 U | 0.00211 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

TABLE 5-1

INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | HHRA | BACKGROUND | ERA | **27SB059** | **27SB060** | **27SB061** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS059C0002** | **27SS060C0002** | **27SS061C0002** |
| SAMPLE DATE | | | | **20110409** | **20110409** | **20110409** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | -- | -- |
| BARIUM | 1500 | 211 | 1.04 | -- | -- | -- |
| CADMIUM | 7 | 6.05 | 0.36 | -- | -- | -- |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | -- | -- |
| COPPER | 310 | 17.6 | 28 | -- | -- | -- |
| LEAD | 81 | 27 | 11 | -- | -- | -- |
| MAGNESIUM | --- | 2800 | --- | -- | -- | -- |
| MANGANESE | 180 | 5700 | 220 | -- | -- | -- |
| POTASSIUM | --- | 1970 | --- | -- | -- | -- |
| SODIUM | --- | 28 | --- | -- | -- | -- |
| STRONTIUM | 4700 | 46.4 | --- | -- | -- | -- |
| ZINC | 2300 | 65.6 | 46 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 55000 | --- | --- | -- | -- | -- |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | 9.95 U | 10.2 U | 10.5 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | -- | -- |
| ACETONE | 28 | --- | 2.5 | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | -- | -- | -- |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | -- | -- |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | -- | -- | -- |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

**TABLE 5-1**

**INVESTIGATION AREA 1 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB062** | **27SB064** |
|---|---|---|---|---|---|
| AREA | | | | **IA 1** | **IA 1** |
| SAMPLE ID | | | | **27SS062C0002** | **27SS064C0002** |
| SAMPLE DATE | | | | **20110409** | **20110826** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 7700 | 19900 | --- | -- | 7290 |
| BARIUM | 1500 | 211 | 1.04 | -- | **104** |
| CADMIUM | 7 | 6.05 | 0.36 | -- | 0.574 U |
| CHROMIUM | 0.0118 | 28.7 | 26 | -- | **16.8** |
| COPPER | 310 | 17.6 | 28 | -- | 10.4 |
| LEAD | 81 | 27 | 11 | -- | **26.1** |
| MAGNESIUM | --- | 2800 | --- | -- | 947 J |
| MANGANESE | 180 | 5700 | 220 | -- | **396** |
| POTASSIUM | --- | 1970 | --- | -- | 455 J |
| SODIUM | --- | 28 | --- | -- | 861 U |
| STRONTIUM | 4700 | 46.4 | --- | -- | 4.72 |
| ZINC | 2300 | 65.6 | 46 | -- | 35.8 |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | |
| PERCHLORATE | 55000 | --- | --- | -- | 2.38 U |
| **PCBS (UG/KG)** | | | | | |
| AROCLOR-1260 | 220 | --- | 0.332 | 10.3 U | -- |
| **VOLATILES (MG/KG)** | | | | | |
| 2-BUTANONE | 20 | --- | 89.6 | -- | 0.0125 J |
| 4-METHYL-2-PENTANONE | 4.6 | --- | 443 | -- | 0.00408 J |
| ACETONE | 28 | --- | 2.5 | -- | 0.112 J |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | -- | 0.00234 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | -- | **0.0267** |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | -- | **0.00439 J** |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
-- = not analyzed
--- = value not available

**TABLE 5-2**

**INVESTIGATION AREA 2 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - FLARE TEST AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB009** | **27SB013** | **27SB014** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 2** | **IA 2** | **IA 2** |
| SAMPLE ID | | | | **27SS009G0001** | **27SS013G0002** | **27SS014G0002** |
| SAMPLE DATE | | | | **20110408** | **20110408** | **20110408** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **1** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | 1510 | 7310 | **9090** |
| BARIUM | 1500 | 211 | 1.04 | **29.5 J** | **80.6 J** | **48.2** |
| CADMIUM | 7 | 6.05 | 0.36 | 2.59 U | 2.74 U | 0.0689 J |
| CHROMIUM | 0.0118 | 28.7 | 26 | **5.74 J** | **14.5 J** | **13 J** |
| COPPER | 310 | 17.6 | 28 | 10.3 U | 8.31 J | 7.53 |
| LEAD | 81 | 27 | 11 | 4.84 | **14.9** | 8.52 |
| MAGNESIUM | --- | 2800 | --- | 10800 J | 8830 J | 1120 J |
| MANGANESE | 180 | 5700 | 220 | 123 | **849** | 77.2 |
| POTASSIUM | --- | 1970 | --- | 338 J | 777 J | 416 J |
| SODIUM | --- | 28 | --- | 135 J | 258 J | 175 U |
| STRONTIUM | 4700 | 46.4 | --- | 152 | 100 | 7.96 |
| ZINC | 2300 | 65.6 | 46 | 20.5 U | 48.4 U | 32 J |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-2**

**INVESTIGATION AREA 2 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - FLARE TEST AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB015** | **27SB016** | **27SB017** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 2** | **IA 2** | **IA 2** |
| SAMPLE ID | | | | **27SS015G0002** | **27SS016G0002** | **27SS017G0002** |
| SAMPLE DATE | | | | **20110407** | **20110407** | **20110408** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **13800** | **12300** | **17900** |
| BARIUM | 1500 | 211 | 1.04 | **87.6 J** | **37 J** | **90.5** |
| CADMIUM | 7 | 6.05 | 0.36 | 0.324 | 0.0598 J | 0.131 J |
| CHROMIUM | 0.0118 | 28.7 | 26 | **16.2** | **16.3** | **20.4 J** |
| COPPER | 310 | 17.6 | 28 | 14.7 | 7.23 | 19.5 |
| LEAD | 81 | 27 | 11 | 11 J | 7.95 J | **18.2** |
| MAGNESIUM | --- | 2800 | --- | 3950 J | 1220 J | 2730 J |
| MANGANESE | 180 | 5700 | 220 | **297 J** | 53.1 J | **298** |
| POTASSIUM | --- | 1970 | --- | 847 J | 322 J | 1170 J |
| SODIUM | --- | 28 | --- | 103 J | 92.8 J | 85.1 J |
| STRONTIUM | 4700 | 46.4 | --- | 65.4 J | 9.31 J | 23.4 |
| ZINC | 2300 | 65.6 | 46 | 38.1 J | 15.8 J | **55.7 J** |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-2**

**INVESTIGATION AREA 2 SURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - FLARE TEST AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB018** | **27SB058** | **27SB063** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 2** | **IA 2** | **IA 2** |
| SAMPLE ID | | | | **27SS018G0002** | **27SS058G0001** | **27SS063G0002** |
| SAMPLE DATE | | | | **20110408** | **20110408** | **20110411** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **1** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **16800** | **17800** | **7740** |
| BARIUM | 1500 | 211 | 1.04 | **95** | **88.8** | **132** |
| CADMIUM | 7 | 6.05 | 0.36 | 0.12 UJ | 0.124 UJ | **0.798 J** |
| CHROMIUM | 0.0118 | 28.7 | 26 | **19.4 J** | **19.7 J** | **11.3 J** |
| COPPER | 310 | 17.6 | 28 | 17.6 | 18.2 | 9.71 |
| LEAD | 81 | 27 | 11 | **14.1** | **13.6** | **15.8** |
| MAGNESIUM | --- | 2800 | --- | 2540 J | 3520 J | 11000 J |
| MANGANESE | 180 | 5700 | 220 | **304** | **231** | **426** |
| POTASSIUM | --- | 1970 | --- | 989 J | 878 J | 695 J |
| SODIUM | --- | 28 | --- | 208 J | 186 U | 773 J |
| STRONTIUM | 4700 | 46.4 | --- | 44 | 28.3 | 234 |
| ZINC | 2300 | 65.6 | 46 | **49.4 J** | **51.6 J** | **60.2 J** |

Notes:
HHRA - Human Health Risk Assessment Screening Value
ERA - Ecological Risk Assessment Screening Value
**Exceeds both HHRA and ERA**
**Exceeds ERA only**
**Exceeds HHRA only**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-3**

**INVESTIGATION AREA 1 SUBSURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | **27SB036** | **27SB037** | **27SB038** |
|---|---|---|---|---|---|
| AREA | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | **27SB036G0406** | **27SB037G0507** | **27SB038G0406** |
| SAMPLE DATE | | | **20110408** | **20110408** | **20110408** |
| SAMPLE CODE | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | **SB** | **SB** | **SB** |
| TOP DEPTH | | | **4** | **5** | **4** |
| BOTTOM DEPTH | | | **6** | **7** | **6** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 7700 | 19900 | 4460 | 2960 | **18900** |
| BARIUM | 1500 | 211 | 24.1 | 89.7 | 99.6 |
| CADMIUM | 7 | 6.05 | 0.106 U | 0.0621 J | 0.324 |
| CHROMIUM | 0.0118 | 28.7 | **16.3 J** | **7.72** | **19.3** |
| COPPER | 310 | 17.6 | 11 | 5.3 | 15.6 |
| LEAD | 81 | 27 | 7.4 | 4.94 | 16.7 |
| MAGNESIUM | --- | 2800 | 1010 J | 327 | 2250 |
| MANGANESE | 180 | 5700 | **518** | 122 J | **453 J** |
| POTASSIUM | --- | 1970 | 939 J | 536 J | 1050 J |
| SODIUM | --- | 28 | 159 U | 164 U | 101 J |
| STRONTIUM | 4700 | 46.4 | 5.39 | 10.5 J | 11 J |
| ZINC | 2300 | 65.6 | 57.8 J | 27.8 J | 56.3 J |
| **VOLATILES (MG/KG)** | | | | | |
| ACETONE | 28 | --- | 0.00553 J | 0.00992 U | 0.00957 U |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.00254 U | 0.00248 U | 0.00239 U |
| ETHYLBENZENE | 0.034 | --- | 0.00652 | 0.00182 J | 0.00239 U |
| METHYL ACETATE | 6.4 | --- | 0.00507 U | 0.00496 U | 0.00478 U |
| TOTAL XYLENES | 3.8 | --- | 0.0226 | 0.00462 J | 0.00717 U |
| TRICHLOROETHENE | 0.0032 | --- | **0.00521** | 0.00248 U | 0.00239 U |
| VINYL CHLORIDE | 0.000112 | --- | 0.00254 U | 0.00248 U | 0.00239 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
**Exceeds HHRA**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-3**

**INVESTIGATION AREA 1 SUBSURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | | | **27SB038** | **27SB039** | **27SB040** |
|---|---|---|---|---|---|
| AREA | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | **27SB038G0406-D** | **27SB039G0709** | **27SB040G0406** |
| SAMPLE DATE | HHRA | BACKGROUND | **20110408** | **20110407** | **20110408** |
| SAMPLE CODE | | | **DUP** | **NORMAL** | **NORMAL** |
| MATRIX | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | **SB** | **SB** | **SB** |
| TOP DEPTH | | | **4** | **7** | **4** |
| BOTTOM DEPTH | | | **6** | **9** | **6** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 7700 | 19900 | **18400** | **10600** | **12100** |
| BARIUM | 1500 | 211 | 96.4 | 22.9 | 60.2 |
| CADMIUM | 7 | 6.05 | 0.199 J | 0.501 | 0.184 J |
| CHROMIUM | 0.0118 | 28.7 | **17.9** | **35.6** | **17.2** |
| COPPER | 310 | 17.6 | 15.5 | 15.9 | 12.4 |
| LEAD | 81 | 27 | 16.8 | 7.5 | 10 |
| MAGNESIUM | --- | 2800 | 2210 | 4910 | 1660 |
| MANGANESE | 180 | 5700 | **507 J** | **900 J** | **207 J** |
| POTASSIUM | --- | 1970 | 1000 J | 566 J | 624 J |
| SODIUM | --- | 28 | 107 J | 166 U | 175 U |
| STRONTIUM | 4700 | 46.4 | 10.6 J | 33 J | 8.7 J |
| ZINC | 2300 | 65.6 | 53.5 J | 104 J | 35.3 J |
| **VOLATILES (MG/KG)** | | | | | |
| ACETONE | 28 | --- | 0.00668 J | 0.00626 J | 0.0101 J |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.00248 U | 0.00213 U | 0.00226 U |
| ETHYLBENZENE | 0.034 | --- | 0.00248 U | 0.00213 U | 0.00226 U |
| METHYL ACETATE | 6.4 | --- | 0.00497 U | 0.00427 U | 0.00453 U |
| TOTAL XYLENES | 3.8 | --- | 0.00745 U | 0.0064 U | 0.00679 U |
| TRICHLOROETHENE | 0.0032 | --- | 0.00248 U | 0.00213 U | 0.00226 U |
| VINYL CHLORIDE | 0.000112 | --- | 0.00248 U | 0.00213 U | 0.00226 U |

Notes:
HHRA - Human Health Risk Assessment Screening Value
**Exceeds HHRA**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-3**

**INVESTIGATION AREA 1 SUBSURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | | | **27SB041** | **27SB042** | **27SB065** |
|---|---|---|---|---|---|
| AREA | | | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | | | **27SB041G0406** | **27SB042G0406** | **27SB065G0406** |
| SAMPLE DATE | HHRA | BACKGROUND | **20110408** | **20110407** | **20110427** |
| SAMPLE CODE | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | **SB** | **SB** | **SB** |
| TOP DEPTH | | | **4** | **4** | **4** |
| BOTTOM DEPTH | | | **6** | **6** | **6** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 7700 | 19900 | **10800** | **16700** | **13100** |
| BARIUM | 1500 | 211 | 53.6 | 34.8 | 63.2 |
| CADMIUM | 7 | 6.05 | 0.109 J | 0.268 J | 0.248 UJ |
| CHROMIUM | 0.0118 | 28.7 | **14.3** | **62.6** | **15.9** |
| COPPER | 310 | 17.6 | 12.9 | 16.1 | 12.9 |
| LEAD | 81 | 27 | 13 | 11.7 | 10.8 |
| MAGNESIUM | --- | 2800 | 1350 | 570 | 1900 |
| MANGANESE | 180 | 5700 | 180 J | **759 J** | **353** |
| POTASSIUM | --- | 1970 | 533 J | 537 J | 645 |
| SODIUM | --- | 28 | 108 J | 177 U | 373 UJ |
| STRONTIUM | 4700 | 46.4 | 10.9 J | 7.48 J | 12.6 |
| ZINC | 2300 | 65.6 | 40.5 J | 90.9 J | 35.4 |
| **VOLATILES (MG/KG)** | | | | | |
| ACETONE | 28 | --- | 0.00952 U | 0.00913 U | 0.0126 UR |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.00238 U | 0.00228 U | 0.00796 |
| ETHYLBENZENE | 0.034 | --- | 0.00238 U | 0.00228 U | 0.00315 U |
| METHYL ACETATE | 6.4 | --- | 0.00476 U | 0.00456 U | 0.00373 J |
| TOTAL XYLENES | 3.8 | --- | 0.00714 U | 0.00685 U | 0.00944 U |
| TRICHLOROETHENE | 0.0032 | --- | 0.00238 U | 0.00228 U | **0.0176** |
| VINYL CHLORIDE | 0.000112 | --- | 0.00238 U | 0.00228 U | **0.00683** |

Notes:
HHRA - Human Health Risk Assessment Screening Value
**Exceeds HHRA**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-4**

**INVESTIGATION AREA 2 SUBSURFACE SOIL SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - FLARE TEST AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**

| LOCATION | | | **27SB017** | **27SB017** | **27SB018** | **27SB018** | **27SB018** |
|---|---|---|---|---|---|---|---|
| AREA | | | **IA 2** | **IA 2** | **IA 2** | **IA 2** | **IA 2** |
| SAMPLE ID | | | **27SB017G0204** | **27SB017G0406** | **27SB018G0204** | **27SB018G0406** | **27SB018G0406-D** |
| SAMPLE DATE | HHRA | BACKGROUND | **20110408** | **20110408** | **20110408** | **20110408** | **20110408** |
| SAMPLE CODE | | | **NORMAL** | **NORMAL** | **NORMAL** | **NORMAL** | **DUP** |
| MATRIX | | | **SO** | **SO** | **SO** | **SO** | **SO** |
| SUBMATRIX | | | **SB** | **SB** | **SB** | **SB** | **SB** |
| TOP DEPTH | | | **2** | **4** | **2** | **4** | **4** |
| BOTTOM DEPTH | | | **4** | **6** | **4** | **6** | **6** |
| **METALS (MG/KG)** | | | | | | | |
| ALUMINUM | 7700 | 19900 | **14300** | **15000** | **13500** | **13400** | **12600** |
| BARIUM | 1500 | 211 | 116 | 83.4 | 53.9 | 88 | 88.8 |
| CADMIUM | 7 | 6.05 | 0.13 U | 0.113 U | 0.167 J | 0.19 J | 0.131 J |
| CHROMIUM | 0.0118 | 28.7 | **16.4** | **18.1** | **20.4** | **19.5** | **14.4** |
| COPPER | 310 | 17.6 | 11.6 | 14.9 | 11 | 11.7 | 12.1 |
| LEAD | 81 | 27 | 13.7 | 12.6 | 9.51 | 16.8 | 16.5 |
| MAGNESIUM | --- | 2800 | 1680 | 2030 | 1840 | 1570 | 1660 |
| MANGANESE | 180 | 5700 | **674 J** | **286 J** | **189 J** | **537 J** | **725 J** |
| POTASSIUM | --- | 1970 | 750 J | 734 J | 538 J | 640 J | 673 J |
| STRONTIUM | 4700 | 46.4 | 14.5 J | 11.8 J | 30.7 J | 9.43 J | 9.49 J |
| ZINC | 2300 | 65.6 | 42.1 J | 42 J | 22.5 J | 40.2 J | 45 J |

Notes:
HHRA - Human Health Risk Assessment Screening Value
**Exceeds HHRA**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-5**

**PIT/SUMP SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | | | | **27SB029** | **27SB030** | **27SB031** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1 - Pit** | **IA 1 - Pit** | **IA 1 - Pit** |
| SAMPLE ID | | | | **27SS029C0002** | **27SS030C0002** | **27SS031C0002** |
| SAMPLE DATE | HHRA | BACKGROUND | ERA | **20110408** | **20110411** | **20110408** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | 3190 | 6230 | **10600 J** |
| BARIUM | 1500 | 211 | 1.04 | **76.5 J** | **134** | **779 J** |
| CADMIUM | 7 | 6.05 | 0.36 | **11.9** | **3.49** | **14.3 J** |
| CHROMIUM | 0.0118 | 28.7 | 26 | **240 J** | **18.9** | **56.7 J** |
| COPPER | 310 | 17.6 | 28 | **277** | **498** | **1200 J** |
| LEAD | 81 | 27 | 11 | **597** | **266** | **738 J** |
| MAGNESIUM | --- | 2800 | --- | 6970 J | 10600 | 13600 UJ |
| MANGANESE | 180 | 5700 | 220 | **640** | **365** | **120000 J** |
| POTASSIUM | --- | 1970 | --- | 179 J | 191 J | 935 J |
| SODIUM | --- | 28 | --- | 270 U | 137 J | 1380 J |
| STRONTIUM | 4700 | 46.4 | --- | 36.6 | 57.8 | 221 J |
| ZINC | 2300 | 65.6 | 46 | **4580 J** | **2530** | **6410 J** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | 0.491 J | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 1,2-DICHLOROBENZENE | 5.4 | --- | 2.96 | 5.49 U | 0.00302 U | 0.0123 UJ |
| 1,4-DICHLOROBENZENE | 0.0082 | --- | 0.546 | 5.49 U | 0.00302 U | 0.0123 UJ |
| 2-BUTANONE | 20 | --- | 89.6 | 11 UJ | 0.00605 UJ | 0.153 J |
| ACETONE | 28 | --- | 2.5 | 22 U | 0.0121 UJ | 0.399 J |
| BENZENE | 0.0042 | --- | 0.255 | 5.49 U | 0.00302 U | 0.0123 UJ |
| CARBON DISULFIDE | 4.2 | --- | 0.094 | 5.49 U | 0.0055 U | 0.00888 J |
| CHLOROBENZENE | 0.98 | --- | 13.1 | 5.49 U | 0.00302 U | 0.0123 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 5.49 U | 0.00302 U | 0.0123 UJ |
| CYCLOHEXANE | 260 | --- | --- | 27.9 | 0.00302 U | 0.0416 J |
| ETHYLBENZENE | 0.034 | --- | 5.16 | **297** | 0.00302 U | **1.85 J** |
| ISOPROPYLBENZENE | 11 | --- | --- | **20.1** | 0.00302 U | 0.442 J |
| METHYL CYCLOHEXANE | --- | --- | --- | 349 | 0.00302 U | 0.918 J |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 11 U | **0.0778** | 0.0246 UJ |
| TOLUENE | 12 | --- | 5.45 | 5.49 U | 0.00302 U | 0.0123 UJ |
| TOTAL XYLENES | 3.8 | --- | 10 | **829** | 0.00907 U | 3.3 J |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 5.49 U | 0.00302 U | 0.0123 UJ |
| VINYL CHLORIDE | 0.000112 | --- | 0.646 | 5.49 U | 0.00302 U | 0.0123 UJ |

**Exceeds HHRA and ERA - [H,E] on maps**
**Exceeds ERA only - [E] on maps**
**Exceeds HHRA only - [H] on maps**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-5**

**PIT/SUMP SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB032** | **27SB033** |
|---|---|---|---|---|---|
| AREA | | | | **IA 1 - Pit** | **IA 1 - Pit** |
| SAMPLE ID | | | | **27SS032C0002** | **27SS033C0002** |
| SAMPLE DATE | | | | **20110408** | **20110408** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 7700 | 19900 | --- | 1500 | 3690 |
| BARIUM | 1500 | 211 | 1.04 | **102 J** | **257 J** |
| CADMIUM | 7 | 6.05 | 0.36 | 12.8 U | 18.1 U |
| CHROMIUM | 0.0118 | 28.7 | 26 | 63.9 U | 36.3 U |
| COPPER | 310 | 17.6 | 28 | **2420** | **154** |
| LEAD | 81 | 27 | 11 | **1570** | **396** |
| MAGNESIUM | --- | 2800 | --- | 45300 J | 29100 J |
| MANGANESE | 180 | 5700 | 220 | **208000** | **125000** |
| POTASSIUM | --- | 1970 | --- | 305 J | 657 J |
| SODIUM | --- | 28 | --- | 149 J | 262 J |
| STRONTIUM | 4700 | 46.4 | --- | 18.1 | 128 |
| ZINC | 2300 | 65.6 | 46 | **18900 J** | **12400 J** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- |
| **VOLATILES (MG/KG)** | | | | | |
| 1,2-DICHLOROBENZENE | 5.4 | --- | 2.96 | 0.0092 J | 0.00277 J |
| 1,4-DICHLOROBENZENE | 0.0082 | --- | 0.546 | **0.0241 J** | 0.00604 J |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00554 UJ | 0.00924 U |
| ACETONE | 28 | --- | 2.5 | 0.0111 UJ | 0.0185 U |
| BENZENE | 0.0042 | --- | 0.255 | 0.00331 J | 0.00359 J |
| CARBON DISULFIDE | 4.2 | --- | 0.094 | 0.00277 UJ | 0.00462 U |
| CHLOROBENZENE | 0.98 | --- | 13.1 | 0.00779 J | 0.00876 J |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00277 UJ | 0.00462 U |
| CYCLOHEXANE | 260 | --- | --- | 0.00277 UJ | 0.00462 U |
| ETHYLBENZENE | 0.034 | --- | 5.16 | 0.00277 UJ | 0.00397 J |
| ISOPROPYLBENZENE | 11 | --- | --- | 0.00277 UJ | 0.00462 U |
| METHYL CYCLOHEXANE | --- | --- | --- | 0.00277 UJ | 0.00462 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00554 UJ | 0.00924 U |
| TOLUENE | 12 | --- | 5.45 | 0.0136 J | 0.0129 |
| TOTAL XYLENES | 3.8 | --- | 10 | 0.0083 UJ | 0.0171 J |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00277 UJ | 0.00462 U |
| VINYL CHLORIDE | 0.000112 | --- | 0.646 | 0.00277 UJ | 0.00462 U |

**Exceeds HHRA and ERA - [H,E] on maps**
**Exceeds ERA only - [E] on maps**
**Exceeds HHRA only - [H] on maps**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

**TABLE 5-5**

**PIT/SUMP SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | HHRA | BACKGROUND | ERA | **27SB034** | **27SB035** | **27SB056** |
|---|---|---|---|---|---|---|
| AREA | | | | **IA 1 - Pit** | **IA 1 - Pit** | **IA 1 - Pit** |
| SAMPLE ID | | | | **27SS034C0002** | **27SS035C0002** | **27SS056G0002** |
| SAMPLE DATE | | | | **20110408** | **20110408** | **20110407** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** | **2** |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 7700 | 19900 | --- | **10900 J** | 6830 | 7230 |
| BARIUM | 1500 | 211 | 1.04 | **239 J** | **62.5** | **373 J** |
| CADMIUM | 7 | 6.05 | 0.36 | **7.63 J** | **18.8** | **7.97 J** |
| CHROMIUM | 0.0118 | 28.7 | 26 | **39.5 J** | **13.8 J** | 29.3 U |
| COPPER | 310 | 17.6 | 28 | **168 J** | **63.4** | **233** |
| LEAD | 81 | 27 | 11 | **221 J** | **442** | **1270 J** |
| MAGNESIUM | --- | 2800 | --- | 11300 J | 5000 J | 14500 J |
| MANGANESE | 180 | 5700 | 220 | **2400 J** | **267** | **67900 J** |
| POTASSIUM | --- | 1970 | --- | 1040 J | 460 J | 1320 J |
| SODIUM | --- | 28 | --- | 921 J | 199 U | 251 J |
| STRONTIUM | 4700 | 46.4 | --- | 108 J | 11.7 | 223 J |
| ZINC | 2300 | 65.6 | 46 | **2120 J** | **824 J** | **7240 J** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 1,2-DICHLOROBENZENE | 5.4 | --- | 2.96 | 0.0113 UJ | 0.00273 U | 0.00397 U |
| 1,4-DICHLOROBENZENE | 0.0082 | --- | 0.546 | 0.0113 UJ | 0.00273 U | 0.00397 U |
| 2-BUTANONE | 20 | --- | 89.6 | 0.134 J | 0.00546 U | 0.00794 U |
| ACETONE | 28 | --- | 2.5 | 0.761 J | 0.0109 U | 0.0159 U |
| BENZENE | 0.0042 | --- | 0.255 | 0.0113 UJ | 0.00273 U | 0.00397 U |
| CARBON DISULFIDE | 4.2 | --- | 0.094 | 0.017 J | 0.00273 U | 0.00397 U |
| CHLOROBENZENE | 0.98 | --- | 13.1 | 0.0113 UJ | 0.00273 U | 0.00397 U |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.0113 UJ | 0.00273 U | 0.00397 U |
| CYCLOHEXANE | 260 | --- | --- | 0.891 J | 0.00273 U | 0.00397 U |
| ETHYLBENZENE | 0.034 | --- | 5.16 | 0.0113 UJ | 0.00181 J | 0.00397 U |
| ISOPROPYLBENZENE | 11 | --- | --- | 0.0113 UJ | 0.00273 U | 0.00397 U |
| METHYL CYCLOHEXANE | --- | --- | --- | 0.0113 UJ | 0.00273 U | 0.00397 U |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.0227 UJ | 0.00546 U | 0.00794 U |
| TOLUENE | 12 | --- | 5.45 | 0.0113 UJ | 0.00273 U | 0.00397 U |
| TOTAL XYLENES | 3.8 | --- | 10 | 0.0171 J | 0.00527 J | 0.0119 U |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.0113 UJ | 0.00238 J | 0.00397 U |
| VINYL CHLORIDE | 0.000112 | --- | 0.646 | 0.0113 UJ | 0.00273 U | 0.00397 U |

**Exceeds HHRA and ERA - [H,E] on maps**
**Exceeds ERA only - [E] on maps**
**Exceeds HHRA only - [H] on maps**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

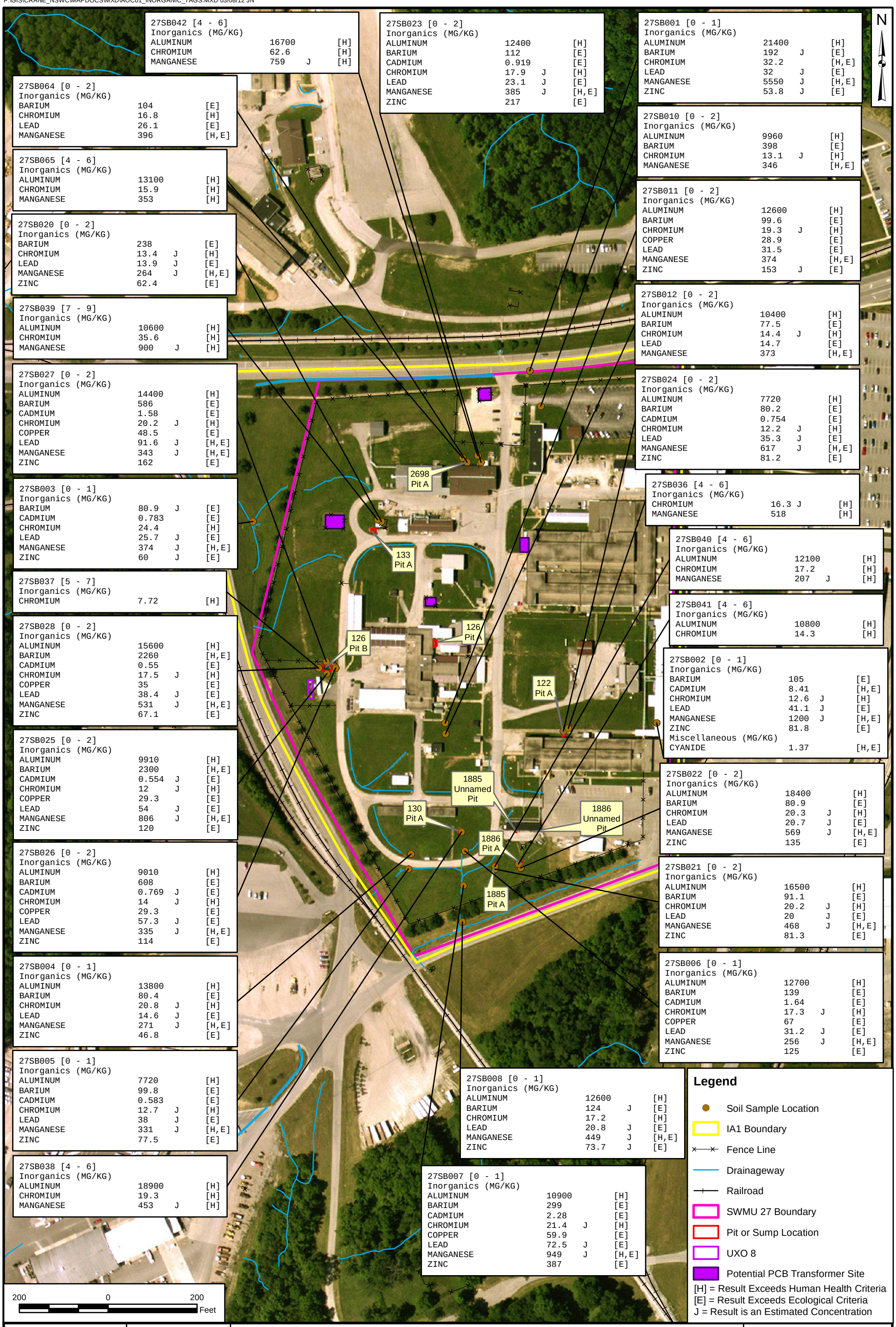
**TABLE 5-5**

**PIT/SUMP SAMPLE ANALYSIS SUMMARY**
**SWMU 27 - PYROTECHNICS AREA**
**RCRA FACILITY INSPECTION REPORT**
**NSA CRANE**
**CRANE, INDIANA**


| LOCATION | | | | **27SB057** | **27SB066** |
|---|---|---|---|---|---|
| AREA | | | | **IA 1 - Pit** | **IA 1 - Pit** |
| SAMPLE ID | | | | **27SS057G0002** | **27SS066C0002** |
| SAMPLE DATE | HHRA | BACKGROUND | ERA | **20110407** | **20110826** |
| SAMPLE CODE | | | | **NORMAL** | **NORMAL** |
| MATRIX | | | | **SO** | **SO** |
| SUBMATRIX | | | | **SS** | **SS** |
| TOP DEPTH | | | | **0** | **0** |
| BOTTOM DEPTH | | | | **2** | **2** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 7700 | 19900 | --- | 5670 | **18800 J** |
| BARIUM | 1500 | 211 | 1.04 | **491 J** | **1010 J** |
| CADMIUM | 7 | 6.05 | 0.36 | **10.2 J** | **138 J** |
| CHROMIUM | 0.0118 | 28.7 | 26 | 94.6 U | **656 J** |
| COPPER | 310 | 17.6 | 28 | **515** | **765 J** |
| LEAD | 81 | 27 | 11 | **840 J** | **6100 J** |
| MAGNESIUM | --- | 2800 | --- | 27000 J | 3280 J |
| MANGANESE | 180 | 5700 | 220 | **279000 J** | 52 J |
| POTASSIUM | --- | 1970 | --- | 921 J | 2790 UJ |
| SODIUM | --- | 28 | --- | 460 J | 2790 UJ |
| STRONTIUM | 4700 | 46.4 | --- | 538 J | 35.9 J |
| ZINC | 2300 | 65.6 | 46 | **3250 J** | **7010 J** |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | |
| CYANIDE | 0.94 | --- | 1.3 | -- | -- |
| **VOLATILES (MG/KG)** | | | | | |
| 1,2-DICHLOROBENZENE | 5.4 | --- | 2.96 | 0.00438 U | 0.0114 UJ |
| 1,4-DICHLOROBENZENE | 0.0082 | --- | 0.546 | 0.00438 U | 0.0114 UJ |
| 2-BUTANONE | 20 | --- | 89.6 | 0.00876 U | 0.236 J |
| ACETONE | 28 | --- | 2.5 | 0.0175 U | 0.777 J |
| BENZENE | 0.0042 | --- | 0.255 | 0.00438 U | 0.0114 UJ |
| CARBON DISULFIDE | 4.2 | --- | 0.094 | 0.00438 U | 0.0315 J |
| CHLOROBENZENE | 0.98 | --- | 13.1 | 0.00438 U | 0.0114 UJ |
| CIS-1,2-DICHLOROETHENE | 0.4 | --- | 0.784 | 0.00438 U | 0.00799 J |
| CYCLOHEXANE | 260 | --- | --- | 0.00438 U | 0.0904 J |
| ETHYLBENZENE | 0.034 | --- | 5.16 | 0.00438 U | 0.0114 UJ |
| ISOPROPYLBENZENE | 11 | --- | --- | 0.00438 U | 0.0114 UJ |
| METHYL CYCLOHEXANE | --- | --- | --- | 0.00438 U | 0.989 J |
| METHYLENE CHLORIDE | 0.023 | --- | 4.05 | 0.00876 U | **0.173 J** |
| TOLUENE | 12 | --- | 5.45 | 0.00438 U | 0.0415 J |
| TOTAL XYLENES | 3.8 | --- | 10 | 0.0131 U | 0.051 J |
| TRICHLOROETHENE | 0.0032 | --- | 12.4 | 0.00438 U | **0.0564 J** |
| VINYL CHLORIDE | 0.000112 | --- | 0.646 | 0.00438 U | **0.00724 J** |

**Exceeds HHRA and ERA - [H,E] on maps**
**Exceeds ERA only - [E] on maps**
**Exceeds HHRA only - [H] on maps**
J - estimated value
U - concentration is below the laboratory detection limit
--- = value not available

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\AOC01_INORGANIC_TAGS.MXD 03/08/12 JN




27SB042 [4 - 6]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 16700 | | [H] |
| CHROMIUM | 62.6 | | [H] |
| MANGANESE | 759 | J | [H] |

27SB064 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| BARIUM | 104 | | [E] |
| CHROMIUM | 16.8 | | [H] |
| LEAD | 26.1 | | [E] |
| MANGANESE | 396 | | [H,E] |

27SB065 [4 - 6]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 13100 | | [H] |
| CHROMIUM | 15.9 | | [H] |
| MANGANESE | 353 | | [H] |

27SB020 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| BARIUM | 238 | | [E] |
| CHROMIUM | 13.4 | J | [H] |
| LEAD | 13.9 | J | [E] |
| MANGANESE | 264 | J | [H,E] |
| ZINC | 62.4 | | [E] |

27SB039 [7 - 9]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 10600 | | [H] |
| CHROMIUM | 35.6 | | [H] |
| MANGANESE | 900 | J | [H] |

27SB027 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 14400 | | [H] |
| BARIUM | 586 | | [E] |
| CADMIUM | 1.58 | | [E] |
| CHROMIUM | 20.2 | J | [H] |
| COPPER | 48.5 | | [E] |
| LEAD | 91.6 | J | [H,E] |
| MANGANESE | 343 | J | [H,E] |
| ZINC | 162 | | [E] |

27SB003 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| BARIUM | 80.9 | J | [E] |
| CADMIUM | 0.783 | | [E] |
| CHROMIUM | 24.4 | | [H] |
| LEAD | 25.7 | J | [E] |
| MANGANESE | 374 | J | [H,E] |
| ZINC | 60 | J | [E] |

27SB037 [5 - 7]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| CHROMIUM | 7.72 | | [H] |

27SB028 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 15600 | | [H] |
| BARIUM | 2260 | | [H,E] |
| CADMIUM | 0.55 | | [E] |
| CHROMIUM | 17.5 | J | [H] |
| COPPER | 35 | | [E] |
| LEAD | 38.4 | J | [E] |
| MANGANESE | 531 | J | [H,E] |
| ZINC | 67.1 | | [E] |

27SB025 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 9910 | | [H] |
| BARIUM | 2300 | | [H,E] |
| CADMIUM | 0.554 | J | [E] |
| CHROMIUM | 12 | J | [H] |
| COPPER | 29.3 | | [E] |
| LEAD | 54 | J | [E] |
| MANGANESE | 806 | J | [H,E] |
| ZINC | 120 | | [E] |

27SB026 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 9010 | | [H] |
| BARIUM | 608 | | [E] |
| CADMIUM | 0.769 | J | [E] |
| CHROMIUM | 14 | J | [H] |
| COPPER | 29.3 | | [E] |
| LEAD | 57.3 | J | [E] |
| MANGANESE | 335 | J | [H,E] |
| ZINC | 114 | | [E] |

27SB004 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 13800 | | [H] |
| BARIUM | 80.4 | | [E] |
| CHROMIUM | 20.8 | J | [H] |
| LEAD | 14.6 | J | [E] |
| MANGANESE | 271 | J | [H,E] |
| ZINC | 46.8 | | [E] |

27SB005 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 7720 | | [H] |
| BARIUM | 99.8 | | [E] |
| CADMIUM | 0.583 | | [E] |
| CHROMIUM | 12.7 | J | [H] |
| LEAD | 38 | J | [E] |
| MANGANESE | 331 | J | [H,E] |
| ZINC | 77.5 | | [E] |

27SB038 [4 - 6]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 18900 | | [H] |
| CHROMIUM | 19.3 | | [H] |
| MANGANESE | 453 | J | [H] |

27SB023 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 12400 | | [H] |
| BARIUM | 112 | | [E] |
| CADMIUM | 0.919 | | [E] |
| CHROMIUM | 17.9 | J | [H] |
| LEAD | 23.1 | J | [E] |
| MANGANESE | 385 | J | [H,E] |
| ZINC | 217 | | [E] |

27SB001 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 21400 | | [H] |
| BARIUM | 192 | J | [E] |
| CHROMIUM | 32.2 | | [H,E] |
| LEAD | 32 | J | [E] |
| MANGANESE | 5550 | J | [H,E] |
| ZINC | 53.8 | J | [E] |

27SB010 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 9960 | | [H] |
| BARIUM | 398 | | [E] |
| CHROMIUM | 13.1 | J | [H] |
| MANGANESE | 346 | | [H,E] |

27SB011 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 12600 | | [H] |
| BARIUM | 99.6 | | [E] |
| CHROMIUM | 19.3 | J | [H] |
| COPPER | 28.9 | | [E] |
| LEAD | 31.5 | | [E] |
| MANGANESE | 374 | | [H,E] |
| ZINC | 153 | J | [E] |

27SB012 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 10400 | | [H] |
| BARIUM | 77.5 | | [E] |
| CHROMIUM | 14.4 | J | [H] |
| LEAD | 14.7 | | [E] |
| MANGANESE | 373 | | [H,E] |

27SB024 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 7720 | | [H] |
| BARIUM | 80.2 | | [E] |
| CADMIUM | 0.754 | | [E] |
| CHROMIUM | 12.2 | J | [H] |
| LEAD | 35.3 | J | [E] |
| MANGANESE | 617 | J | [H,E] |
| ZINC | 81.2 | | [E] |

27SB036 [4 - 6]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| CHROMIUM | 16.3 | J | [H] |
| MANGANESE | 518 | | [H] |

27SB040 [4 - 6]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 12100 | | [H] |
| CHROMIUM | 17.2 | | [H] |
| MANGANESE | 207 | J | [H] |

27SB041 [4 - 6]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 10800 | | [H] |
| CHROMIUM | 14.3 | | [H] |

27SB002 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| BARIUM | 105 | | [E] |
| CADMIUM | 8.41 | | [H,E] |
| CHROMIUM | 12.6 | J | [H] |
| LEAD | 41.1 | J | [E] |
| MANGANESE | 1200 | J | [H,E] |
| ZINC | 81.8 | | [E] |
| Miscellaneous (MG/KG) | | | |
| CYANIDE | 1.37 | | [H,E] |

27SB022 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 18400 | | [H] |
| BARIUM | 80.9 | | [E] |
| CHROMIUM | 20.3 | J | [H] |
| LEAD | 20.7 | J | [E] |
| MANGANESE | 569 | J | [H,E] |
| ZINC | 135 | | [E] |

27SB021 [0 - 2]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 16500 | | [H] |
| BARIUM | 91.1 | | [E] |
| CHROMIUM | 20.2 | J | [H] |
| LEAD | 20 | J | [E] |
| MANGANESE | 468 | J | [H,E] |
| ZINC | 81.3 | | [E] |

27SB006 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 12700 | | [H] |
| BARIUM | 139 | | [E] |
| CADMIUM | 1.64 | | [E] |
| CHROMIUM | 17.3 | J | [H] |
| COPPER | 67 | | [E] |
| LEAD | 31.2 | J | [E] |
| MANGANESE | 256 | J | [H,E] |
| ZINC | 125 | | [E] |

27SB008 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 12600 | | [H] |
| BARIUM | 124 | J | [E] |
| CHROMIUM | 17.2 | | [H] |
| LEAD | 20.8 | J | [E] |
| MANGANESE | 449 | J | [H,E] |
| ZINC | 73.7 | J | [E] |

27SB007 [0 - 1]
Inorganics (MG/KG)

| | | | |
|---|---|---|---|
| ALUMINUM | 10900 | | [H] |
| BARIUM | 299 | | [E] |
| CADMIUM | 2.28 | | [E] |
| CHROMIUM | 21.4 | J | [H] |
| COPPER | 59.9 | | [E] |
| LEAD | 72.5 | J | [E] |
| MANGANESE | 949 | J | [H,E] |
| ZINC | 387 | | [E] |

**Legend**

- Soil Sample Location
- IA1 Boundary
- Fence Line
- Drainageway
- Railroad
- SWMU 27 Boundary
- Pit or Sump Location
- UXO 8
- Potential PCB Transformer Site

[H] = Result Exceeds Human Health Criteria
[E] = Result Exceeds Ecological Criteria
J = Result is an Estimated Concentration

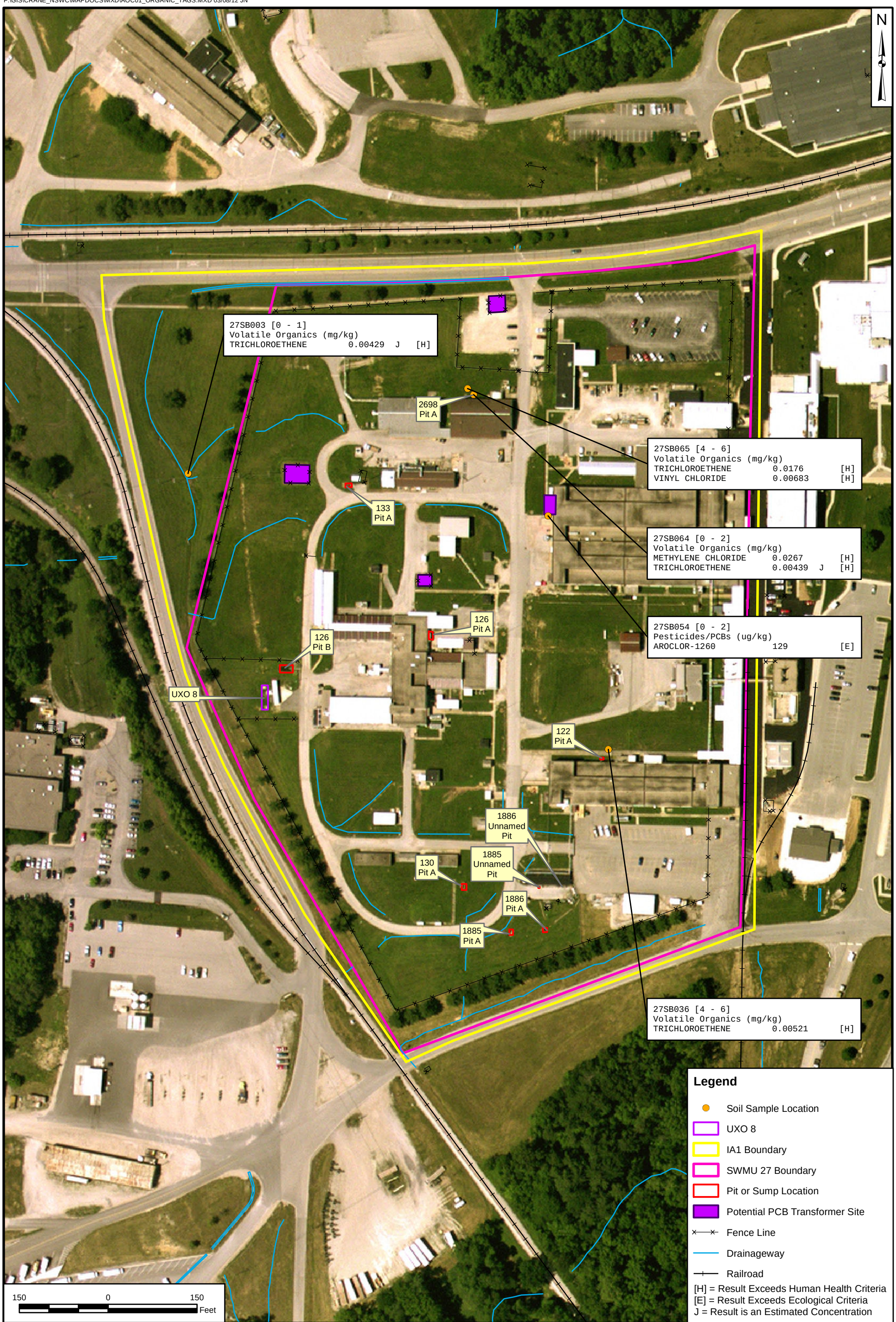
| DRAWN BY | DATE |
|---|---|
| J. NOVAK | 02/17/12 |
| CHECKED BY | DATE |
| J. DUCAR | 03/08/12 |
| REVISED BY | DATE |
| J. NOVAK | 03/08/12 |
| SCALE | |
| AS NOTED | |

NAVFAC

METALS/INORGANICS WITH EXCEEDANCES OF
HUMAN HEALTH AND ECOLOGICAL SCREENING VALUES
SWMU 27 - INVESTIGATION AREA 1
NSA CRANE
CRANE, INDIANA

| CONTRACT NUMBER | |
|---|---|
| F276 | |
| APPROVED BY | DATE |
| APPROVED BY | DATE |
| FIGURE NO. | REV |
| FIGURE 5-1 | 0 |

P:\GIS\CRANE_NSWC\MAPDOCS\MXD\AOC01_ORGANIC_TAGS.MXD 03/08/12 JN



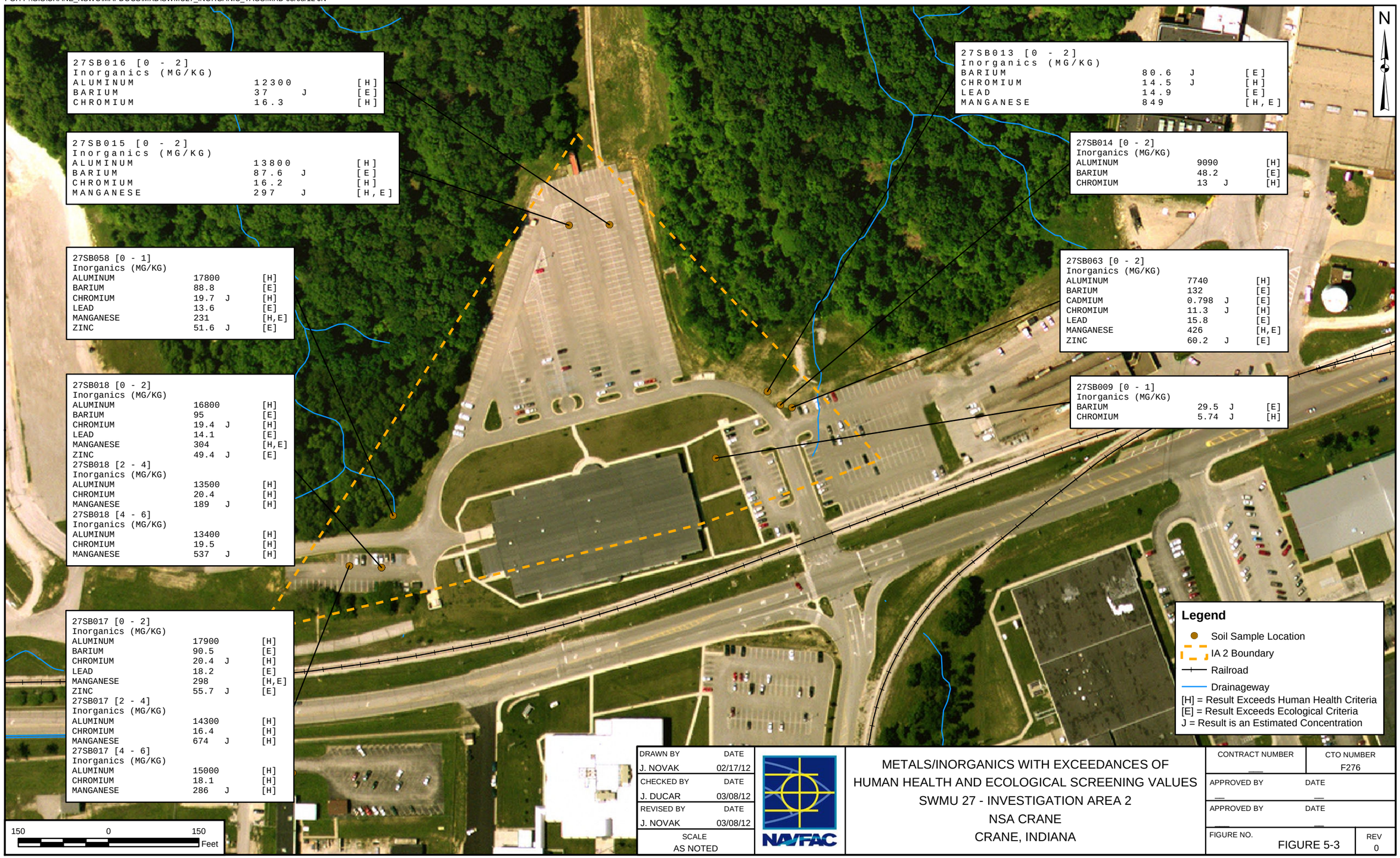

| DRAWN BY | DATE |
|---|---|
| J. NOVAK | 02/17/12 |
| CHECKED BY | DATE |
| J. DUCAR | 03/08/12 |
| REVISED BY | DATE |
| J. NOVAK | 03/08/12 |
| SCALE | |
| AS NOTED | |

NAVFAC

ORGANICS WITH EXCEEDANCES OF HUMAN HEALTH
AND ECOLOGICAL SCREENING VALUES
SWMU 27 - INVESTIGATION AREA 1
NSA CRANE
CRANE, INDIANA

| CONTRACT NUMBER | |
|---|---|
| F276 | |
| APPROVED BY | DATE |
| ___ | ___ |
| APPROVED BY | DATE |
| ___ | ___ |
| FIGURE NO. | REV |
| FIGURE 5-2 | 0 |

PGH P:\GIS\CRANE_NSWC\MAPDOCS\MXD\SWMU27_INORGANIC_TAGS.MXD 03/08/12 JN




| DRAWN BY | DATE |
|---|---|
| J. NOVAK | 02/17/12 |
| CHECKED BY | DATE |
| J. DUCAR | 03/08/12 |
| REVISED BY | DATE |
| J. NOVAK | 03/08/12 |
| SCALE | |
| AS NOTED | |

NAVFAC

METALS/INORGANICS WITH EXCEEDANCES OF
HUMAN HEALTH AND ECOLOGICAL SCREENING VALUES
SWMU 27 - INVESTIGATION AREA 2
NSA CRANE
CRANE, INDIANA

| CONTRACT NUMBER | CTO NUMBER |
|---|---|
| — | F276 |
| APPROVED BY | DATE |
| — | — |
| APPROVED BY | DATE |
| — | — |
| FIGURE NO. FIGURE 5-3 | REV 0 |

# 6.0 CONCEPTUAL SITE MODEL

Spills and releases from general site activities (pyrotechnic device production, red phosphorous pressing, and metal plating), sump overflows, flare testing, and PCB transformer maintenance at the PPA are the likely sources of potential contamination. The historical operations at the site and information from previous site investigations indicate that releases likely occurred directly onto the surface and have potentially migrated into site soil or off site via surface water flow.

## 6.1 PPA SITE ACTIVITY

The pyrotechnic devices are produced from metal, mixtures of oxidizing agents, fuels, and dyes. Examples of oxidizing agents include chlorates, perchlorates, peroxides, chromates, and nitrates. Examples of fuels include aluminum and magnesium powder and their alloys, sulfur, lactose, and other easily oxidizable materials. Examples of dyes include red and yellow dye.

The phosphorus pressing process used red phosphorous, manganese dioxide, magnesium, zinc oxide, and linseed oil.

A CSM schematic for pits, sumps, catch/settling basins, and drainageways is presented as Figure 6-1.

## 6.2 PPA FLARE TESTING ACTIVITIES

Metals, oxidizing agents, fuels, and dyes are flare constituents. However, with the exception of metals, the majority of these constituents are consumed during the testing process. Additionally, Buildings 124 and 125 maintenance activities, such as parts washing, likely utilized petroleum-based solvents that may have contained VOCs.

A flare testing activities CSM schematic is presented as Figure 6-2.

## 6.3 PCB TRANSFORMERS

No historical information regarding transformer maintenance was available; therefore, potential releases of PCBs during transformer maintenance activities could not be eliminated.

Several transformers are PCB-labeled, and one transformer located west of Building 124 is labeled as containing both PCBs and Wecosol, a chlorinated VOC that is also used in the dry cleaning industry.

A PCB transformers CSM schematic is presented as Figure 6-3.

## 6.4 METAL-PLATING OPERATIONS

The plating operations utilized acid and alkaline cleaning, chrome conversion coating, phosphate coating, and cadmium/zinc cyanide plating on a variety of munitions-related metal parts. The Building 1884 metal finishing operations included the use of solvent for degreasing that may have contained VOCs.

The metal-plating wastewaters and rinsates may have discharged into open ditches near Building 1884 and may have impacted surface soil.

A metal-plating CSM schematic is presented as Figure 6-4.

## 6.5 CONCLUSIONS

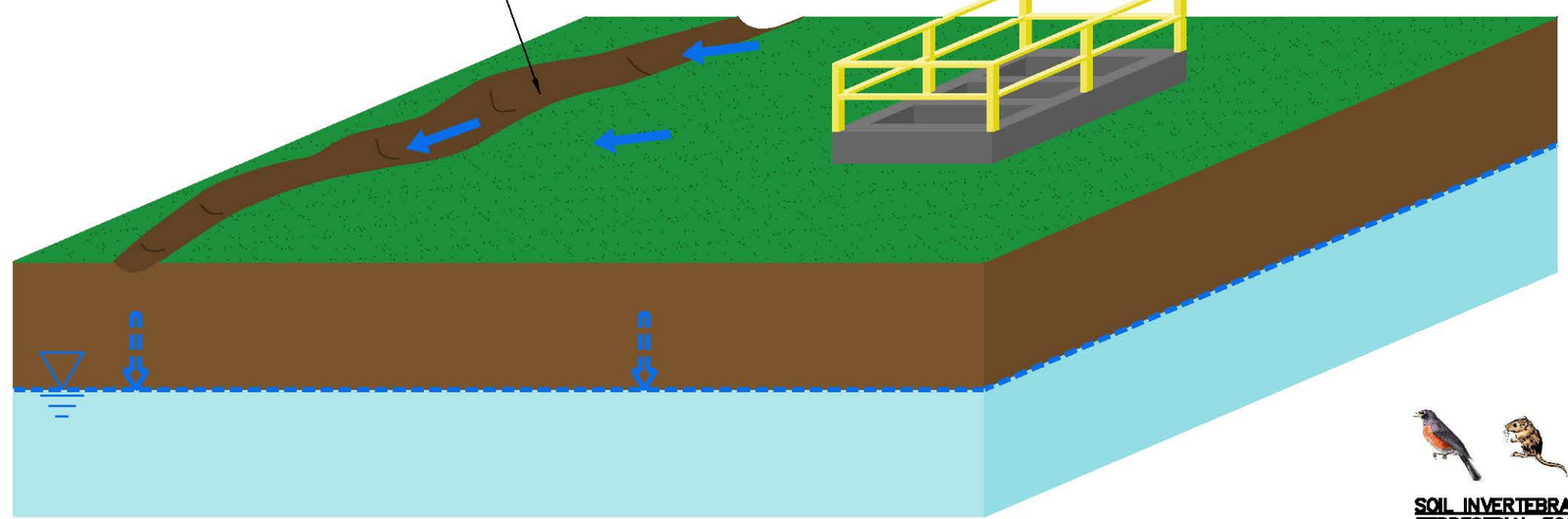
These releases and potential releases to the soil may: (1) present complete exposure pathways to human receptors, and/or (2) serve as a source of contamination to groundwater and present complete exposure pathways to human receptors through those routes. The PR/VSI Report concluded that there are low release potentials to surface water because of the sanitary sewer system discharge (A.T. Kearny, 1987). Additionally, surface water flow is intermittent (surface water was not present during the sampling events), and it is unlikely that current SWMU 27 activities could be impacting the surface water. Therefore, the impacts of contamination from the site surface waters reaching Boggs Creek and/or Turkey Creek were not investigated. However, potential historical releases to site soil prior to connection to the sanitary sewer system may act as contaminant reservoirs for migration to groundwater.

Human receptors include persons currently employed at the site or future site construction workers who could interact with contaminated media. The area is rural, and there are no identified residences within 1 mile of the site. However, because future land use is unknown, it is customary to conservatively evaluate future use of a property for residential and recreational purposes. Therefore, potential future receptors include residents and people recreating at the site. Human receptors may be exposed to different media following various pathways based on their specific activities. These media include surface and subsurface soil, groundwater, and surface runoff within IA 1 and IA 2. However, just beyond the site boundary there is a potential for ecological receptors. Therefore, potential ecological receptors include terrestrial plants and invertebrates, mammals and birds, and aquatic organisms. Ecological receptors may be exposed to different media following various pathways based on their specific activities.

The exposure media for ecological receptors are typically surface soil, sediment, and surface runoff. Because SWMU 27 is largely industrialized, ecological exposure is not considered significant at the site and was not evaluated for the production areas. A screening level ecological risk assessment was performed only for the drainageways outside the PPA fenceline. As previously stated, surface water flow is intermittent, and it is unlikely that current SWMU 27 activities could be impacting the surface water.

**ON BASE RESIDENT**
DIRECT CONTACT AND INHALATION AND INCIDENTAL INGESTION OF SOIL AND GROUNDWATER EXPOSURES

**CONSTRUCTION/ INDUSTRIAL WORKER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES



**RECREATIONAL USER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES

**SOIL INVERTEBRATES AND TERRESTRIAL ECOLOGICAL RECEPTORS**

## LEGEND

- WATER TABLE ELEVATION (ESTIMATED)
- SURFACE RUNOFF FLOW DIRECTION
- INFILTRATION

| | | | |
|---|---|---|---|
| DRAWN BY CK | DATE 4/7/10 | NAVFAC | CONCEPTUAL SITE MODEL SUMPS PITS AND SWMU 27 DRAINAGEWAYS NSA CRANE CRANE, INDIANA |
| CHECKED BY | DATE | | |
| REVISED BY | DATE | | |
| SCALE NOT TO SCALE | | | |

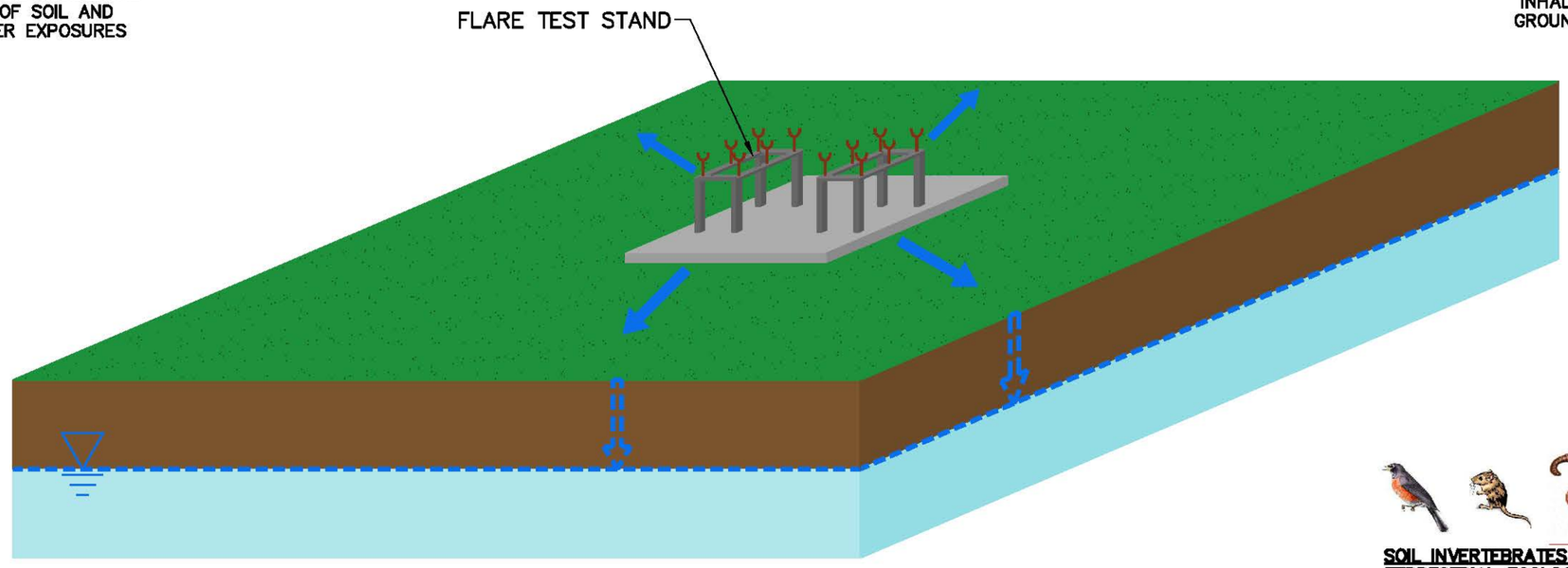
| | |
|---|---|
| CONTRACT NO. F276 | |
| OWNER NO. | |
| APPROVED BY | DATE |
| DRAWING NO. 6-1 | SIZE B / REV. 0 |

R:\2126 – NSA Crane\CSM\2126CSM01.dwg PIT NICHOLE.DILLA 3/2/2012 8:45:05 AM

**ON BASE RESIDENT**
DIRECT CONTACT AND INHALATION AND INCIDENTAL INGESTION OF SOIL AND GROUNDWATER EXPOSURES

**CONSTRUCTION/ INDUSTRIAL WORKER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES

**RECREATIONAL USER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES



**SOIL INVERTEBRATES AND TERRESTRIAL ECOLOGICAL RECEPTORS**

## LEGEND

- WATER TABLE ELEVATION (ESTIMATED)
- SURFACE RUNOFF FLOW DIRECTION
- INFILTRATION

| | | | |
|---|---|---|---|
| DRAWN BY CK | DATE 4/7/10 | CONCEPTUAL SITE MODEL<br>FLARE TESTING ACTIVITIES<br>SWMU 27<br>NSA CRANE<br>CRANE, INDIANA | CONTRACT NO. F276 |
| CHECKED BY | DATE | | OWNER NO. |
| REVISED BY | DATE | | APPROVED BY / DATE |
| SCALE NOT TO SCALE | | | DRAWING NO. 6–2 / SIZE B / REV. 0 |

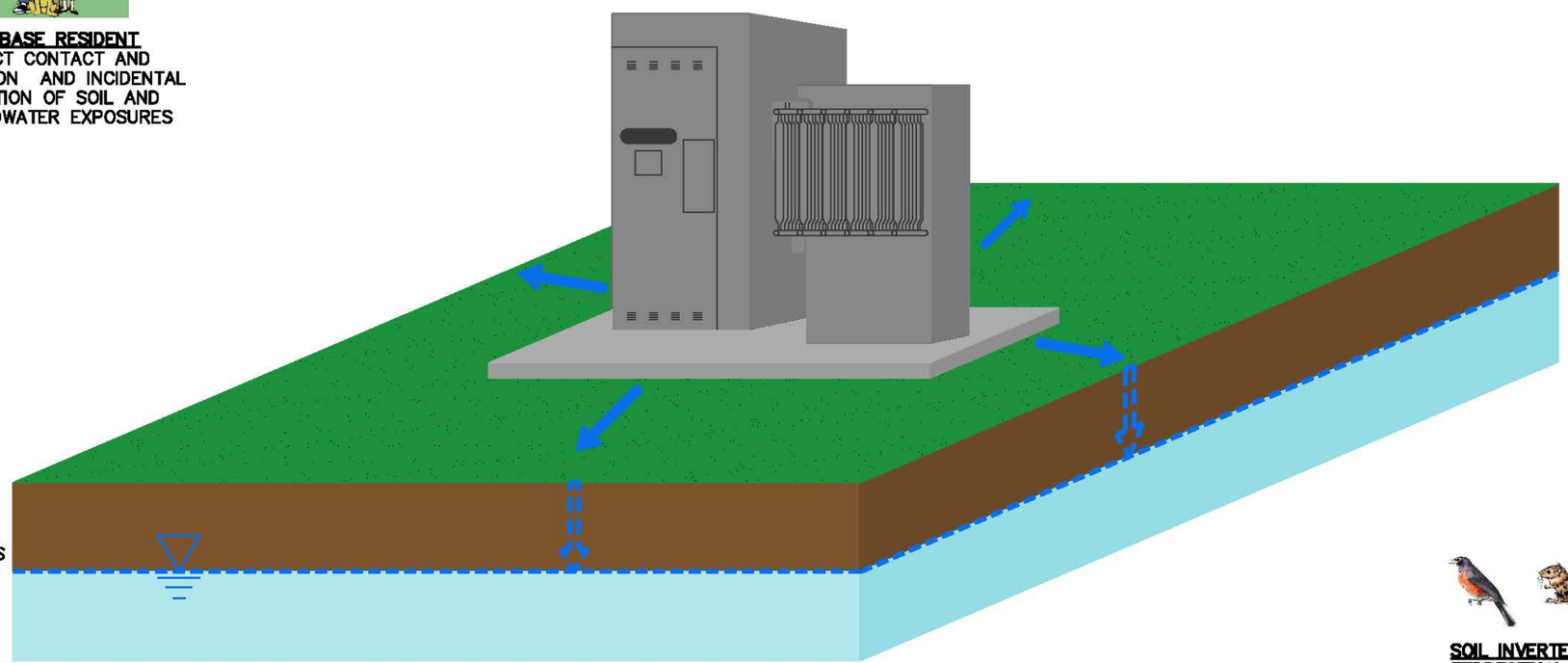
NAVFAC

R:\2126 – NSA Crane\CSM\2126CSM02.dwg PIT NICHOLE.DILLA 1/30/2012 8:57:02 AM

**ON BASE RESIDENT**
DIRECT CONTACT AND INHALATION AND INCIDENTAL INGESTION OF SOIL AND GROUNDWATER EXPOSURES

**CONSTRUCTION/ INDUSTRIAL WORKER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES

**RECREATIONAL USER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES



**SOIL INVERTEBRATES AND TERRESTRIAL ECOLOGICAL RECEPTORS**

## LEGEND

- WATER TABLE ELEVATION (ESTIMATED)
- SURFACE RUNOFF FLOW DIRECTION
- INFILTRATION

| | | | |
|---|---|---|---|
| DRAWN BY CK | DATE 4/7/10 | CONCEPTUAL SITE MODEL<br>POLYCHLORINATED BIPHENYLS (PCBs)<br>TRANSFORMERS – SWMU 27<br>NSA CRANE<br>CRANE, INDIANA | CONTRACT NO. F276 |
| CHECKED BY | DATE | | OWNER NO. |
| REVISED BY | DATE | | APPROVED BY / DATE |
| SCALE NOT TO SCALE | | | DRAWING NO. 6–3 / SIZE B / REV. 0 |

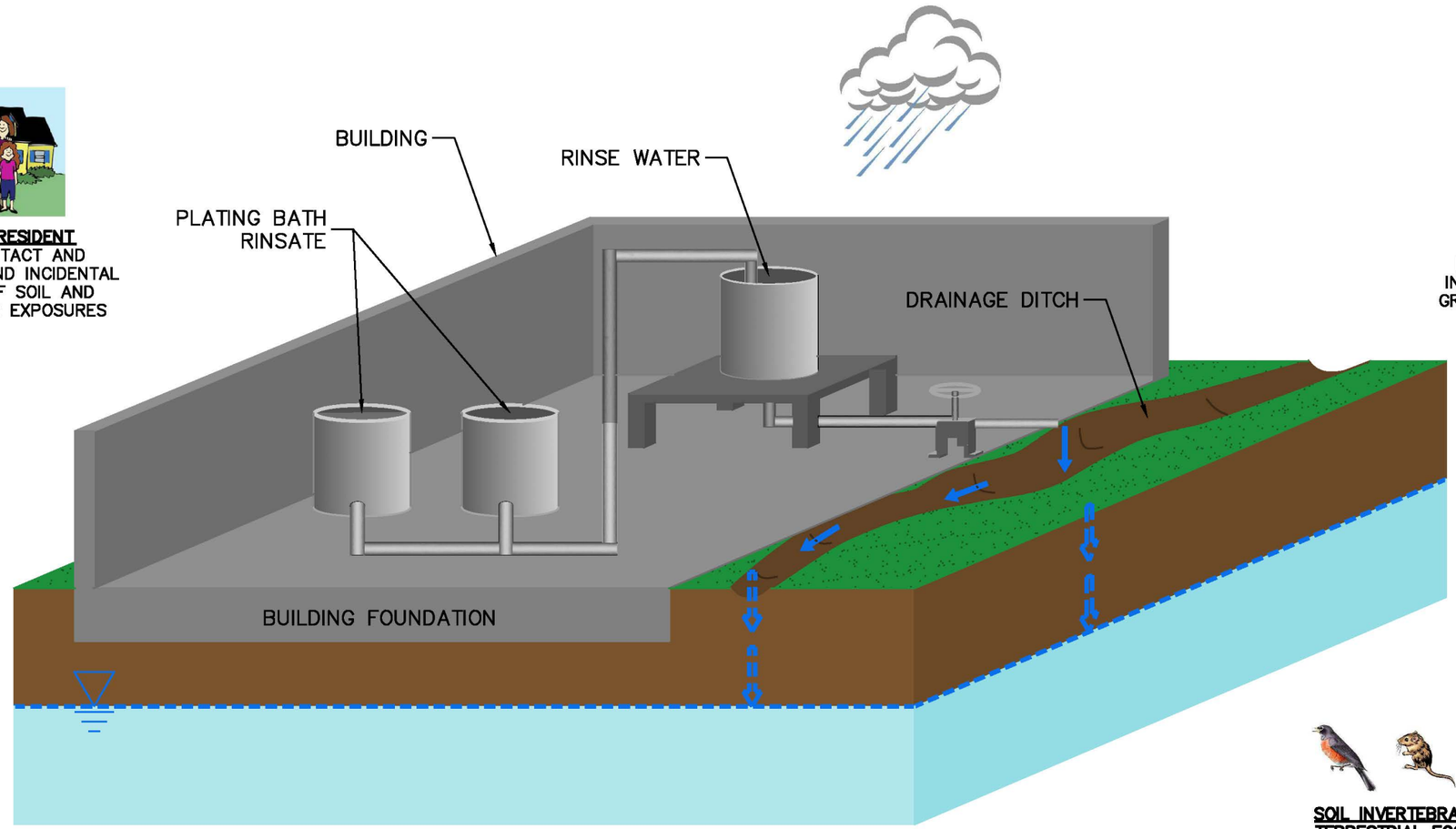
NAVFAC

R:\2126 – NSA Crane\CSM\2126CSM03.dwg PIT NICHOLE.DILLA 3/2/2012 8:35:38 AM

**ON BASE RESIDENT**
DIRECT CONTACT AND INHALATION AND INCIDENTAL INGESTION OF SOIL AND GROUNDWATER EXPOSURES

**CONSTRUCTION / INDUSTRIAL WORKER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES

**RECREATIONAL USER**
DERMAL CONTACT AND INHALATION OF SOIL AND GROUNDWATER EXPOSURES



**SOIL INVERTEBRATES AND TERRESTRIAL ECOLOGICAL RECEPTORS**

## LEGEND

- WATER TABLE ELEVATION (ESTIMATED)
- SURFACE RUNOFF FLOW DIRECTION
- INFILTRATION

| | | | |
|---|---|---|---|
| DRAWN BY CK | DATE 4/7/10 | CONCEPTUAL SITE MODEL<br>METAL PLATING DRAINAGE<br>SWMU 27<br>NSA CRANE<br>CRANE, INDIANA | CONTRACT NO. F276 |
| CHECKED BY | DATE | | OWNER NO. |
| REVISED BY | DATE | | APPROVED BY / DATE |
| SCALE NOT TO SCALE | | | DRAWING NO. 6-4 / SIZE B / REV. 0 |

R:\2126 – NSA Crane\CSM\2126CSM04.dwg PIT NICHOLE.DILLA 3/2/2012 9:01:45 AM

# 7.0 HUMAN HEALTH RISK ASSESSMENT

This section presents the HHRA for the Illuminant Building 126 (SWMU 27) at NSA Crane. The objective of the HHRA is to determine whether detected concentrations of chemicals within the study areas pose a significant threat to potential human receptors under current and/or future land use. The potential risks to human receptors were estimated based on the assumption that no actions were taken to control contaminant releases.

The following current USEPA and IDEM guidance documents were used to develop the framework for the baseline HHRA.

- Conducting Human Health Risk Assessments Under the Environmental Restoration Program (Navy, 2001).
- Navy Policy on the Use of Background Chemical Levels (Navy, 2004).
- U.S. Navy Human Health Risk Assessment Guidance (Navy, 2008)
- Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A) (USEPA, 1989).
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, 1991).
- Distribution of Preliminary Review Draft: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure (USEPA, 1993a).
- Exposure Factors Handbook. (USEPA, 1997a).
- Guidance for Characterizing Background and Chemical Concentrations in Soil for CERCLA Sites (USEPA, 2002c).
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002d).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) (USEPA, 2004).

- Guidelines for Carcinogen Risk Assessment (USEPA, 2005f).

- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005g).

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) (USEPA, 2009a).

- Remediation Closure Guide. (IDEM, 2012)

The HHRA is structured and reported according to the guidelines of the Risk Assessment Guidance for Superfund (RAGS), Human Health Evaluation Manual, Part D: Standardized Planning, Reporting, and Review of Superfund Risk Assessments (RAGS Part D) (USEPA, 2001).

A HHRA consists of five components: data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. Sections 7.1 through 7.5 contain detailed discussions of the five components of the HHRA.

Three major aspects of chemical contamination and environmental fate and transport must be considered to evaluate potential risks: (1) contaminants with toxic characteristics must be found in environmental media and must be released by either natural processes or by human action; (2) potential exposure points must exist; and (3) human receptors must be present at the point of exposure. Risk is a function of both toxicity and exposure. If any one of these factors is absent for a site, the exposure pathway is incomplete, and no potential risks are considered to exist for human receptors.

## 7.1 DATA EVALUATION

Data evaluation, the first component of a baseline HHRA, is a medium-specific task involving the compilation and evaluation of analytical data. The main objective of the data evaluation is to develop a medium-specific list of COPCs that will be used to quantitatively determine potential human health risks for site media.

Samples collected during the 2011 investigation were used in this HHRA. Field measurements and data regarded as unreliable (e.g., qualified as "R" during the data validation process) were not used in the quantitative HHRA. The maximum of the original and duplicate sample was used in the selection of COPCs. Samples used in this HHRA are listed in the COPC selection tables and in Appendix F.1.

### 7.1.1 Derivation of Screening Criteria

The primary criteria used to identify COPCs are based on USEPA Regional Screening Levels (RSLs) (USEPA, 2012) and IDEM screening levels (IDEM, 2012). The RSLs are based on exposure pathways for which generally accepted methods, models, and assumptions have been developed (i.e., ingestion, dermal contact, and inhalation) for specific land-use conditions, and do not consider ecological receptors. The screening concentrations based on the RSLs correspond to a systemic hazard quotient (HQ) of 0.1 for non-carcinogens or an incremental lifetime cancer risk (ILCR) of $1 \times 10^{-6}$ for carcinogens. The RSLs for non-carcinogens are based on an HQ of 1, whereas the screening concentrations used in the selection of COPCs were based on an HQ of 0.1 to account for the potential cumulative effects of several chemicals affecting the same target organ or producing the same adverse non-carcinogenic effect.

The IDEM screening levels for soil are based on the USEPA RSLs; however the IDEM screening levels are not necessary the same as the RSLs. The IDEM screening levels for direct contact correspond to systemic HQ of 1 (for noncarcinogens) or an ILCR of $1x10^{-5}$ (for carcinogens). The USEPA RSLs for carcinogens corresponds to an ILCR of $1x10^{-6}$. The IDEM screening levels for soil can also be based on the soil saturation limit or capped at 100,000 mg/kg.

Screening concentrations based on the following criteria were used to select COPCs for surface and subsurface soil:

- USEPA RSLs for Residential Soil (USEPA, 2012).
- IDEM residential soil screening levels (IDEM, 2012).

Because of the different exposure scenarios for potential human receptors, COPCs were identified for surface and subsurface soil. Surface soil was defined as soil collected from 0 to 2 feet bgs. Subsurface soil was defined as soil collected from depths greater than 2 feet bgs.

Maximum chemical concentrations in soil were also compared to USEPA risk-based soil screening levels (SSLs) for groundwater protection and to IDEM screening levels for migration from soil to groundwater. The SSLs and IDEM screening levels for migration from soil to groundwater were not used for the

selection of COPCs for direct contact exposure; however, they do allow qualitative evaluation of the potential for chemical migration from soil to groundwater. Chemicals with concentrations exceeding the SSLs/IDEM default closure levels may potentially migrate from the soil to groundwater in sufficient quantities to pose groundwater quality problems.

The risk-based screening levels used in the COPC selection for soil are presented in Table 7-1.

**Essential Nutrients**

Per USEPA guidance (USEPA, 1989), "Chemicals that are (1) essential human nutrients, (2) present at low concentrations (i.e., only slightly elevated above natural occurring levels), and (3) toxic at very high does (i.e., much higher than those that could be associated with contact at the site) need not be considered further in the quantitative risk assessment." Examples of such chemicals are magnesium, calcium, potassium, and sodium. Based on historical information, no unusual use or disposal of these constituents occurred at the site under investigation. Soil concentrations greater than 1,000,000 mg/kg (i.e., pure mineral intake) would be required before receptor intake would exceed recommended daily allowance (RDA) and recommended daily intake (RDI) values. A review of currently available analytical data indicates that such concentrations have not been detected in soil at the Site.

**Screening Levels for Chromium**

Chromium speciation was not performed on the soil samples collected at the site. Therefore, the screening levels for hexavalent chromium were used for the selection of COPCs.

**Background Evaluation**

In accordance with Navy policy (Navy, 2004) chemicals present at background concentrations were not retained as COPCs in this HHRA. Discussion of the NSA Crane Basewide Background report is presented in Section 5.1. The background evaluation was conducted in accordance with the following Navy guidance:

- Guidance for Environmental Background Analysis, Volume I: Soil. Prepared by Battelle Memorial Institute, Earth Tech, Inc., and Newfields for the Naval Facilities Engineering Command, Washington D.C., April 2002.

In the COPC selection process, if the results of the background evaluation indicated that a chemical concentration detected in Site soils did not exceed the background concentration, that chemical was not

selected as a COPC and was not carried through the quantitative risk assessment. However, chemicals present at concentrations exceeding risk-based screening criteria, but not selected as COPCs on the basis of background evaluations are further discussed in the risk characterization section in Section 7.4.33.4. The results of the background comparison analysis for surface soil and subsurface soil are presented in Appendix E.

The elimination of chemicals as site-related COPCs on the basis of background follows Navy Policy on the Use of Background Chemical Levels (Navy, 2004). This document also presents the Navy's interpretation of the USEPA guidance about the role of background in the CERCLA Cleanup Program (USEPA, 2002c), and details the methodology to be used in evaluating background under the Navy's Environmental Restoration and Base Realignment and Closure (BRAC) programs. Navy policy has been accepted by the USEPA as not contradicting the USEPA guidance (USEPA, 2002c). Navy policy applies to both the screening-level and baseline risk assessments and requires the following:

1. A clear and concise understanding of chemicals released from a site thus ensuring the Navy is focusing on remediating the release.

2. The use of background data in the screening-level risk assessment.

    a. The comparison of site chemical levels to risk-based screening criteria.
    b. The comparison of site chemical levels to background concentrations.
    c. The identification of site-related COPCs based on screening criteria comparisons and background comparisons. Site-related COPCs are those chemicals with concentrations exceeding risk-based screening criteria and background concentrations. To the extent possible, site-related COPCs are further evaluated quantitatively in the baseline risk assessment. (Non-site-related COPCs are further discussed in the risk characterization sections of the baseline risk assessments.)

3. The consideration of background in the baseline risk assessment.

    a. The calculation of risk estimates for site-related COPCs only.
    b. The further evaluation of non-site-related COPCs in the risk characterization section only (e.g., the qualitative evaluation of chemicals detected at concentrations exceeding screening criteria but less than background concentrations). The Navy considers this evaluation to be consistent with USEPA's guidance (USEPA, 2002c).

4. The selection of site cleanup remedial goals at levels not less than background levels. Additionally, cleanup levels should not be developed for chemicals not identified as chemicals of concern (COCs). As defined in the Navy guidance, COCs are site-related COPCs found to be the risk drivers in the baseline risk assessment, and that may pose unacceptable human or ecological risks.

### 7.1.2 Decision Rules for Establishing COPCs

The following decision rule was used to select initial lists of COPCs for SWMU 27:

- A chemical detected in soil was selected as a COPC for soil if any detected chemical concentration exceeded the screening levels for soil, and for inorganics if the background comparison indicated that the site concentrations are statistically greater than the corresponding background concentrations. (Appendix E).

### 7.1.3 COPCs Selected for HHRA

As discussed in Section 1.0, SWMU 27 is divided into two main areas; Investigation Area 1 and Investigation Area 2. These areas were evaluated separately in this HHRA. COPCs were selected for surface soil, subsurface soil, and sumps/pits using the risk-based COPC screening levels described in Section 7.1.1. A discussion of the chemicals identified as COPCs and the rationale for COPC selection is provided in the following subsections. A discussion of nature and extent of the chemicals detected in site media is presented in Section 5.0. COPC selection information for each medium is presented in Tables 7-2 through 7-9. Chemicals retained as COPCs are presented in Table 7-10. RAGS Part D tables for COPC selection are included in Appendix F.2.

#### 7.1.3.1 Investigation Area 1 Surface Soil

Six VOCs, Aroclor-1260, 12 metals, cyanide, and perchlorate were detected in surface soil samples collected at the Investigation Area 1. A comparison of maximum detected surface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 7-2. The following chemicals were detected at maximum concentrations exceeding direct contact COPC screening levels and were retained as COPCs for surface soil at Investigation Area 1:

- Metals (aluminum, barium, and chromium).

The maximum detected concentrations of aluminum and barium exceeded the screening toxicity levels (set at a HQ of 0.1); however, they did not exceed the RSLs. Concentrations of aluminum and barium

exceeded the screening criteria based on the RSLs but were less than the IDEM screening levels. Concentrations of cadmium and manganese also exceeded the screening levels but were within site background levels and are not considered to be site related (Appendix E); therefore these chemicals were not retained as COPCs for direct contact with surface soil at Investigation Area 1.

A comparison of maximum detected surface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from soil to groundwater is presented in Table 7-3. The following chemicals were detected in surface soil at maximum concentrations exceeding the screening levels for migration from soil to groundwater and were retained as COPCs for surface soil at Investigation Area 1:

- VOCs (methylene chloride and trichloroethene).
- Metals (barium and chromium).

Concentrations of trichloroethene exceeded the screening levels based on RSLs, but were less than the IDEM screening levels for migration from soil to groundwater. Concentrations of methylene chloride and barium exceeded the screening levels based on IDEM screening levels for migration from soil to groundwater, but were less than the RSLs. Concentrations of cadmium and manganese also exceeded the screening levels but were within site background levels and are not considered to be site-related (Appendix E); therefore, these chemicals were not retained as COPCs for migration from surface soil to groundwater at Investigation Area 1.

#### 7.1.3.2 Investigation Area 1 Subsurface Soil

Seven VOCs, Aroclor-1260, and 12 metals were detected in subsurface soil samples collected at the Investigation Area 1. A comparison of maximum detected subsurface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 7-4. The following chemicals were detected at maximum concentrations exceeding direct contact COPC screening levels and were retained as COPCs for subsurface soil at Investigation Area 1:

- Metals (chromium and manganese).

The maximum detected concentration of manganese exceeded the screening toxicity levels (set at a HQ of 0.1); however, it did not exceed the RSLs. Concentrations of aluminum also exceeded the screening levels but were within site background levels and are not considered to be site-related (Appendix E); therefore, aluminum was not retained as a COPC for direct contact with subsurface soil at Investigation Area 1.

A comparison of maximum detected subsurface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from soil to groundwater is presented in Table 7-5. The following chemicals were detected in subsurface soil at maximum concentrations exceeding the screening levels for migration from soil to groundwater, and were retained as COPCs for subsurface soil at Investigation Area 1:

- VOCs (trichloroethene and vinyl chloride)
- Metals (chromium and manganese)

Concentrations of trichloroethene and vinyl chloride exceeded the screening levels based on RSLs, but were less than the IDEM screening levels for migration from soil to groundwater.

#### 7.1.3.3 Investigation Area 1 Sumps/Pits

Seventeen VOCs, 12 metals, and cyanide were detected in samples collected from the ten sumps/pits at the Investigation Area 1. A comparison of maximum detected concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 7-6. The following chemicals were detected at maximum concentrations exceeding direct contact COPC screening levels and were retained as COPCs for the sumps/pits at Investigation Area 1:

- VOCs (ethylbenzene and total xylenes)
- Metals (aluminum, cadmium, chromium, copper, lead, manganese, and zinc).

The maximum detected concentrations of aluminum, copper, and zinc exceeded the screening toxicity levels (set at a HQ of 0.1); however, they did not exceed the RSLs. Concentrations of aluminum, copper, and zinc exceeded the screening criteria based on the RSLs but were less than the IDEM screening levels.

#### 7.1.3.4 Investigation Area 2 Surface Soil

Twelve metals were detected in surface soil samples collected at the Investigation Area 2. A comparison of maximum detected surface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 7-7. The following chemicals were detected at maximum concentrations exceeding direct contact COPC screening levels and were retained as COPCs for surface soil at Investigation Area 2:

- Metals (aluminum).

The maximum detected concentration of aluminum exceeded the screening toxicity levels (set at a HQ of 0.1); however, it did not exceed the RSL. Concentrations of chromium and manganese also exceeded the screening levels, but were within site background levels and are not considered to be site-related (Appendix E); therefore, these chemicals were not retained as COPCs for direct contact with surface soil at Investigation Area 2.

A comparison of maximum detected surface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from soil to groundwater is presented in Table 7-8. Concentrations of all chemicals were less than the screening levels; therefore, no chemicals were retained as COPCs for migration from soil to groundwater in surface soil at Investigation Area 2. Concentrations of chromium and manganese exceeded the screening levels, but were within site background levels and are not considered to be site-related (Appendix E); therefore, chromium and manganese were not retained as COPCs for migration from surface soil to groundwater at Investigation Area 2.

#### 7.1.3.5 Investigation Area 2 Subsurface Soil

Eleven metals were detected in subsurface soil samples collected at the Investigation Area 2. A comparison of maximum detected subsurface soil concentrations to screening levels based on RSLs and IDEM screening levels for residential exposures to soil is presented in Table 7-9. Concentrations of all chemicals were less than the screening criteria; therefore, no COPCs were retained for direct contact with subsurface soil at Investigation Area 2. Concentrations of aluminum, chromium, and manganese exceeded the screening levels, but were within site background levels and are not considered to be site-related (Appendix E); therefore, these chemicals were not retained as COPCs for direct contact with subsurface soil at Investigation Area 2.

A comparison of maximum detected surface soil concentrations to USEPA SSLs and IDEM screening levels for chemical migration from soil to groundwater is presented in Table 7-10. Concentrations of all chemicals were less than the screening levels; therefore, no chemicals were retained as COPCs for migration from soil to groundwater in subsurface soil at Investigation Area 2. Concentrations of chromium and manganese exceeded the screening levels, but were within site background levels and are not considered to be site-related (Appendix E); therefore, chromium and manganese were not retained as a COPCs for migration from subsurface soil to groundwater at Investigation Area 2.

#### 7.1.3.6 Summary

Table 7-11 summarizes the chemicals retained as COPCs for surface soil, subsurface soil, and the sumps/pits at the SWMU 27. RAGS Part D tables for COPC selection are included in Appendix F.2.

## 7.2 EXPOSURE ASSESSMENT

This portion of the risk assessment defines and evaluates, quantitatively or qualitatively, the type and magnitude of human exposure to the chemicals present at or migrating from a site. The exposure assessment is designed to depict the physical setting of the site, to identify potentially exposed populations and applicable exposure pathways, to calculate concentrations of COPCs to which receptors might be exposed, and to estimate chemical intakes under the identified exposure scenarios.

Actual or potential exposures at SWMU 27 were determined based on the most likely pathways of contaminant release and transport, as well as human activity patterns. A complete exposure pathway has three components: a source of chemicals that can be released to the environment, a route of contaminant transport through an environmental medium, and an exposure or contact point for a human receptor.

### 7.2.1 Conceptual Site Model

A CSM facilitates consistent and comprehensive evaluation of potential risks to human health by creating a framework for identifying the pathways by which human receptors may come in contact with environmental media contaminated by site activities. A CSM depicts the relationships among the following elements, which are necessary for defining complete exposure pathways:

- Site sources of contamination
- Contaminant release mechanisms and transport/migration pathways
- Exposure routes
- Potential receptors

The elements of the CSM establish the manner and degree to which a potential receptor may be exposed to chemicals present at the site. The degree of risk incurred by a potential receptor varies according to the means of exposure, the duration of exposure, and the specific chemical to which the receptor is exposed.

Section 1.0 presents a detailed discussion of the site location, site description, and site history for SWMU 27. This section summarizes the information in Section 1.0 as it applies to the HHRA. Sources of contamination, contaminant release mechanisms, transport and migration pathways, exposure routes, and potential receptors are defined. Table 7-12 provides a site-specific summary of the potential receptors evaluated for SWMU 27. A summary of the exposure routes addressed quantitatively for each human receptor is provided in Table 7-13. Figure 7-1 illustrates the CSM for SWMU 27.

**Site Sources of Environmental Contamination**

SWMU 27 is located in the north-central portion of NSA Crane and is located within the industrial process area in the general vicinity of Illuminant Building 126, including two discrete IAs: IA 1, and IA 2. Spills and releases from general site activities (pyrotechnic device production, red phosphorous pressing, and metal plating), sump overflows, flare testing, and PCB transformer maintenance at the PPA are the likely sources of potential contamination. Possible contaminants associated with these activities are summarized below.

PPA Site Activity

The pyrotechnic devices are produced from metal, mixtures of oxidizing agents, fuels, and dyes. Examples of oxidizing agents include chlorates, perchlorates, peroxides, chromates, and nitrates. Examples of fuels include aluminum and magnesium powder and their alloys, sulfur, lactose, and other easily oxidizable materials. Examples of dyes include red and yellow dye. The phosphorus pressing process used red phosphorous, manganese dioxide, magnesium, zinc oxide, and linseed oil.

PPA Flare Testing Activities

Metals, oxidizing agents, fuels, and dyes are flare constituents. However, with the exception of metals, the majority of these constituents are consumed during the testing process. Additionally, Buildings 124 and 125 maintenance activities, such as parts washing, likely utilized petroleum-based solvents that may have contained VOCs.

PCB Transformers

No historical information regarding transformer maintenance was available; therefore, potential releases of PCB during transformer maintenance activities could not be eliminated.

Metal-Plating Operations

The plating operations utilized acid and alkaline cleaning, chrome conversion coating, phosphate coating, and cadmium/zinc cyanide plating on a variety of munitions-related metal parts. The Building 1884 metal finishing operations included the use of solvent for degreasing that may have contained VOCs. The metal-plating wastewaters and rinsates may have discharged into open ditches near Building 1884 and may have impacted surface soil.

**Potential Contaminant Release Mechanisms and Transport/Migration Pathways**

Past operations at SWMU 27 have resulted in the release of fuel oil and petroleum contaminants of concern to soil. The petroleum contaminants of concern may have been transported from the soils to groundwater.

**Potential Current and Future Receptors of Concern and Exposure Pathways**

NSA Crane is an active Naval base and will remain active for the foreseeable future. Current site receptors include industrial or construction workers, and adolescent trespassers. However, for purposes of completeness, the baseline risk assessment will consider receptor exposure under residential, industrial, and recreational land use scenarios. Based on current and potential future land use, the following potential receptors may be exposed to contaminated environmental media within the study area:

- **Construction Workers** – A plausible receptor under current and future land use. No construction activities are currently planned for the study area. However, this receptor could be exposed to surface and subsurface soils (incidental ingestion, dermal contact), and air (inhalation) if construction activities were to occur in the future. This receptor could also be exposed to materials in the sumps/pits (incidental ingestion, dermal contact), and air (inhalation) if the sumps/pits were excavated and removed in the future.

- **Industrial Worker** – A plausible receptor under current and future land use. This includes adult military or civilian personnel assigned to routine daily work tasks in the SWMU 27 area. This receptor could be exposed to surface soil (incidental ingestion, dermal contact) and air (inhalation). Industrial worker exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions.

- **Recreational Users** – A plausible receptor under future land use. If NSA Crane were to close, the most likely scenario is that the property would be converted to a park. A recreational user may be exposed to potentially contaminated surface soil (incidental ingestion, dermal contact), and air (inhalation). Recreational exposure to subsurface soil is unlikely; however, because future construction could potentially bring subsurface soil to the surface, exposure to subsurface soil via incidental ingestion, dermal contact, and inhalation was evaluated for this receptor to aid in risk management decisions. NSA Crane is not expected to close because principal base operations (the demilitarization of munitions) are critical to the support of the United States Naval fleet.

- **On-Base Residents** – Given the anticipated future land use for much of SWMU 27 (commercial/industrial), residents are a very unlikely future receptor. However, the hypothetical future residential scenario is typically evaluated in a risk assessment for decision-making purposes. For example, the need for deed restrictions at a site may be eliminated prior to site closure if minimal risks are estimated for residential receptors. It is assumed that a hypothetical resident may be exposed to surface soil (ingestion, dermal contact, and inhalation). Receptor exposure to subsurface soil would only occur if subsurface soil was excavated and deposited on existing surface soil. Although this is an unlikely scenario, it is included in this HHRA for purposes of completeness and to assist the risk managers regarding the need for deed restrictions.

### 7.2.2 Central Tendency Exposure versus Reasonable Maximum Exposure

Traditionally, exposures evaluated in the HHRA were based on the concept of a reasonable maximum exposure (RME) only, which is defined as "the maximum exposure that is reasonably expected to occur at a site" (USEPA, 1989). However, subsequent risk assessment guidance (USEPA, 1992) indicates the need to address an average case or central tendency exposure (CTE).

To provide a full characterization of potential exposure, both RME and CTE scenarios were evaluated in the HHRA for SWMU 27. The available guidance (USEPA, 1993a) concerning the evaluation of CTE is limited. Therefore, professional judgment was exercised when defining CTE conditions for a particular receptor at a site.

### 7.2.3 Exposure Point Concentrations

The exposure point concentration (EPC), which is calculated for COPCs only, is an estimate of the chemical concentration within an exposure unit (EU). The EPC is assumed to be the concentration to

which the receptor is exposed and is used to estimate exposure intakes. An EU is the area over which receptor activity is expected to occur.

As previously discussed, the Investigation Area 1 and Investigation Area 2 were evaluated as separate EUs. EPCs were calculated for surface soil (0 to 2 ft. bgs) and subsurface soil (greater than 2 ft. bgs).

The following guidelines were used to calculate EPCs:

- For surface soil and subsurface soil, the 95 percent upper confidence limit (UCL) on the arithmetic mean, which was based on the distribution of the data set, was selected as the EPCs. EPCs were calculated following USEPA's guidance for calculating confidence limits for EPCs (USEPA, 2002d) and using USEPA's ProUCL software Version 4.1.01. If ProUCL was unable to calculate an UCL, then the maximum detected concentration was used as the EPC. The uncertainty associated with using the maximum detected concentration as the EPC is discussed in the uncertainty analysis in Section 7.5.2.

- Since it is possible for a single sump/pit to be excavated and removed, the pits/sumps were evaluated separately. Therefore the chemical concentrations in the one sample collected from each of the pits/sumps were used as the EPCs for each of the sumps/pits.

- Non-detected values were evaluated in accordance with the ProUCL guidance. Duplicates were averaged for purposes of calculating EPCs for COPCs in environmental media. In calculating the averages, if one sample was detected and the other was not detected, then the average was calculated using the detected value and one half the non-detected value.

- The same EPCs were used for both the RME and CTE scenarios.

Table 7-14 summarizes the EPCs for soil and Table 7-15 summarizes the EPCs used for the sumps/pits. ProUCL Outputs are included in Appendix F.3. RAGS Part D Tables for the EPCs are presented in Appendix F.2.

### 7.2.4 Chemical Intake Estimation

The methodologies and techniques used to estimate exposure intakes are presented in this section. Intakes for the identified potential receptor groups were calculated using current USEPA risk assessment guidance and are presented in the risk assessment spreadsheets. Risk assessment results are

presented using USEPA RAGS Part D table format. Assumptions regarding exposure are presented in Tables 7-16 and 7-17 for the RME and CTE scenarios, respectively. The exposure assumptions presented in Tables 7-16 and 7-17 are based on current USEPA and IDEM risk assessment guidance.

Non-carcinogenic intakes were estimated using the concept of an average annual exposure. Carcinogenic intakes were calculated as incremental lifetime exposures, which assume a life expectancy of 70 years. The exposure assumptions reflect current USEPA guidance. The majority of the exposure assumptions used to estimate chemical intakes were based on default assumptions described in several USEPA guidance documents (e.g., USEPA, 1989, 1991, 1997a, and 2004). The following paragraphs discuss the non-default receptor-specific exposure assumptions used in the risk assessment.

#### 7.2.4.1 Incidental Ingestion of Soil

Direct physical contact with soil may result in the incidental ingestion of chemicals. Chemical intake for the incidental ingestion of soil is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(IR)(FI)(EF)(ED)(CF)}{(BW)(AT)}$$

where:

| | | |
|---|---|---|
| Intake | = | intake of chemical from soil (mg/kg/day) |
| $C_s$ | = | concentration of chemical in soil (mg/kg) |
| IR | = | ingestion rate (mg/day) |
| FI | = | fraction ingested from contaminated source (dimensionless) |
| EF | = | exposure frequency (days/yr) |
| ED | = | exposure duration (yr) |
| CF | = | conversion factor ($1 \times 10^{-6}$ kg/mg) |
| BW | = | body weight (kg) |
| AT | = | averaging time (days); |
| | | for non-carcinogens, AT = ED x 365 days/yr |
| | | for carcinogens, AT = 70 yr x 365 days/yr |

Most of the exposure assumptions used to estimate chemical intakes from incidental ingestion of soil were based on default assumptions described in standard USEPA guidance and are summarized in Tables 7-16 and 7-17. The following paragraphs briefly discuss the non-default receptor-specific exposure assumptions for incidental ingestion of soil that were used in the HHRA.

The selected exposure frequency assumptions consider anticipated receptor activities at SWMU 27. It is assumed that construction workers assigned to future construction projects at SWMU 27 are exposed to soil for 5 days a week over 30 weeks (150 days per year) for 1 year under the RME scenario. The exposure frequency for the CTE scenario was assumed to be 50 percent of the RME or 75 days per year. Child and adult recreational users are assumed to be exposed to soil 2 days a week during the summer months (52 days per year) under the RME scenario, and one day per week (26 days per year) under the CTE scenario. It is assumed that construction workers are exposed to material in the sumps/pits for 45 days for 1 year under the RME scenario (IDEM, 2012). The exposure frequency for the CTE scenario was assumed to be 50 percent of the RME or 23 days per year.

#### 7.2.4.2 Dermal Contact with Soil

Direct physical contact with soil may result in the dermal absorption of chemicals. Exposure associated with dermal contact with soil is estimated in the following manner (USEPA, 1989):

$$\text{Intake} = \frac{(C_s)(SA)(AF)(ABS)(CF)(EF)(ED)}{(BW)(AT)}$$

where:

| | | |
|---|---|---|
| Intake | = | amount of chemical absorbed during contact with soil (mg/kg/day) |
| $C_s$ | = | concentration of chemical in soil (mg/kg) |
| SA | = | skin surface area available for contact ($cm^2$/day) |
| AF | = | skin adherence factor ($mg/cm^2$) |
| ABS | = | absorption factor (dimensionless) |
| CF | = | conversion factor ($1x10^{-6}$ kg/mg) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (year) |
| BW | = | body weight (kg) |
| AT | = | averaging time (days); |
| | | for non-carcinogens, AT = ED x 365 days/year |
| | | for carcinogens, AT = 70 years x 365 days/year |

Most of the exposure assumptions used to estimate chemical intakes from dermal contact with soil were based on the default assumptions described in standard USEPA guidance and are summarized in

Tables 7-16 and 7-17. The following paragraphs briefly discuss non-default receptor-specific exposure assumptions for dermal contact with soil that were used in the HHRA.

The exposed skin surface areas of the body available for dermal contact with soil were determined on a receptor-specific basis because they correspond with assumed human activities and clothing worn during exposure events. With the exception of the skin surface area recommended for child and adult recreational users, all of the skin surface areas presented in Tables 7-16 and 7-17 are based on USEPA default values. Current guidance (USEPA, 1997a and 2004) was used to develop the skin surface area available for contact for the child and adult recreational users as follows:

- For adult recreational users assumed to be exposed to soil/sediment, the exposed surface area available for contact was the sum of the head, arms, hands, lower legs, and feet of an adult male. This skin surface area is 9,070 square centimeters ($cm^2$) for the RME and CTE scenarios. This value represents the $50^{th}$-percentile areas for the arms, hands, lower legs, and feet (USEPA, 1997). For a small child recreational user (0 to 6 years old), it was assumed that 50 percent of the body surface area was exposed to surface soil and sediment (i.e., 3,300 $cm^2$). This value represents the $50^{th}$-percentile areas presented in Table 4-6 of the Exposure Factors Handbook (USEPA, 1997a).

The same exposure frequencies and durations recommended for the evaluation of incidental ingestion of soil were used to estimate chemical intakes for dermal contact with soil. The soil adherence factors presented are those in Exhibits 3.3 and 3.5 of RAGS Part E. To the extent possible, chemical-specific dermal absorption factors provided in RAGS Part E were used to evaluate the COPCs for soil. However, dermal absorption factors are only available for the short list of chemicals in Exhibit 3-4 of RAGS Part E. In addition, as indicated in RAGS Part E, absorption factors for metals other than arsenic and cadmium have not been developed because of insufficient data to support default values. Therefore, ABS was set equal to zero for these chemicals, and risks from dermal absorption of metals other than arsenic and cadmium from soil were not quantified in this risk assessment. The uncertainty associated with the omission of these constituents is discussed in the uncertainty analysis.

#### 7.2.4.3 Inhalation of Air Containing Fugitive Dust/Volatiles Emitted from Soil

Intakes of both particulates and vapors/gases are calculated using the same equation, as follows (USEPA, 2009a):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{AT \times 24\ hrs/day}$$

where:

| | | |
|---|---|---|
| EC | = | exposure concentration ($mg/m^3$) |
| $C_{air}$ | = | concentration of chemical in air ($mg/m^3$) |
| ET | = | exposure time (hours/day) |
| EF | = | exposure frequency (days/yr) |
| ED | = | exposure duration (yr) |
| AT | = | averaging time (hours); |
| | = | for non-carcinogens, AT = ED x 365 days/yr |
| | = | for carcinogens, AT = 70 yr x 365 days/yr |

Some of the exposure assumptions used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface and subsurface soil were based on default assumptions described in standard USEPA guidance and are summarized in Tables 7-16 and 7-17. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes were used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface and subsurface soil.

The concentrations of chemicals in air resulting from emissions from soil are developed following procedures presented in USEPA Soil Screening Guidance (USEPA, 2002e). Chemical concentrations in air were calculated as follows:

$$C_{air} = C_{soil} \times \left[ \frac{1}{PEF} + \frac{1}{VF} \right]$$

where:

| | | |
|---|---|---|
| $C_{air}$ | = | chemical concentration in air ($mg/m^3$) |
| $C_{soil}$ | = | chemical concentration in soil (mg/kg) |
| PEF | = | Particulate emission factor ($m^3/kg$) |
| VF | = | volatilization factor ($m^3/kg$) |

No volatile chemicals were retained as COPCs in surface and subsurface soil; therefore, the above equation reduces to:

$$C_{air} = C_{soil} \times \left[ \frac{1}{PEF} \right]$$

The particulate emissions factor (PEF) relates the concentration of the chemical in soil to the concentration of dust particles in air. A PEF value of $1.316 \times 10^{+9}$ was used for the HHRA of SWMU 27 soils (USEPA, 2002e; IDEM, 2009). Because air emissions resulting from fugitive dust emissions settings will be different than dust emissions generated during construction activities, a separate PEF was used for construction activities. The PEF for construction workers ($1.34 \times 10^{+6}$ $m^3$/kg) was calculated using the equations presented in the supplemental SSL guidance document (USEPA, 2002e). Sample calculations showing how the PEFs were calculated are presented in Appendix F.4.

#### 7.2.4.4 Exposure to Lead

Lead was identified as a COPC for the sumps/pits at Investigation Area 1. Lead concentrations at 7 sumps/pits exceeded the IDEM and OSWER soil screening level of 400 mg/kg for residents. Two sumps/pits had lead concentrations exceeding the IDEM screening criteria of 1,300 mg/kg for industrial/commercial workers and three sumps/pits had lead concentrations exceeding the IDEM screening criteria of 970 mg/kg for excavation workers. Construction workers are the only potential receptors that are exposed to the sumps/pits; therefore risks from exposures to lead were only evaluated for construction workers.

The equations and methodology presented in the previous section cannot be used to evaluate exposure to lead because of the absence of published dose-response parameters. Non-residential adult exposure to lead in soil was evaluated using USEPA's TRW for Model for lead (USEPA, 2003c, 2009b). In this model, adult exposure to lead in soil is addressed by an evaluation of the relationship between the site soil lead concentration and the blood-lead concentration in the developing fetuses of adult women. The adult lead model generates a spreadsheet for each exposure scenario evaluated (e.g., industrial). The output of the spreadsheet is the probability that the blood-lead concentrations in the fetuses exceed 10 µg/L.

#### 7.2.4.5 Assessing Cancer Risks from Early Life Exposures

USEPA's guidance for assessing early-life exposure to carcinogens (USEPA, 2005g) recommends making adjustments to the toxicity of carcinogenic chemicals that act via the mutagenic mode of action when evaluating early-life exposures. The guidance recommends using age-dependent adjustment factors (ADAFs) combined with age-specific exposure estimates when assessing cancer risks. In the absence of chemical-specific data, the supplemental guidance recommends the following default

adjustments, which reflect the fact that cancer risks are generally higher from early-life exposures than from similar exposures later in life:

- For exposures before 2 years of age (i.e., spanning a 2-year interval from the first day of birth until a child's second birthday), a 10-fold adjustment.

- For exposures between 2 and 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday until their sixteenth birthday), a three-fold adjustment.

- For exposures after turning 16 years of age, no adjustment.

The adjustments were applied using the same method as that used by ORNL in the development of RSLs. Children were evaluated as two age groups, ages 0 to 2 years and ages 2 to 6 years; and adults were evaluated as two age groups, ages 6 to 16, and ages greater than 16 years old. Using this approach, the intakes for child and adult recreational users and hypothetical residents were calculated as follows:

$$\text{Intake}_{\text{Child}} = \text{Intake}_{(\text{ages } 0 - 2 \text{ years})} \times 10 + \text{Intake}_{(\text{ages } 2 - 6 \text{ years})} \times 3$$
$$\text{Intake}_{\text{Adult}} = \text{Intake}_{(\text{ages } 6 - 16 \text{ years})} \times 3 + \text{Intake}_{(\text{ages} > 16 \text{ years})}$$

The above approach was used only for those chemicals that are identified as mutagenic in the ORNL screening table (e.g., hexavalent chromium). Sample calculations showing how this approach was applied are included in Appendix F.4.

#### 7.2.4.6 Summary of Exposure Parameters

A summary of exposure input parameters for all exposure pathways is presented in Tables 7-15 and 7-16 for the identified potential receptor groups at the Site. In general, standard default parameters (e.g., USEPA, 1989, 1991, 1997a, and 2004), which combine mid-range and upper-end exposure factors, were used to assess RME conditions in this HHRA. CTE conditions were assessed primarily by the use of mid-range exposure factors presented in current risk assessment guidance (USEPA, 1989 and 1993a).

## 7.3 TOXICITY ASSESSMENT

The toxicity assessment weighs the evidence regarding the potential for exposure to chemicals to produce adverse effects in exposed receptors; and when possible, the assessment estimates the

relationship between the exposure to a chemical and the increased likelihood and/or severity of adverse effects. Quantitative estimates of the relationship between the magnitude and type of exposures and the severity or probability of human health effects are defined for the identified constituents of concern. Quantitative toxicity values determined during this component of the risk assessment are integrated with exposure assessment outputs to characterize the potential occurrence of adverse health effects for each receptor group.

The reference dose (RfD) is the toxicity value used to evaluate noncarcinogenic health effects for ingestion and dermal exposures. The reference concentration (RfC) is used to evaluate noncarcinogenic health effects for inhalation exposures. The RfD and RfC estimate a daily exposure level for a human population that is unlikely to pose an appreciable risk during a portion or for all of a human lifetime. It is based on a review of animal and/or human toxicity data, with adjustments for various data uncertainties. Carcinogenic effects are quantified using the cancer slope factor (CSF) for ingestion and dermal exposures, and using inhalation unit risks (IURs) for inhalation exposure that are plausible upper-bound estimates of the probability of the development of cancer per unit intake of the chemical over a lifetime. These are typically based on dose-response data from human and/or animal studies.

### 7.3.1 Toxicity Criteria for Oral and Inhalation Exposures

Oral RfDs and CSFs and inhalation RfCs and IURs used in this HHRA were obtained from the following primary USEPA literature sources (USEPA, 2003d):

- Tier 1 - Integrated Risk Information System (IRIS).

- Tier 2 - USEPA Provisional Peer Reviewed Toxicity Values (PPRTVs) – The Office of Research and Development/National Center for Environmental Assessment (NCEA) Superfund Health Risk Technical Support Center develops PPRTVs on a chemical-specific basis when requested by USEPA's Superfund program.

- Tier 3 - Other Toxicity Values – These sources include but are not limited to California Environmental Protection Agency (Cal EPA) toxicity values, Agency for Toxic Substances and Disease Registry (ATSDR) values, and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997a).

Although toxicity criteria can be found in several toxicological sources, USEPA's IRIS online database is the preferred source of toxicity values. This database is continuously updated, and the presented values

have been verified by USEPA. The toxicity criteria for the constituents selected as COPCs are presented in Tables 7-18 through 7-21.

### 7.3.2 Toxicity Criteria for Dermal Exposure

RfDs and CSFs in the scientific literature are typically expressed as "administered" (i.e., not absorbed) doses. Therefore, these values are considered inappropriate for estimating risks associated with dermal exposures. Oral dose response parameters based on administered doses must be adjusted to absorbed doses before they can be compared to estimated dermal exposure intakes.

When oral absorption is essentially complete (i.e., 100 percent), an absorbed dose is equivalent to the administered dose, and therefore no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a chemical is poor (e.g., 1 percent), the absorbed dose is smaller than the administered dose; thus, toxicity factors based on absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (2004) recommends a 50 percent absorption cut-off to reflect the intrinsic variability in analyzing absorption studies. Therefore, the adjustment from administered to absorbed dose was only performed when the chemical-specific gastrointestinal absorption efficiency was less than 50 percent. The adjustment from administered to absorbed dose was made using chemical-specific gastrointestinal absorption efficiencies published in numerous sources of guidance [e.g., (USEPA, 2004), IRIS, ATSDR toxicological profiles, etc.), using the following equations:

$$RfD_{dermal} = (RfD_{oral})(ABS_{GI})$$

$$CSF_{dermal} = (CSF_{oral}) \ / \ (ABS_{GI})$$

where:

| | | |
|---|---|---|
| $ABS_{GI}$ | = | absorption efficiency in the gastrointestinal tract |
| $RfD_{dermal}$ | = | RfD for the dermal route of exposure |
| $RfD_{oral}$ | = | RfD for the oral route of exposure |
| $CSF_{dermal}$ | = | CSF for the dermal route of exposure |
| $CSF_{oral}$ | = | CSF of the oral route of exposure |

As noted above, the preceding adjustment of the oral toxicity criteria (e.g., RfDs, CSFs) was necessary to allow quantitative evaluation of the dermal route of exposure in the baseline risk assessment. An explanation of this procedure and the need for this procedure are presented in Appendix A of USEPA RAGS Part A.

### 7.3.3 Toxicity of Chromium

Toxicity criteria are available for different forms of chromium, which is considered to be more toxic in the hexavalent state. Chromium speciation analyses were not completed for samples collected at the Site. Therefore, risks associated with this chemical were assessed by conservatively assuming that 100 percent of the reported total chromium result is attributable to hexavalent chromium.

### 7.3.4 Mutagenic Chemicals

USEPA's guidance documents (USEPA, 2005f and 2005g) specify the use of ADAFs for carcinogens that act via a mutagenic mode of action. Hexavalent chromium is included in the group of chemicals that have been determined to act via the mutagenic mode of action. No chemical-specific ADAFs have been derived for hexavalent chromium; therefore, the following default ADAFs were used: 10 for ages 0 to 2, 3 for ages 2 to 16, and 1 (no adjustment) for ages 16 to 70. The ADAFs were used in evaluating exposures to hexavalent chromium for recreational users and hypothetical residents using the approach presented in Section 7.2.4.5.

## 7.4 RISK CHARACTERIZATION

This section provides a characterization of human health risks associated with potential exposures to COPCs at the Site. Potential risks (non-carcinogenic and carcinogenic) for human receptors resulting from exposures outlined in the exposure assessment were quantitatively determined and are discussed in this section. Section 7.4.1 outlines the methods used to quantitatively estimate the type and magnitude of potential risks for human receptors. Summaries of the risk characterization for the SWMU 27 are provided in Section 7.4.2.

### 7.4.1 Quantitative Analysis

Quantitative estimates of risk for chemicals were calculated according to risk assessment methods outlined in USEPA guidance (USEPA, 1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as ILCRs, based on CSFs and IURs. Non-carcinogenic risk estimates are presented in the form of HQs that are determined through a comparison of intakes with published RfDs and RfCs.

ILCR estimates for ingestion and dermal exposures were generated for each COPC using estimated exposure intakes and published CSFs, as follows:

ILCR = (Estimated Exposure Intake)(CSF)

ILCRs estimates for inhalation exposures were generated for each COPC using estimated exposure concentrations and published IURs, as follows:

ILCR = (IUR)(Exposure Concentration)(1000 μg/mg)

An ILCR of $1 \times 10^{-6}$ indicates that the exposed receptor has an one-in-one-million chance of developing cancer under the defined exposure scenario. Alternatively, such a risk may be interpreted as representing one additional case of cancer in an exposed population of one million people.

Non-carcinogenic risks were assessed using the concept of HQs and HIs. The HQ for a COPC is the ratio of the estimated intake to the RfD and is calculated for ingestion and dermal exposures as follows:

HQ = (Estimated Exposure Intake)/(RfD)

For inhalation exposures, HQ is calculated as follows:

HQ = (Exposure Concentration)/(RfC)

An HI was generated by summing the individual HQs for all COPCs. The HI is not a mathematical prediction of the severity of toxic effects, and therefore is not a true "risk"; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

### 7.4.2 Comparison of Quantitative Risk Estimates to Benchmarks

To interpret the quantitative risks and to aid risk managers in determining the need for remediation at a site, quantitative risk estimates were compared to typical risk benchmarks. Calculated ILCRs were interpreted using the USEPA's "target range" ($1x10^{-6}$ to $1x10^{-4}$).

USEPA has defined the range of $1x10^{-6}$ to $1x10^{-4}$ as the ILCR "target risk range" for most hazardous waste facilities addressed under CERCLA and RCRA. IDEM has defined this same risk range for the nondefault evaluation under their RISC program. Individual or cumulative ILCRs greater than $1x10^{-4}$ will typically not be considered as protective of human health, and ILCRs less than $1x10^{-6}$ will typically be

regarded as protective. Risk management decisions are necessary when the ILCR is within the $1x10^{-4}$ to $1x10^{-6}$ cancer risk range.

An HI exceeding unity (1) indicates that there may be potential noncarcinogenic health risks associated with exposure. If an HI exceeds unity, a segregation of target organ effects associated with exposure to COPCs is typically performed. Only those chemicals that affect the same target organ(s) or exhibit similar critical effect(s) are regarded as truly additive. Consequently, it may be possible for a cumulative HI to exceed 1, but no adverse health effects are anticipated if the COPCs do not affect the same target organ or exhibit the same critical effect.

### 7.4.3 Results of the Risk Characterization

This section contains a summary of the results of the risk characterization for SWMU 27. Quantitative risk estimates for potential human receptors are developed for chemicals detected in soils and sumps/pits. Uncertainties associated with the risk estimates are discussed in Section 7.5. The methodology used to calculate the risks presented in this section is provided in Sections 7.2 and 7.3. Potential cancer risks and hazard indices were calculated for current/future construction workers, industrial workers, future child recreation users, adult recreational users, and hypothetical residents under the RME and CTE scenarios and are summarized in Tables 7-22, 7-23, 7-26, and 7-27. Potential risks for future construction workers exposed to the sumps/pits under the RME and CTE scenarios and are summarized in Tables 7-24 and 7-25. Chemicals retained as chemicals of concern (COCs) are summarized in Table 7-28. Sample calculations are presented in Appendix F.4, and the results of the risk assessment in RAGS Part D format are included in Appendix F.2.

#### 7.4.3.1 Investigation Area 1 - Soil

Noncarcinogenic Risks

Tables 7-22 and 7-23 and Figures 7-2 and 7-3 present the HIs for exposures to soils under the RME and CTE scenarios at Investigation Area 1. HIs for all receptors exposed to surface soils and subsurface soils at Investigation Area 1 under the RME and CTE scenarios were less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

Carcinogenic Risks

Tables 7-22 and 7-23 and Figures 7-4 and 7-5 present the ILCRs for exposures to soil under the RME and CTE scenarios at Investigation Area 1. ILCRs for all receptors exposed to surface soil and subsurface soil at Investigation Area 1 under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of $10^{-4}$ to $10^{-6}$.

#### 7.4.3.2 Investigation Area 1 – Sumps/Pits

Noncarcinogenic Risks

Tables 7-24 and 7-25 and Figures 7-6 and 7-7 present the HIs for construction workers exposed to the sumps/pits under the RME and CTE scenarios at Investigation Area 1. Under the RME scenario, HIs at locations 27SB029, 27SB030, 27SB034, 27SB035, and 27SB066 were less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. HIs, calculated on an organ-specific basis, at locations 27SB031 (HI = 3), 27SB032 (HI = 5), 27SSB033 (HI = 3), 27SB056 (HI = 2), and SB27057 (HI = 7) exceeded 1. Under the CTE scenario HIs were less than 1 at all locations with the exception of 27SB057 (HI=2). Manganese was the major contributor to the HI.

Carcinogenic Risks

Tables 7-24 and 7-25 and Figures 7-8 and 7-9 present the ILCRs for construction workers exposed to the sumps/pits under the RME and CTE scenarios at Investigation Area 1. ILCRs for construction workers under the RME and CTE scenarios were less than or within USEPA's and IDEM's target risk range of $10^{-4}$ to $10^{-6}$ for all ten sumps/pits at Investigation Area 1.

#### 7.4.3.3 Investigation Area 2

No COPCs were identified for subsurface soil at Investigation Area 2; consequently, only exposures to surface soil at Investigation Area 2 were evaluated in this HHRA.

Noncarcinogenic Risks

Tables 7-26 and 7-27 and Figures 7-10 and 7-11 present the HIs for the RME and CTE scenarios at Investigation Area 2. HIs for all receptors exposed to surface soils at Investigation Area 2 under the RME and CTE scenarios were less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

Carcinogenic Risks

No carcinogenic COPCs were identified in surface soil at Investigation Area 2; consequently, no ILCRs were calculated.

#### 7.4.3.4 Lead Risks

As previously discussed in Section 7.2.4.4 lead was identified as a COPC for construction workers exposed to the sumps/pits at Investigation Area 1. Lead concentrations in 3 sumps/pits (locations 27SB032, 27SB056, and 27SB066) exceeded the IDEM screening criteria of 970 mg/kg for construction workers.

Exposures to lead in the sumps/pits by construction workers were evaluated using Adult Lead Methodology (ALM) developed by the USEPA TRW for Lead (2003c, 2009b). The lead concentrations of 1,570 mg/kg, 1,270 mg/kg, and 6,100 mg/kg at sumps/pits 27SB032, 27SB056, and 27SB066, respectively, were evaluated as the EPCs. The incidental ingestion rate was assumed to be 330 mg/day and the exposure frequency was assumed to be 45 days per year. Default parameters were used for the remaining model input parameters (USEPA, 2009b). Results of the model runs are included in Appendix F.5. The fetus of a pregnant worker is the ultimate receptor of concern for the TRW model. The results of the modeling are shown below.

| Sumps/Pits | Blood-Lead Geometric Mean Concentration (µg/dL) | Percent of Receptors Exceeding 10 µg/dL |
|---|---|---|
| 27SB032 | 4.1 | 4.4 |
| 27SB056 | 2.0 | 0.2 |
| 27SB066 | 12.9 | 60 |

The results for construction workers do not exceed the USEPA goal of no more than 5 percent of children (fetuses of exposed women) exceeding a 10 µg/dL blood-lead level as a consequence of exposure at locations 27SB032 and 27SB056, while the results for the lead concentrations at location 27SB066 do exceed the USEPA goal.

#### 7.4.3.4 Risk Estimates Due to Chemicals Attributable to Background

COPCs for SWMU 27 were selected, in part, using available background concentrations for soil. A statistical data set to background data set comparison was conducted to determine if site concentrations

exceeded background concentrations for chemicals with concentrations exceeding screening criteria (see Appendix E). At Investigation Area 1, cadmium and manganese were within background levels in surface soil, and aluminum was within background levels in subsurface soil. At Investigation Area 2 chromium and manganese were within background levels in surface soil and aluminum, chromium, and manganese were within background levels in subsurface soil. Tables 7-25 through 7-28 present the cancer risks and hazard indices associated with these metals. RAGS Part D tables for these chemicals are presented in Appendix F.6.

HIs were less than the acceptable level of 1 for all receptors at Investigation Areas 1 and 2 under the RME and CTE scenarios with the exception of construction workers. HIs exceeded the acceptable level of 1 for construction workers exposed to surface soil at Investigation Area 1 under the RME and CTE scenarios, and to subsurface soil at Investigation Area 2 under the RME scenario. Manganese was the major contributor to the HI at Investigation Area 1. Aluminum and manganese were the major contributors to the HI at Investigation Area 2.

ILCRs for all receptors were within USEPA's and IDEM's target risk range for the RME and CTE scenarios at Investigation Areas 1 and 2.

## 7.5 UNCERTAINTY ANALYSIS

There is uncertainty associated with all aspects of the baseline human health risk assessment. A summary of the uncertainties, including a discussion of how they may affect the final risk numbers, is provided in this section.

Uncertainty in the selection of COPCs is related to the current status of the predictive databases; the grouping of samples; the numbers, types, and distributions of samples; and the procedures used to include or exclude constituents as COPCs. Uncertainty associated with the exposure assessment includes the values used as input variables for a given intake route or scenario, the assumptions made to determine exposure point concentrations, and the predictions regarding future land use and population characteristics. Uncertainty in the toxicity assessment includes the quality of the existing toxicity data needed to support dose-response relationships, and the weight-of-evidence used to determine the carcinogenicity of COPCs. Uncertainty in risk characterization includes that associated with exposure to multiple chemicals, and the cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment process.

Whereas there are various sources of uncertainty, the direction of uncertainty can be influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose-response relationships. Throughout the entire risk assessment, assumptions are biased toward a margin of safety so that the final calculated risks are overestimated.

Generally, risk assessments carry two types of uncertainty: measurement and informational uncertainty. Measurement uncertainty refers to the usual variance that accompanies scientific measurements. For example, this type of uncertainty is associated with analytical data collected for each site. The risk assessment reflects the accumulated variances of the individual values used.

Informational uncertainty stems from inadequate availability of information needed to complete the toxicity and exposure assessments. Often, this gap is significant, such as the absence of information on the effects of human exposure to low doses of a chemical, on the biological mechanism of action of a chemical, or the behavior of a chemical in soil.

Once the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Reliance on results from a risk assessment without consideration of uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to account for uncertainties in the development of exposure assumptions, conservative estimates must be made to ensure that the particular assumptions made are protective of sensitive subpopulations or the maximum exposed individuals. If a number of conservative assumptions are combined in an exposure model, the resulting calculations can propagate the uncertainties associated with those assumptions, thereby producing a much larger uncertainty for the final results. This uncertainty is biased toward over predicting both carcinogenic and noncarcinogenic risks. Thus, both the results of the risk assessment and the uncertainties associated with those results must be considered when making risk management decisions.

This interpretation is especially relevant when the risks exceed the point of departure for defining "acceptable" risk. For example, when risks calculated using a high degree of uncertainty are less than an acceptable risk level (i.e., $1x10^{-6}$ to $1x10^{-4}$), the interpretation of no significant risk is typically straightforward. However, when risks calculated using a high degree of uncertainty exceed an acceptable risk level (i.e., $1x10^{-4}$), a conclusion can be difficult unless uncertainty is considered.

### 7.5.1 Uncertainty in Data Evaluation

The most significant issue related to uncertainty in the data evaluation is the usability of the existing database. A brief discussion of the uncertainty in the data evaluation is provided in the remainder of this section.

**Usability of Existing Databases**

All the data used in the HHRA were validated as discussed in Section 3.0. The qualification of data during the formal data validation process is not expected to compromise the results of the baseline human health risk assessment. Analytical data qualified as estimated were utilized, even though the reported positive concentrations or sample-specific quantitation limits may be somewhat imprecise. The use of estimated data adds to the uncertainty associated with the risk assessment; however, the associated uncertainty is expected to be negligible compared to the other uncertainties inherent in the risk evaluation process (i.e., uncertainties with land uses, exposure scenarios, toxicological criteria, etc.). Because all data have been validated, the uncertainty in the calculated risks associated with the data is minimal.

### 7.5.2 Uncertainty in the Exposure Assessment

Uncertainty in the exposure assessment arises because of the methods used to calculate exposure point concentrations, the determination of land use conditions, the selection of receptors and scenarios, the estimation of exposure point concentrations, and the selection of exposure parameters. Each of these is discussed below.

**Land Use**

The current land use patterns at NSA Crane are well established, thereby limiting the uncertainty associated with land use assumptions. Land use at SWMU 27 is currently limited and is expected to be limited in the future, as long as NSA remains open (industrial workers and construction workers are the only current and likely future receptors). To be conservative, risks to potential and future recreational users, and hypothetical residents were estimated for the site.

**Exposure Point Concentrations**

Uncertainty is associated with the use of the 95 percent UCL on the mean concentration as the EPC. As a result of using the 95 percent UCL, the estimations of potential risk for the RME scenario are most likely

overstated since this is a representation of the upper limit that potential receptors would be exposed to over the entire exposure period.

**Exposure Routes and Receptor Identification**

The determination of various receptor groups and exposure routes of potential concern was based on current land use observed at the site and the anticipated future land use. Therefore, the uncertainty associated with the selection of exposure routes and potential receptors is minimal because they are considered to be well defined.

**Exposure Parameters**

Each exposure factor (for RME and CTE scenarios) selected for use in the risk assessment has some associated uncertainty. Generally, exposure factors are based on surveys of physiological parameters and lifestyle profiles across the United States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimation of exposure, in most cases, the USEPA guidelines (USEPA, 1991 and 1993a) on the RME receptor were used, which generally specify the use of the 95th percentile for most parameters. Therefore, the selected values for the RME receptor represent the upper bound of the observed or expected habits of the majority of the population.

Generally, the uncertainty can be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical analyses on human population characteristics. Often, the database used to summarize a particular exposure parameter (i.e., body weight) is quite large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report are selected from a distribution of possible values, including USEPA guidance (USEPA, 1991 and 1993a) and dermal guidance (USEPA, 1997a and 2004). For the RME scenario, the value representing the 95th percentile is generally selected for each parameter to ensure that the assessment bounds the actual risks from a postulated exposure. This risk number is used in risk management decisions but does not indicate what a more average or typical exposure might be, or what risk range might be expected for individuals in the exposed population.

To address these issues, USEPA (1992) has suggested the use of the CTE receptor, whose intake variables are often set at approximately the 50th percentile of the distribution. The risks for this receptor

seek to incorporate the range of uncertainty associated with various intake assumptions. Some of the parameters presented in this risk assessment were estimated using professional judgment, although USEPA does provide limited guidance for the CTE evaluation (USEPA, 1993a).

### 7.5.3 Uncertainty in the Toxicological Evaluation

Uncertainties associated with the toxicity assessment (determination of RfDs and CSFs and use of available criteria) are discussed in this section.

**Derivation of Toxicity Criteria**

Uncertainty associated with the toxicity assessment is associated with hazard assessment and dose-response evaluations for the COPCs. The hazard assessment deals with characterizing the nature and strength of the evidence of causation, or the likelihood that a chemical that induces adverse effects in animals will also induce adverse effects in humans. Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination, using the USEPA methods. Positive animal cancer test data suggest that humans contain tissue(s) that may manifest a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans.

Uncertainty in hazard assessment arises from the nature and quality of the animal and human data. Uncertainty is reduced when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose related; when pharmacokinetic data indicate a similar fate in humans and animals; when postulated mechanisms of toxicity are similar for humans and animals; and when the chemical of concern is structurally similar to other chemicals for which the toxicity is more completely characterized.

Uncertainty in the dose-response evaluation includes the determination of a CSF for the carcinogenic assessment. Uncertainty is introduced from interspecies (animal to human) extrapolation, which in the absence of quantitative pharmacokinetic or mechanistic data, is usually based on consideration of interspecies differences in basal metabolic rate. Uncertainty also results from intraspecies variation. Most toxicity experiments are performed with animals that are very similar in age and genotype, so intragroup biological variation is minimal, but the human population of concern may reflect a great deal of heterogeneity, including unusual sensitivity or tolerance to the COPC. Even toxicity data from human occupational exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly (the "healthy worker effect"), and those not unusually sensitive to the chemical are likely to be occupationally exposed. Finally, uncertainty arises from the quality of the key study from which the

quantitative estimate is derived and the database. For cancer effects, the uncertainty associated with dose-response factors is mitigated by assuming the 95 percent upper bound for the slope factor. Another source of uncertainty in carcinogenic assessment is the method by which data from high doses in animal studies are extrapolated to the dose range expected for environmentally exposed humans. The linearized multistage model, which is used in nearly all quantitative estimations of human risk from animal data, is based on a nonthreshold assumption of carcinogenesis. Evidence suggests, however, that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are noncarcinogenic. Therefore, the use of the linearized multistage model is conservative for chemicals that exhibit a threshold for carcinogenicity.

**Use of Chronic Toxicity Values for Construction Workers**

Construction workers exposed to material in the sumps/pits were evaluated using exposure assumptions recommended by IDEM (2012), which assume an exposure frequency of 45 days a year. However, construction workers mostly likely will only be exposed to the material in the sumps/pits for a couple days at most. Exposures less than two weeks are considered to be acute exposures. However, acute toxicity values are not available. Therefore, chronic and subchronic toxicity values were used to evaluate exposures to construction workers. This likely resulted in an overestimation of potential noncarcinogenic risks for the construction worker receptor because acute toxicity values may be up to one or more orders of magnitude higher than subchronic and chronic toxicity values. Therefore, the “unacceptable HIs” identified for construction workers exposed to the sumps/pits may actually not exceed 1. Consequently, hazard indices for construction workers exposed to material in the sumps/pits may be within acceptable levels.

### 7.5.4 Uncertainty in the Risk Characterization

Uncertainty in risk characterization results from assumptions made regarding additivity of effects from exposure to multiple COPCs from various exposure routes. High uncertainty exists when summing noncancer risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Even when compounds affect the same target organs, they may have different mechanisms of action or differ in their fate in the body, so additivity may not be an appropriate assumption. The assumption of additivity in this risk characterization was considered acceptable because in most cases it represented a conservative estimate of risk.

Risks to any individual may also have been overestimated by summing multiple assumed exposure pathway risks for any single receptor. Although every effort was made to develop reasonable scenarios, not all individual receptors may have been exposed via all pathways considered.

Also, the risk characterization did not consider antagonistic or synergistic effects. Little or no information was available to determine the potential for antagonism or synergism for the COPCs. Because chemical-specific interactions could not be predicted, the likelihood for risks to be over predicted or under predicted could not be defined, but the methodology used was based on current USEPA guidance.

## 7.6 SUMMARY AND CONCLUSIONS

This section summarizes the results of the baseline human health risk assessment for SWMU 27 which was performed to characterize the potential risks to likely human receptors under current and potential future land uses. Potential receptors under current land use are industrial workers and construction workers. Potential receptors under future land use are industrial workers and construction workers, child and adult recreational users, and hypothetical child and adult residents. Although future land use is likely to be the same as current land use, the potential future recreational user and resident receptors were evaluated in the baseline human health risk assessment primarily for decision-making purposes.

The COPCs for direct contact with` soil at Investigation Area 1:

- Surface soil – Aluminum, barium, and chromium.
- Subsurface Soil – Chromium and manganese.

The COPCs for chemical migration from soil to groundwater at Investigation Area 1:

- Surface soil – Methylene chloride, trichloroethene, barium, and chromium.
- Subsurface Soil – Trichloroethene, vinyl chloride, chromium, and manganese.

The COPCs for direct contact with residual material in the sumps/pits at Investigation Area 1:

- Ethylbenzene, total xylenes, aluminum, cadmium, chromium, copper, lead, manganese, and zinc.

The COPCs for direct contact exposures at Investigation Area 2 are as follows:

- Surface soil – Aluminum
- Subsurface Soil – No COPCs

No COPCs were identified for chemical migration from soil to groundwater at Investigation Area 2.

Quantitative estimates of noncarcinogenic and carcinogenic risks (HIs and ILCRs, respectively) were developed for potential human receptors. HIs for all receptors exposed to soils in both Investigation Areas 1 and 2 at SWMU 27 were less than or equal to unity (1) for both the RME and CTE scenarios, indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

Under the RME scenario, HIs for construction workers exposed to residual materials in the sumps/pits at locations 27SB029, 27SB030, 27SB034, 27SB035, and 27SB066 were less than or equal to unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions. HIs, calculated on a target organ specific basis, for locations 27SB031, 27SB032, 27SB033, 27SB056, and SB27057 exceeded 1. Under the CTE scenario HIs were less than 1 at all locations with the exception of 27SB057. Manganese was the major contributor to the HI for construction worker exposures to residual materials in the sumps/pits.

ILCRs for all receptors exposed to surface soil and subsurface soil at Investigation Area 1 and construction workers exposed to residual materials in the sumps/pits under the RME were less than or within USEPA's and IDEM's target risk range of $1x10^{-6}$ to $1x10^{-4}$. No carcinogenic COPCs were identified in surface soil at Investigation Area 2; consequently, no ILCRs were calculated.

Lead was identified as a COPC for residual materials in the sumps/pits at Investigation Area 1. Lead concentrations at 7 sumps/pits exceeded the IDEM and OSWER soil screening level of 400 mg/kg for the residential land use scenario. Two sumps/pits had lead concentrations exceeding the IDEM screening criteria of 1,300 mg/kg for industrial/commercial workers and three sumps/pits had lead concentrations exceeding the IDEM screening criteria of 970 mg/kg for excavation workers.

Construction workers are the only potential receptors that may be exposed to residual materials in the sumps/pits; therefore risks from exposures to lead were only evaluated at the three sumps/pits where lead concentrations in the residual materials exceeded the IDEM screening levels for construction workers: 27SB032, 27SB056, and 27SB066. The risk evaluation results for construction workers do not exceed the USEPA goal of no more than 5 percent of children (fetuses of exposed women) exceeding a

10 µg/dL blood-lead level at locations 27SB032 and 27SB056, while the results at location 27SB066 do exceed the USEPA goal.

**TABLE 7-1**

**SCREENING CRITERIA USED IN SELECTION OF COPCS - SOIL**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


| CAS No. | Chemical | USEPA Regional Screening Levels[1] | | Indiana Department of Environmental Management[2] | |
|---|---|---|---|---|---|
| | | Adjusted Direct Contact Residential | Protection of Groundwater | Residential Soil | Migration to Groundwater |
| **Volatile Organic Compounds (mg/kg)** | | | | | |
| 95-50-1 | 1,2-Dichlorobenzene | 190 N | 5.4 | 380 S | 12 M |
| 106-46-7 | 1,4-Dichlorobenzene | 2.4 C | 0.008 | 34 C | 1.4 M |
| 78-93-3 | 2-Butanone | 2,800 N | 20 | 28,000 S | 21 N |
| 108-10-1 | 4-Methyl-2-Pentanone | 530 N | 4.6 | 3,400 S | 4.5 N |
| 67-64-1 | Acetone | 6,100 N | 48 | 85,000 N | 49 N |
| 71-43-2 | Benzene | 1.1 C | 0.004 | 15 C | 0.051 M |
| 75-15-0 | Carbon Disulfide | 82 N | 4.2 | 740 S | 4.2 N |
| 108-90-7 | Chlorobenzene | 29 N | 0.98 | 410 N | 1.4 M |
| 156-59-2 | cis-1,2-Dichloroethene | 16 N | 0.16 | 220 N | 0.41 M |
| 110-82-7 | Cyclohexane | 700 N | 260 | 120 S | 270 N |
| 100-41-4 | Ethylbenzene | 5.4 C | 0.03 | 76 C | 16 M |
| 98-82-8 | Isopropylbenzene | 210 N | 13 | 270 S | 13 N |
| 79-20-9 | Methyl Acetate | 7,800 N | 64 | 29,000 S | 66 N |
| 108-87-2 | Methyl Cyclohexane | NA | NA | NA | NA |
| 75-09-2 | Methylene Chloride | 36 N[3] | 0.05 | 150 C | 0.025 M |
| 108-88-3 | Toluene | 500 N | 12 | 820 S | 14 M |
| 1330-20-7 | Total Xylenes | 63 N | 3.8 | 260 S | 200 M |
| 79-01-6 | Trichloroethene | 0.44 N[3] | 0.0032 | 6.2 N | 0.036 M |
| 75-01-4 | Vinyl Chloride | 0.06 C | 0.00011 | 0.84 C | 0.014 M |
| **PCBs (ug/kg)** | | | | | |
| 11096-82-5 | Aroclor-1260 | 220 C | 480 | 3,100 C | 4,800 C |
| **Metals (mg/kg)** | | | | | |
| 7429-90-5 | Aluminum | 7,700 N | 460,000 | 100,000 L | 1,000,000 R |
| 7440-39-3 | Barium | 1,500 N | 2,400 | 21,000 N | 1,700 M |
| 7440-43-9 | Cadmium | 7 N | 10 | 98 N | 7.5 M |
| 7440-47-3 | Chromium | 0.29 C[4] | 0.0118 [4] | 4.1 C[4] | 0.12 C[4] |
| 7440-50-8 | Copper | 310 N | 440 | 4,300 N | 920 M |
| 7439-92-1 | Lead | 400 | 280 [5] | 400 | 270 M |
| 7439-95-4 | Magnesium | NA | NA | NA | NA |
| 7439-96-5 | Manganese | 180 N | 420 | 2,500 N | 420 N |
| 7440-09-7 | Potassium | NA | NA | NA | NA |
| 7440-23-5 | Sodium | NA | NA | NA | NA |
| 7440-24-6 | Strontium | 4,700 N | 6,600 | 66,000 N | 6,600 N |
| 7440-66-6 | Zinc | 2,300 N | 5,800 | 32,000 N | NA |
| **Miscellaneous Parameters** | | | | | |
| 57-12-5 | Cyanide (mg/kg) | 4.7 N | 1.9 | 2,200 N | 40 M |
| 14797-73-0 | Perchlorate (ug/kg) | 5,500 N | NA | 77,000 N | NA |

**TABLE 7-1**

**SCREENING CRITERIA USED IN SELECTION OF COPCS - SOIL**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


**Notes:**

1 - USEPA Regional Screening Level, May 2012. Carcinogenic values represent an incremental cancer risk of 1E-06. The noncarcinogenic values are the RSL divided by 10 to correspond to a Target Hazard Quotient of 0.1. Protection of groundwater values are risk-based SSLs and have been multiplied by 20 to represent a dilution attenuation factor of 20.
2 - IDEM Closure Guide, March 22, 2012.
3 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
4 - Value is for hexavalent chromium.
5 - Value is MCL based soil screening level.
C - Carcinogenic.
CAS = Chemical Abstracts Service.
IDEM = Indiana Department of Environmental Management.
L = Capped at 100,000 mg/kg.
M = Maximum contaminant level.
mg/kg = Milligram per kilogram.
N = Noncarcinogenic.
R = Capped at 1,000,000 mg/kg.
S = Soil saturation limit.
SSL = Soil screening level.
ug/kg = Microgram per kilogram.
USEPA = United States Environmental Protection Agency.

**TABLE 7-2**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


| CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | Adjusted USEPA RSL Residential Soil[5] | IDEM Residential Soil[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 78-93-3 | 2-Butanone | 0.0125 J | 0.0222 J | mg/kg | 27SS007G0001 | 2/19 | 0.00444 - 0.0104 | 0.0222 | NA | 2,800 N | 28,000 S | No | BSL |
| 108-10-1 | 4-Methyl-2-Pentanone | 0.00408 J | 0.00408 J | mg/kg | 27SS064C0002 | 1/19 | 0.00222 - 0.00525 | 0.00408 | NA | 530 N | 3,400 S | No | BSL |
| 67-64-1 | Acetone | 0.112 J | 0.122 J | mg/kg | 27SS007G0001 | 2/19 | 0.00888 - 0.0208 | 0.122 | NA | 6,100 N | 85,000 N | No | BSL |
| 156-59-2 | cis-1,2-Dichloroethene | 0.00179 J | 0.00179 J | mg/kg | 27SS003G0001 | 1/22 | 0.00211 - 0.00525 | 0.00179 | NA | 16 N | 220 N | No | BSL |
| 75-09-2 | Methylene Chloride | 0.0267 | 0.0267 | mg/kg | 27SS064C0002 | 1/19 | 0.00444 - 0.0105 | 0.0267 | NA | 36 N[8] | 150 C | No | BSL |
| 79-01-6 | Trichloroethene | 0.00429 J | 0.00439 J | mg/kg | 27SS064C0002 | 2/22 | 0.00211 - 0.00525 | 0.00439 | NA | 0.44 N[8] | 6.2 N | No | BSL |
| **PCBs** | | | | | | | | | | | | | |
| 11096-82-5 | Aroclor-1260 | 129 | 129 | ug/kg | 27SS054G0002 | 1/17 | 8.63 - 10.5 | 129 | NA | 220 C | 3,100 C | No | BSL |
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | **Aluminum** | 6,890 | 21,400 | mg/kg | 27SS001G0001 | 21/21 | - | 21,400 | Yes | **7,700 N** | 100,000 L | **Yes** | ASL |
| 7440-39-3 | **Barium** | 77.5 | 2,300 | mg/kg | 27SS025C0002 | 21/21 | - | 2,300 | Yes | **1,500 N** | 21,000 N | **Yes** | ASL |
| 7440-43-9 | Cadmium | 0.0786 J | 8.41 | mg/kg | 27SS002G0001 | 17/21 | 0.126 - 1.26 | 8.41 | No | **7 N** | 98 N | No | BKG |
| 7440-47-3 | **Chromium** | 12 J | 32.2 | mg/kg | 27SS001G0001 | 21/21 | - | 32.2 | Yes | **0.29 C[9]** | **4.1 C[9]** | **Yes** | ASL |
| 7440-50-8 | Copper | 10.4 | 67 | mg/kg | 27SS006G0001 | 21/21 | - | 67 | Yes | 310 N | 4,300 N | No | BSL |
| 7439-92-1 | Lead | 11 | 92 J | mg/kg | 27SS027C0002 | 21/21 | - | 92 | Yes | 400 | 400 | No | BSL |
| 7439-95-4 | Magnesium | 715 J | 6,030 J | mg/kg | 27SS026C0002 | 21/21 | - | 6,030 | Yes | NA | NA | No | NUT |
| 7439-96-5 | Manganese | 256 J | 5,550 J | mg/kg | 27SS001G0001 | 21/21 | - | 5,550 | No | **180 N** | **2,500 N** | No | BKG |
| 7440-09-7 | Potassium | 455 J | 1,050 J | mg/kg | 27SS022C0002 | 21/21 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| 7440-23-5 | Sodium | 71.7 J | 216 J | mg/kg | 27SS003G0001 | 7/21 | 168 - 935 | 216 | Yes | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 4.72 | 142 | mg/kg | 27SS026C0002 | 21/21 | - | 142 | Yes | 4,700 N | 66,000 N | No | BSL |
| 7440-66-6 | Zinc | 30.2 J | 387 | mg/kg | 27SS007G0001 | 21/21 | - | 387 | Yes | 2,300 N | 32,000 N | No | BSL |
| **Miscellaneous Parameters** | | | | | | | | | | | | | |
| 57-12-5 | Cyanide | 0.19 J | 1.37 | mg/kg | 27SS002G0001 | 1/2 | 0.288 - 0.288 | 1.37 | NA | 4.7 N | 2,200 N | No | BSL |
| 14797-73-0 | Perchlorate | 0.835 J | 1.75 J | ug/kg | 27SS027C0002 | 3/22 | 2.32 - 4.1 | 1.75 | NA | 5,500 N | 77,000 N | No | BSL |

**TABLE 7-2**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
9 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**Associated Samples**

| | |
|---|---|
| 27SS001G0001 | 27SS028C0002 |
| 27SS002G0001 | 27SS043C0002 |
| 27SS002G0001-D | 27SS044C0002 |
| 27SS003G0001 | 27SS045C0002 |
| 27SS004G0001 | 27SS046C0002 |
| 27SS005G0001 | 27SS047C0002 |
| 27SS006G0001 | 27SS048C0002 |
| 27SS007G0001 | 27SS049C0002 |
| 27SS008G0001 | 27SS050C0002 |
| 27SS010C0002 | 27SS051C0002 |
| 27SS011G0002 | 27SS052C0002 |
| 27SS012G0002 | 27SS053G0002 |
| 27SS019C0002 | 27SS053G0002-D |
| 27SS020C0002 | 27SS054G0002 |
| 27SS021C0002 | 27SS055G0002 |
| 27SS022C0002 | 27SS059C0002 |
| 27SS023C0002 | 27SS060C0002 |
| 27SS024C0002 | 27SS061C0002 |
| 27SS025C0002 | 27SS062C0002 |
| 27SS026C0002 | 27SS064C0002 |
| 27SS027C0002 | |

TABLE 7-3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 1
SWMU 27 ILLUMINANT BUILDING 126
NSA CRANE, CRANE, INDIANA


| CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | USEPA RSL Protection of Groundwater[5] | IDEM Migration to Groundwater[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 78-93-3 | 2-Butanone | 0.0125 J | 0.0222 J | mg/kg | 27SS007G0001 | 2/19 | 0.00444 - 0.0104 | 0.0222 | NA | 20 | 21 N | No | BSL |
| 108-10-1 | 4-Methyl-2-Pentanone | 0.00408 J | 0.00408 J | mg/kg | 27SS064C0002 | 1/19 | 0.00222 - 0.00525 | 0.00408 | NA | 4.6 | 4.5 N | No | BSL |
| 67-64-1 | Acetone | 0.112 J | 0.122 J | mg/kg | 27SS007G0001 | 2/19 | 0.00888 - 0.0208 | 0.122 | NA | 48 | 49 N | No | BSL |
| 156-59-2 | cis-1,2-Dichloroethene | 0.00179 J | 0.00179 J | mg/kg | 27SS003G0001 | 1/22 | 0.00211 - 0.00525 | 0.00179 | NA | 0.16 | 0.41 M | No | BSL |
| 75-09-2 | **Methylene Chloride** | 0.0267 | 0.0267 | mg/kg | 27SS064C0002 | 1/19 | 0.00444 - 0.0105 | 0.0267 | NA | 0.05 | **0.025 M** | **Yes** | ASL |
| 79-01-6 | **Trichloroethene** | 0.00429 J | 0.00439 J | mg/kg | 27SS064C0002 | 2/22 | 0.00211 - 0.00525 | 0.00439 | NA | **0.0032** | 0.036 M | **Yes** | ASL |
| **PCBs** | | | | | | | | | | | | | |
| 11096-82-5 | Aroclor-1260 | 129 | 129 | ug/kg | 27SS054G0002 | 1/17 | 8.63 - 10.5 | 129 | NA | 480 | 4,800 C | No | BSL |
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 6,890 | 21,400 | mg/kg | 27SS001G0001 | 21/21 | - | 21,400 | Yes | 460,000 | 1,000,000 R | No | BSL |
| 7440-39-3 | **Barium** | 77.5 | 2,300 | mg/kg | 27SS025C0002 | 21/21 | - | 2,300 | Yes | 2,400 | **1,700 M** | **Yes** | ASL |
| 7440-43-9 | Cadmium | 0.0786 J | 8.41 | mg/kg | 27SS002G0001 | 17/21 | 0.126 - 1.26 | 8.41 | No | 10 | **7.5 M** | No | BKG |
| 7440-47-3 | **Chromium** | 12 J | 32.2 | mg/kg | 27SS001G0001 | 21/21 | - | 32.2 | Yes | **0.0118** [8] | **0.12 C**[8] | **Yes** | ASL |
| 7440-50-8 | Copper | 10.4 | 67 | mg/kg | 27SS006G0001 | 21/21 | - | 67 | Yes | 440 | 920 M | No | BSL |
| 7439-92-1 | Lead | 11 | 92 J | mg/kg | 27SS027C0002 | 21/21 | - | 92 | Yes | 280 [9] | 270 M | No | BSL |
| 7439-95-4 | Magnesium | 715 J | 6,030 J | mg/kg | 27SS026C0002 | 21/21 | - | 6,030 | Yes | NA | NA | No | NUT |
| 7439-96-5 | Manganese | 256 J | 5,550 J | mg/kg | 27SS001G0001 | 21/21 | - | 5,550 | No | **420** | **420 N** | No | BKG |
| 7440-09-7 | Potassium | 455 J | 1,050 J | mg/kg | 27SS022C0002 | 21/21 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| 7440-23-5 | Sodium | 71.7 J | 216 J | mg/kg | 27SS003G0001 | 7/21 | 168 - 935 | 216 | Yes | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 4.72 | 142 | mg/kg | 27SS026C0002 | 21/21 | - | 142 | Yes | 6,600 | 6,600 N | No | BSL |
| 7440-66-6 | Zinc | 30.2 J | 387 | mg/kg | 27SS007G0001 | 21/21 | - | 387 | Yes | 5,800 | NA | No | BSL |
| **Miscellaneous Parameters** | | | | | | | | | | | | | |
| 57-12-5 | Cyanide | 0.19 J | 1.37 | mg/kg | 27SS002G0001 | 1/2 | 0.288 - 0.288 | 1.37 | NA | 1.9 | 40 M | No | BSL |
| 14797-73-0 | Perchlorate | 0.835 J | 1.75 J | ug/kg | 27SS027C0002 | 3/22 | 2.32 - 4.1 | 1.75 | NA | NA | NA | No | NTX |

**TABLE 7-3**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
9 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | |
|---|---|
| 27SS001G0001 | 27SS028C0002 |
| 27SS002G0001 | 27SS043C0002 |
| 27SS002G0001-D | 27SS044C0002 |
| 27SS003G0001 | 27SS045C0002 |
| 27SS004G0001 | 27SS046C0002 |
| 27SS005G0001 | 27SS047C0002 |
| 27SS006G0001 | 27SS048C0002 |
| 27SS007G0001 | 27SS049C0002 |
| 27SS008G0001 | 27SS050C0002 |
| 27SS010C0002 | 27SS051C0002 |
| 27SS011G0002 | 27SS052C0002 |
| 27SS012G0002 | 27SS053G0002 |
| 27SS019C0002 | 27SS053G0002-D |
| 27SS020C0002 | 27SS054G0002 |
| 27SS021C0002 | 27SS055G0002 |
| 27SS022C0002 | 27SS059C0002 |
| 27SS023C0002 | 27SS060C0002 |
| 27SS024C0002 | 27SS061C0002 |
| 27SS025C0002 | 27SS062C0002 |
| 27SS026C0002 | 27SS064C0002 |
| 27SS027C0002 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level.
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg.

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient
NTX = No toxicity criteria

**TABLE 7-4**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | Adjusted USEPA RSL Residential Soil(5) | IDEM Residential Soil Direct(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 67-64-1 | Acetone | 0.00553 J | 0.0101 J | mg/kg | 27SB040G0406 | 4/7 | 0.00913 - 0.00992 | 0.0101 | NA | 6,100 N | 85,000 N | No | BSL |
| 156-59-2 | cis-1,2-Dichloroethene | 0.00796 | 0.00796 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00796 | NA | 16 N | 220 N | No | BSL |
| 100-41-4 | Ethylbenzene | 0.00182 J | 0.00652 | mg/kg | 27SB036G0406 | 2/8 | 0.00213 - 0.00315 | 0.00652 | NA | 5.4 C | 76 C | No | BSL |
| 79-20-9 | Methyl Acetate | 0.00373 J | 0.00373 J | mg/kg | 27SB065G0406 | 1/8 | 0.00427 - 0.00507 | 0.00373 | NA | 7,800 N | 29,000 S | No | BSL |
| 1330-20-7 | Total Xylenes | 0.00462 J | 0.0226 | mg/kg | 27SB036G0406 | 2/8 | 0.0064 - 0.00944 | 0.0226 | NA | 63 N | 260 S | No | BSL |
| 79-01-6 | Trichloroethene | 0.00521 | 0.0176 | mg/kg | 27SB065G0406 | 2/9 | 0.00213 - 0.00301 | 0.0176 | NA | 0.44 N(8) | 6.2 N | No | BSL |
| 75-01-4 | Vinyl Chloride | 0.00683 | 0.00683 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00683 | NA | 0.06 C | 0.84 C | No | BSL |
| **PCBs** | | | | | | | | | | | | | |
| 11096-82-5 | Aroclor-1260 | 83.4 J | 83.4 J | ug/kg | 27SB055G0406 | 1/1 | - | 83.4 | NA | 220 C | 3,100 C | No | BSL |
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 2,960 | 18,900 | mg/kg | 27SB038G0406 | 8/8 | - | 18,900 | No | **7,700 N** | 100,000 L | No | BKG |
| 7440-39-3 | Barium | 22.9 | 99.6 | mg/kg | 27SB038G0406 | 8/8 | - | 99.6 | Yes | 1,500 N | 21,000 N | No | BSL |
| 7440-43-9 | Cadmium | 0.0621 J | 0.501 | mg/kg | 27SB039G0709 | 6/8 | 0.106 - 0.248 | 0.501 | No | 7 N | 98 N | No | BSL, BKG |
| 7440-47-3 | **Chromium** | 7.72 | 62.6 | mg/kg | 27SB042G0406 | 8/8 | - | 62.6 | Yes | **0.29 C(9)** | **4.1 C(9)** | **Yes** | ASL |
| 7440-50-8 | Copper | 5.3 | 16.1 | mg/kg | 27SB042G0406 | 8/8 | - | 16.1 | No | 310 N | 4,300 N | No | BSL, BKG |
| 7439-92-1 | Lead | 4.94 | 16.8 | mg/kg | 27SB038G0406-D | 8/8 | - | 16.8 | No | 400 | 400 | No | BSL, BKG |
| 7439-95-4 | Magnesium | 327 | 4,910 | mg/kg | 27SB039G0709 | 8/8 | - | 4,910 | Yes | NA | NA | No | NUT |
| 7439-96-5 | **Manganese** | 122 J | 900 J | mg/kg | 27SB039G0709 | 8/8 | - | 900 | Yes | **180 N** | 2,500 N | **Yes** | ASL |
| 7440-09-7 | Potassium | 533 J | 1,050 J | mg/kg | 27SB038G0406 | 8/8 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| 7440-23-5 | Sodium | 101 J | 108 J | mg/kg | 27SB041G0406 | 2/8 | 159 - 373 | 108 | Yes | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 5.39 | 33 J | mg/kg | 27SB039G0709 | 8/8 | - | 33 | No | 4,700 N | 66,000 N | No | BSL, BKG |
| 7440-66-6 | Zinc | 27.8 J | 104 J | mg/kg | 27SB039G0709 | 8/8 | - | 104 | Yes | 2,300 N | 32,000 N | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
9 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | |
|---|---|---|
| 27SB036G0406 | 27SB038G0406-D | 27SB042G0406 |
| 27SB037G0507 | 27SB039G0709 | 27SB065G0406 |
| 27SB038G0406 | 27SB040G0406 | 27SB055G0406 |
| 27SB038G0406 | 27SB041G0406 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 7-5**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | USEPA RSL Protection of Groundwater(5) | IDEM Migration to Groundwater(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 67-64-1 | Acetone | 0.00553 J | 0.0101 J | mg/kg | 27SB040G0406 | 4/7 | 0.00913 - 0.00992 | 0.0101 | NA | 48 | 49 N | No | BSL |
| 156-59-2 | cis-1,2-Dichloroethene | 0.00796 | 0.00796 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00796 | NA | 0.16 | 0.41 M | No | BSL |
| 100-41-4 | Ethylbenzene | 0.00182 J | 0.00652 | mg/kg | 27SB036G0406 | 2/8 | 0.00213 - 0.00315 | 0.00652 | NA | 0.03 | 16 M | No | BSL |
| 79-20-9 | Methyl Acetate | 0.00373 J | 0.00373 J | mg/kg | 27SB065G0406 | 1/8 | 0.00427 - 0.00507 | 0.00373 | NA | 64 | 66 N | No | BSL |
| 1330-20-7 | Total Xylenes | 0.00462 J | 0.0226 | mg/kg | 27SB036G0406 | 2/8 | 0.0064 - 0.00944 | 0.0226 | NA | 3.8 | 200 M | No | BSL |
| 79-01-6 | **Trichloroethene** | 0.00521 | 0.0176 | mg/kg | 27SB065G0406 | 2/9 | 0.00213 - 0.00301 | 0.0176 | NA | **0.0032** | 0.036 M | **Yes** | ASL |
| 75-01-4 | **Vinyl Chloride** | 0.00683 | 0.00683 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00683 | NA | **0.00011** | 0.014 M | **Yes** | ASL |
| **PCBs** | | | | | | | | | | | | | |
| 11096-82-5 | Aroclor-1260 | 83.4 J | 83.4 J | ug/kg | 27SB055G0406 | 1/1 | - | 83.4 | NA | 480 | 4,800 C | No | BSL |
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 2,960 | 18,900 | mg/kg | 27SB038G0406 | 8/8 | - | 18,900 | No | 46,000 | 1,000,000 R | No | BSL, BKG |
| 7440-39-3 | Barium | 22.9 | 99.6 | mg/kg | 27SB038G0406 | 8/8 | - | 99.6 | Yes | 2,400 | 1,700 M | No | BSL |
| 7440-43-9 | Cadmium | 0.0621 J | 0.501 | mg/kg | 27SB039G0709 | 6/8 | 0.106 - 0.248 | 0.501 | No | 10 | 7.5 M | No | BSL, BKG |
| 7440-47-3 | **Chromium** | 7.72 | 62.6 | mg/kg | 27SB042G0406 | 8/8 | - | 62.6 | Yes | **0.012** (9) | **38 C**(9) | **Yes** | ASL |
| 7440-50-8 | Copper | 5.3 | 16.1 | mg/kg | 27SB042G0406 | 8/8 | - | 16.1 | No | 440 | 920 M | No | BSL, BKG |
| 7439-92-1 | Lead | 4.94 | 16.8 | mg/kg | 27SB038G0406-D | 8/8 | - | 16.8 | No | 280 (10) | 270 M | No | BSL, BKG |
| 7439-95-4 | Magnesium | 327 | 4,910 | mg/kg | 27SB039G0709 | 8/8 | - | 4,910 | Yes | NA | NA | No | NUT |
| 7439-96-5 | **Manganese** | 122 J | 900 J | mg/kg | 27SB039G0709 | 8/8 | - | 900 | Yes | **420** | **420 N** | **Yes** | ASL |
| 7440-09-7 | Potassium | 533 J | 1,050 J | mg/kg | 27SB038G0406 | 8/8 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| 7440-23-5 | Sodium | 101 J | 108 J | mg/kg | 27SB041G0406 | 2/8 | 159 - 373 | 108 | Yes | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 5.39 | 33 J | mg/kg | 27SB039G0709 | 8/8 | - | 33 | No | 6,600 | 6,600 N | No | BSL, BKG |
| 7440-66-6 | Zinc | 27.8 J | 104 J | mg/kg | 27SB039G0709 | 8/8 | - | 104 | Yes | 5,800 | NA | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for total PCBs.
9 - Value is for hexavalent chromium.
10 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | |
|---|---|---|
| 27SB036G0406 | 27SB039G0709 | 27SB055G0406 |
| 27SB037G0507 | 27SB040G0406 | |
| 27SB038G0406 | 27SB041G0406 | |
| 27SB038G0406 | 27SB042G0406 | |
| 27SB038G0406-D | 27SB065G0406 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 7-6**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT - INVESTIGATION AREA 1 - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


| CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | Adjusted USEPA RSL Residential Soil[5] | IDEM Residential Soil[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds** | | | | | | | | | | | | | |
| 95-50-1 | 1,2-Dichlorobenzene | 0.00277 J | 0.0092 J | mg/kg | 27SS032C0002 | 2/10 | 0.00273 - 5.49 | 0.0092 | NA | 190 N | 380 S | No | BSL |
| 106-46-7 | 1,4-Dichlorobenzene | 0.00604 J | 0.0241 J | mg/kg | 27SS032C0002 | 2/10 | 0.00273 - 5.49 | 0.0241 | NA | 2.4 C | 34 C | No | BSL |
| 78-93-3 | 2-Butanone | 0.134 J | 0.236 J | mg/kg | 27SS066C0002 | 3/10 | 0.00546 - 11 | 0.236 | NA | 2,800 N | 28,000 S | No | BSL |
| 67-64-1 | Acetone | 0.399 J | 0.777 J | mg/kg | 27SS066C0002 | 3/10 | 0.0109 - 22 | 0.777 | NA | 6,100 N | 85,000 N | No | BSL |
| 71-43-2 | Benzene | 0.00331 J | 0.00359 J | mg/kg | 27SS033C0002 | 2/10 | 0.00273 - 5.49 | 0.00359 | NA | 1.1 C | 15 C | No | BSL |
| 75-15-0 | Carbon Disulfide | 0.00888 J | 0.0315 J | mg/kg | 27SS066C0002 | 3/10 | 0.00273 - 5.49 | 0.0315 | NA | 82 N | 740 S | No | BSL |
| 108-90-7 | Chlorobenzene | 0.00779 J | 0.00876 J | mg/kg | 27SS033C0002 | 2/10 | 0.00273 - 5.49 | 0.00876 | NA | 29 N | 410 N | No | BSL |
| 156-59-2 | cis-1,2-Dichloroethene | 0.00799 J | 0.00799 J | mg/kg | 27SS066C0002 | 1/10 | 0.00273 - 5.49 | 0.00799 | NA | 16 N | 220 N | No | BSL |
| 110-82-7 | Cyclohexane | 0.0416 J | 27.9 | mg/kg | 27SS029C0002 | 4/10 | 0.00273 - 0.00462 | 27.9 | NA | 700 N | 120 S | No | BSL |
| 100-41-4 | **Ethylbenzene** | 0.00181 J | 297 | mg/kg | 27SS029C0002 | 4/10 | 0.00277 - 0.0114 | 297 | NA | **5.4 C** | **76 C** | **Yes** | ASL |
| 98-82-8 | Isopropylbenzene | 0.442 J | 20.1 | mg/kg | 27SS029C0002 | 2/10 | 0.00273 - 0.0114 | 20.1 | NA | 210 N | 270 S | No | BSL |
| 108-87-2 | Methyl Cyclohexane | 0.918 J | 349 | mg/kg | 27SS029C0002 | 3/10 | 0.00273 - 0.0113 | 349 | NA | NA | NA | No | NTX |
| 75-09-2 | Methylene Chloride | 0.0778 | 0.173 J | mg/kg | 27SS066C0002 | 2/10 | 0.00546 - 11 | 0.173 | NA | 36 N[8] | 150 C | No | BSL |
| 108-88-3 | Toluene | 0.0129 | 0.0415 J | mg/kg | 27SS066C0002 | 3/10 | 0.00273 - 5.49 | 0.0415 | NA | 500 N | 820 S | No | BSL |
| 1330-20-7 | **Total Xylenes** | 0.00527 J | 829 | mg/kg | 27SS029C0002 | 6/10 | 0.0083 - 0.0131 | 829 | NA | **63 N** | **260 S** | **Yes** | ASL |
| 79-01-6 | Trichloroethene | 0.00238 J | 0.0564 J | mg/kg | 27SS066C0002 | 2/10 | 0.00277 - 5.49 | 0.0564 | NA | 0.44 N[8] | 6.2 N | No | BSL |
| 75-01-4 | Vinyl Chloride | 0.00724 J | 0.00724 J | mg/kg | 27SS066C0002 | 1/10 | 0.00273 - 5.49 | 0.00724 | NA | 0.06 C | 0.84 C | No | BSL |
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | **Aluminum** | 1,500 | 18,800 J | mg/kg | 27SS066C0002 | 10/10 | - | 18,800 | NA | **7,700 N** | 100,000 L | **Yes** | ASL |
| 7440-39-3 | Barium | 62.5 | 1,010 J | mg/kg | 27SS066C0002 | 10/10 | - | 1,010 | NA | 1,500 N | 21,000 N | No | BSL |
| 7440-43-9 | **Cadmium** | 3.49 | 138 J | mg/kg | 27SS066C0002 | 8/10 | 12.8 - 18.1 | 138 | NA | **7 N** | **98 N** | **Yes** | ASL |
| 7440-47-3 | **Chromium** | 13.8 J | 656 J | mg/kg | 27SS066C0002 | 6/10 | 29.3 - 94.6 | 656 | NA | **0.29 C[9]** | **4.1 C[9]** | **Yes** | ASL |
| 7440-50-8 | **Copper** | 63.4 | 2,420 | mg/kg | 27SS032C0002 | 10/10 | - | 2,420 | NA | **310 N** | 4,300 N | **Yes** | ASL |
| 7439-92-1 | **Lead** | 221 J | 6,100 J | mg/kg | 27SS066C0002 | 10/10 | - | 6,100 | NA | **400** | **400** | **Yes** | ASL |
| 7439-95-4 | Magnesium | 3,280 J | 45,300 J | mg/kg | 27SS032C0002 | 9/10 | 13600 - 13600 | 45,300 | NA | NA | NA | No | NUT |
| 7439-96-5 | **Manganese** | 52 J | 279,000 J | mg/kg | 27SS057G0002 | 10/10 | - | 279,000 | NA | **180 N** | **2,500 N** | **Yes** | ASL |
| 7440-09-7 | Potassium | 179 J | 1,320 J | mg/kg | 27SS056G0002 | 9/10 | 2790 - 2790 | 1,320 | NA | NA | NA | No | NUT |
| 7440-23-5 | Sodium | 137 J | 1,380 J | mg/kg | 27SS031C0002 | 7/10 | 199 - 2790 | 1,380 | NA | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 11.7 | 538 J | mg/kg | 27SS057G0002 | 10/10 | - | 538 | NA | 4,700 N | 66,000 N | No | BSL |
| 7440-66-6 | **Zinc** | 824 J | 18,900 J | mg/kg | 27SS032C0002 | 10/10 | - | 18,900 | NA | **2,300 N** | 32,000 N | **Yes** | ASL |
| **Miscellaneous Parameters** | | | | | | | | | | | | | |
| 57-12-5 | Cyanide | 0.491 J | 0.491 J | mg/kg | 27SS029C0002 | 1/1 | - | 0.491 | NA | 4.7 N | 2,200 N | No | BSL |

**TABLE 7-6**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT - INVESTIGATION AREA 1 - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**


**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
9 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SS029C0002
27SS030C0002
27SS031C0002
27SS032C0002
27SS033C0002
27SS034C0002
27SS035C0002
27SS056G0002
27SS057G0002
27SS066C0002

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient
NTX = No toxicity criteria

**TABLE 7-7**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL- INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | Adjusted USEPA RSL Residential Soil(5) | IDEM Residential Soil(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | **Aluminum** | 1,510 | 17,900 | mg/kg | 27SS017G0002 | 9/9 | - | 17,900 | Yes | **7,700 N** | 100,000 L | **Yes** | ASL |
| 7440-39-3 | Barium | 29.5 J | 132 | mg/kg | 27SS063G0002 | 9/9 | - | 132 | No | 1,500 N | 21,000 N | No | BSL, BKG |
| 7440-43-9 | Cadmium | 0.0598 J | 0.798 J | mg/kg | 27SS063G0002 | 5/9 | 0.12 - 2.74 | 0.798 | No | 7 N | 98 N | No | BSL, BKG |
| 7440-47-3 | Chromium | 5.74 J | 20.4 J | mg/kg | 27SS017G0002 | 9/9 | - | 20.4 | No | **0.29 C(8)** | **4.1 C(8)** | No | BKG |
| 7440-50-8 | Copper | 7.23 | 19.5 | mg/kg | 27SS017G0002 | 8/9 | 10.3 - 10.3 | 19.5 | Yes | 310 N | 4,300 N | No | BSL |
| 7439-92-1 | Lead | 4.84 | 18.2 | mg/kg | 27SS017G0002 | 9/9 | - | 18.2 | No | 400 | 560 N | No | BSL, BKG |
| 7439-95-4 | Magnesium | 1,120 J | 11,000 J | mg/kg | 27SS063G0002 | 9/9 | - | 11,000 | Yes | NA | NA | No | NUT |
| 7439-96-5 | Manganese | 53.1 J | 849 | mg/kg | 27SS013G0002 | 9/9 | - | 849 | No | **180 N** | 2,500 N | No | BKG |
| 7440-09-7 | Potassium | 322 J | 1,170 J | mg/kg | 27SS017G0002 | 9/9 | - | 1,170 | No | NA | NA | No | NUT, BKG |
| 7440-23-5 | Sodium | 85.1 J | 773 J | mg/kg | 27SS063G0002 | 7/9 | 175 - 186 | 773 | Yes | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 7.96 | 234 | mg/kg | 27SS063G0002 | 9/9 | - | 234 | Yes | 4,700 N | 66,000 N | No | BSL |
| 7440-66-6 | Zinc | 15.8 J | 60.2 J | mg/kg | 27SS063G0002 | 7/9 | 20.5 - 48.4 | 60.2 | Yes | 2,300 N | 32,000 N | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SS009G0001
27SS013G0002
27SS014G0002
27SS015G0002
27SS016G0002
27SS017G0002
27SS018G0002
27SS058G0001
27SS063G0002

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 7-8**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | USEPA RSL Protection of Groundwater(5) | IDEM Migration to Groundwater(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 1,510 | 17,900 | mg/kg | 27SS017G0002 | 9/9 | - | 17,900 | Yes | 460,000 | 1,000,000 R | No | BSL |
| 7440-39-3 | Barium | 29.5 J | 132 | mg/kg | 27SS063G0002 | 9/9 | - | 132 | No | 2,400 | 1,700 M | No | BSL, BKG |
| 7440-43-9 | Cadmium | 0.0598 J | 0.798 J | mg/kg | 27SS063G0002 | 5/9 | 0.12 - 2.74 | 0.798 | No | 10 | 7.5 M | No | BSL, BKG |
| 7440-47-3 | Chromium | 5.74 J | 20.4 J | mg/kg | 27SS017G0002 | 9/9 | - | 20.4 | No | **0.012 (8)** | **0.12 C(8)** | No | BKG |
| 7440-50-8 | Copper | 7.23 | 19.5 | mg/kg | 27SS017G0002 | 8/9 | 10.3 - 10.3 | 19.5 | Yes | 440 | 920 M | No | BSL |
| 7439-92-1 | Lead | 4.84 | 18.2 | mg/kg | 27SS017G0002 | 9/9 | - | 18.2 | No | 280 (9) | 270 M | No | BSL, BKG |
| 7439-95-4 | Magnesium | 1,120 J | 11,000 J | mg/kg | 27SS063G0002 | 9/9 | - | 11,000 | Yes | NA | NA | No | NUT |
| 7439-96-5 | Manganese | 53.1 J | 849 | mg/kg | 27SS013G0002 | 9/9 | - | 849 | No | **420** | **420 N** | No | BKG |
| 7440-09-7 | Potassium | 322 J | 1,170 J | mg/kg | 27SS017G0002 | 9/9 | - | 1,170 | No | NA | NA | No | NUT, BKG |
| 7440-23-5 | Sodium | 85.1 J | 773 J | mg/kg | 27SS063G0002 | 7/9 | 175 - 186 | 773 | Yes | NA | NA | No | NUT |
| 7440-24-6 | Strontium | 7.96 | 234 | mg/kg | 27SS063G0002 | 9/9 | - | 234 | Yes | 6,600 | 6600 N | No | BSL |
| 7440-66-6 | Zinc | 15.8 J | 60.2 J | mg/kg | 27SS063G0002 | 7/9 | 20.5 - 48.4 | 60.2 | Yes | 5,800 | NA | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
9 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SS009G0001
27SS013G0002
27SS014G0002
27SS015G0002
27SS016G0002
27SS017G0002
27SS018G0002
27SS058G0001
27SS063G0002

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 7-9**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | Adjusted USEPA RSL Residential Soil(5) | IDEM Residential Soil(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 12,600 | 15,000 | mg/kg | 27SB017G0406 | 4/4 | - | 15,000 | No | **7,700 N** | 100,000 L | No | BKG |
| 7440-39-3 | Barium | 53.9 | 116 | mg/kg | 27SB017G0204 | 4/4 | - | 116 | Yes | 1,500 N | 21,000 N | No | BSL |
| 7440-43-9 | Cadmium | 0.131 J | 0.19 J | mg/kg | 27SB018G0406 | 2/4 | 0.113 - 0.13 | 0.19 | No | 7 N | 98 N | No | BSL, BKG |
| 7440-47-3 | Chromium | 14.4 | 20.4 | mg/kg | 27SB018G0204 | 4/4 | - | 20.4 | No | **0.29 C(8)** | **4.1 C(8)** | No | BKG |
| 7440-50-8 | Copper | 11 | 14.9 | mg/kg | 27SB017G0406 | 4/4 | - | 14.9 | No | 310 N | 4,300 N | No | BSL, BKG |
| 7439-92-1 | Lead | 9.51 | 16.8 | mg/kg | 27SB018G0406 | 4/4 | - | 16.8 | No | 400 | 400 | No | BSL, BKG |
| 7439-95-4 | Magnesium | 1,570 | 2,030 | mg/kg | 27SB017G0406 | 4/4 | - | 2,030 | No | NA | NA | No | NUT, BKG |
| 7439-96-5 | Manganese | 189 J | 725 J | mg/kg | 27SB018G0406-D | 4/4 | - | 725 | No | **180 N** | 2,500 N | No | BKG |
| 7440-09-7 | Potassium | 538 J | 750 J | mg/kg | 27SB017G0204 | 4/4 | - | 750 | No | NA | NA | No | NUT, BKG |
| 7440-24-6 | Strontium | 9.43 J | 30.7 J | mg/kg | 27SB018G0204 | 4/4 | - | 30.7 | No | 4,700 N | 66,000 N | No | BSL, BKG |
| 7440-66-6 | Zinc | 22.5 J | 45 J | mg/kg | 27SB018G0406-D | 4/4 | - | 45 | No | 2,300 N | 32,000 N | No | BSL, BKG |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SB017G0204
27SB017G0406
27SB018G0204
27SB018G0406
27SB018G0406
27SB018G0406-D

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 7-10**

**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | USEPA RSL Protection of Groundwater(5) | IDEM Migration to Groundwater(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Metals** | | | | | | | | | | | | | |
| 7429-90-5 | Aluminum | 12,600 | 15,000 | mg/kg | 27SB017G0406 | 4/4 | - | 15,000 | No | 460,000 | 1,000,000 R | No | BSL, BKG |
| 7440-39-3 | Barium | 53.9 | 116 | mg/kg | 27SB017G0204 | 4/4 | - | 116 | Yes | 2,400 | 1,700 M | No | BSL |
| 7440-43-9 | Cadmium | 0.131 J | 0.19 J | mg/kg | 27SB018G0406 | 2/4 | 0.113 - 0.13 | 0.19 | No | 10 | 7.5 M | No | BSL, BKG |
| 7440-47-3 | Chromium | 14.4 | 20.4 | mg/kg | 27SB018G0204 | 4/4 | - | 20.4 | No | **0.012 (8)** | **0.12 C(8)** | No | BKG |
| 7440-50-8 | Copper | 11 | 14.9 | mg/kg | 27SB017G0406 | 4/4 | - | 14.9 | No | 440 | 920 M | No | BSL, BKG |
| 7439-92-1 | Lead | 9.51 | 16.8 | mg/kg | 27SB018G0406 | 4/4 | - | 16.8 | No | 280 (9) | 270 M | No | BSL, BKG |
| 7439-95-4 | Magnesium | 1,570 | 2,030 | mg/kg | 27SB017G0406 | 4/4 | - | 2,030 | No | NA | NA | No | NUT, BKG |
| 7439-96-5 | Manganese | 189 J | 725 J | mg/kg | 27SB018G0406-D | 4/4 | - | 725 | No | **420** | **420 N** | No | BKG |
| 7440-09-7 | Potassium | 538 J | 750 J | mg/kg | 27SB017G0204 | 4/4 | - | 750 | No | NA | NA | No | NUT, BKG |
| 7440-24-6 | Strontium | 9.43 J | 30.7 J | mg/kg | 27SB018G0204 | 4/4 | - | 30.7 | No | 6,600 | 6,600 N | No | BSL, BKG |
| 7440-66-6 | Zinc | 22.5 J | 45 J | mg/kg | 27SB018G0406-D | 4/4 | - | 45 | No | 5,800 | NA | No | BSL, BKG |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. Values are based on a dilution attenuation factor of 20.
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) migration to groundwater for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
9 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SB017G0204
27SB017G0406
27SB018G0204
27SB018G0406
27SB018G0406
27SB018G0406-D

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 7-11**

**CHEMICALS RETAINED AS COPCs**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| Chemical | IA1 | | | | | IA2 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Surface Soil | | Subsurface Soil | | Sumps/Pits | Surface Soil | | Subsurface Soil | |
| | Direct Contact | Soil to Groundwater | Direct Contact | Soil to Groundwater | Direct Contact | Direct Contact | Soil to Groundwater | Direct Contact | Soil to Groundwater |
| **Volatile Organic Compounds** | | | | | | | | | |
| Ethylbenzene | | | | | E, I | | | | |
| Methylene Chloride | | I | | | | | | | |
| Trichloroethene | | E | | E | | | | | |
| Vinyl Chloride | | | | E | | | | | |
| Total Xylenes | | | | | E, I | | | | |
| **Inorganics** | | | | | | | | | |
| Aluminum | E | | | | E | E | | | |
| Barium | E | I | | | | | | | |
| Cadmium | | | | | E, I | | | | |
| Chromium | E, I | E, I | E, I | E, I | E, I | | | | |
| Copper | | | | | E | | | | |
| Lead | | | | | E, I | | | | |
| Manganese | | | E | E, I | E, I | | | | |
| Zinc | | | | | E | | | | |
| **Miscellaneous Parameters** | | | | | | | | | |
| Cyanide | | | | | | | | | |

Notes
E - Chemical exceeded USEPA screening criteria and was retained as a COPC.
I - Chemical exceeded IDEM screening criteria and was retained as a COPC.

**TABLE 7-12**

**SELECTION OF EXPOSURE PATHWAYS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| 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/Future | Surface Soil | Surface Soil | SWMU 27 | Industrial Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Industrial workers may contact surface soil during normal work activities. |
| | | | | Construction Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Construction workers may contact surface soil during normal work activities. |
| | | Air | SWMU 27 | Industrial Worker | Adult | Inhalation | Quant | Industrial workers may be exposed to fugitive dust and volatile emissions during work activities. |
| | | | | Construction Worker | Adult | Inhalation | Quant | Construction workers may be exposed to fugitive dust and volatile emissions during construction activities. |
| | Subsurface Soil | Subsurface Soil | SWMU 27 | Industrial Worker | Adult | Ingestion<br>Dermal | None<br>None | Industrial workers are not expected to be exposed to subsurface soil. |
| | | | | Construction Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Construction workers may contact subsurface soil during normal work activities. |
| | | Air | SWMU 27 | Industrial Worker | Adult | Inhalation | None | Industrial workers are not expected to be exposed to subsurface soil. |
| | | | | Construction Worker | Adult | Inhalation | Quant | Construction workers may be exposed to fugitive dust and volatile emissions during construction activities. |
| Future | Surface Soil | Surface Soil | SWMU 27 | Residents | Child | Ingestion<br>Dermal | Quant<br>Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Ingestion<br>Dermal | Quant<br>Quant | |
| | | | | Recreational Users | Child | Ingestion<br>Dermal | Quant<br>Quant | A future child recreational user may be exposed to surface soil. |
| | | | | | Adult | Ingestion<br>Dermal | Quant<br>Quant | A future adult recreational user may be exposed to surface soil. |
| | | Air | SWMU 27 | Residents | Child | Inhalation | Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Inhalation | Quant | |
| | | | | Recreational Users | Child | Inhalation | Quant | Recreational users may be exposed to fugitive dust and volatile emissions while at the site. |
| | | | | | Adult | Inhalation | Quant | Recreational users may be exposed to fugitive dust and volatile emissions while at the site. |
| | Subsurface Soil | Subsurface Soil | SWMU 27 | Residents | Child | Inhalation | Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Inhalation | Quant | |
| | | | | Recreational Users | Child | Inhalation | Quant | A future child recreational user is not expected to be exposed to subsurface soil. |
| | | | | | Adult | Inhalation | Quant | A future adult recreational user is not expected to be exposed to subsurface soil. |

**TABLE 7-12**

**SELECTION OF EXPOSURE PATHWAYS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|---|---|---|---|---|---|---|---|---|
| Future | Subsurface Soil | Air | SWMU 27 | Residents | Child | Inhalation | Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Inhalation | Quant | |
| | | | | Recreational Users | Child | Inhalation | Quant | A future child recreational user is not expected to be exposed to subsurface soil. |
| | | | | | Adult | Inhalation | Quant | A future adult recreational user is not expected to be exposed to subsurface soil. |
| | Sumps/Pits | Sumps/Pits | SWMU 27 | Construction Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Construction workers may contact material in the sumps/pits if the sumps/pits are removed. |
| | | Air | SWMU 27 | Construction Worker | Adult | Inhalation | Quant | Construction workers may be exposed to fugitive dust and volatile emissions during excavation activities. |

Notes:
Quant - Quantitative.

**TABLE 7-13**

**RECEPTORS AND EXPOSURE ROUTES FOR QUANTITATIVE EVALUATION**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| Receptors | Exposure Routes |
|---|---|
| Construction Workers<br>(current/future land use) | • Soil incidental ingestion<br>• Soil dermal contact<br>• Inhalation of air/dust/emissions |
| Industrial Worker<br>(current/future land use) | • Soil incidental ingestion<br>• Soil dermal contact<br>• Inhalation of air/dust/emissions |
| Small Child (0 to 6 years) and<br>Adult Recreational Users<br>(future land use) | • Soil incidental ingestion<br>• Soil dermal contact<br>• Inhalation of air/dust/emissions |
| On-Base Residents (Adult/Children)<br>(future land use) | • Soil incidental ingestion<br>• Soil dermal contact<br>• Inhalation of air/dust/emissions |

**TABLE 7-14**

**EXPOSURE POINT CONCENTRATIONS - SURFACE AND SUBSURFACE SOIL**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| Chemical | Investigation Area 1 | | Investigation Area 2 | |
|---|---|---|---|---|
| | Surface Soil | Subsurface Soil | Surface Soil | Subsurface Soil |
| **Inorganics (mg/kg)** | | | | |
| Aluminum | 13,200[(1)] | NA | 15,060[(1)] | NA |
| Barium | 1,000[(2)] | NA | NA | NA |
| Chromium | 20[(3)] | 40[(3)] | NA | NA |
| Manganese | NA | 630[(1)] | NA | NA |

**Footnotes:**
1 - 95% Student's-t UCL
2 - 95% Chebyshev (Mean, Sd) UCL
3 - 95% Approximate Gamma UCL
ProUCL printouts are included in Appendix F.3.

**TABLE 7-15**

**EXPOSURE POINT CONCENTRATIONS - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

| Chemical | 27SB029 | 27SB030 | 27SB031 | 27SB032 | 27SB033 | 27SB034 | 27SB035 | 27SB056 | 27SB057 | 27SB066 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Volatile Organic Compounds (mg/kg)** | | | | | | | | | | |
| Ethylbenzene | 297 | NA | 1.85 | NA | 0.00397 | NA | 0.00181 | NA | NA | NA |
| Total Xylenes | 829 | NA | 3.3 | NA | 0.0171 | 0.0171 | 0.00527 | NA | NA | 0.051 |
| **Inorganics (mg/kg)** | | | | | | | | | | |
| Aluminum | 3,190 | 6,230 | 10,600 | 1,500 | 3,690 | 10,900 | 6,830 | 7,230 | 5,670 | 18,800 |
| Cadmium | 11.9 | 3.49 | 14.3 | NA | NA | 7.63 | 18.8 | 7.97 | 10.2 | 138 |
| Chromium | 240 | 18.9 | 56.7 | NA | NA | 39.5 | 13.8 | NA | NA | 656 |
| Copper | 277 | 498 | 1,200 | 2,420 | 154 | 168 | 63.4 | 233 | 515 | 765 |
| Lead | 597 | 266 | 738 | 1,570 | 396 | 221 | 442 | 1,270 | 840 | 6,100 |
| Manganese | 640 | 365 | 120,000 | 208,000 | 125,000 | 2,400 | 267 | 67,900 | 279,000 | 52 |
| Zinc | 4,580 | 2,530 | 6,410 | 18,900 | 12,400 | 2,120 | 824 | 7,240 | 3,250 | 7,010 |

**TABLE 7-16**

**SUMMARY OF EXPOSURE INPUT PARAMETERS**
**REASONABLE MAXIMUM EXPOSURES**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**

| Parameter Code | Exposure Parameter | Construction Worker | Industrial Worker | Child Recreational User | Adult Recreational User | On-Site Child Resident | On-Site Adult Resident |
|---|---|---|---|---|---|---|---|
| **All Exposures** | | | | | | | |
| $C_{soil}$ | Exposure concentration for soil (mg/kg) | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] |
| ED | Exposure Duration (years) | 1[2] | 25[3] | 6[3] | 24[3] | 6[3] | 24[3] |
| BW | Body Weight (kg) | 70[3] | 70[3] | 15[3] | 70[3] | 15[3] | 70[3] |
| AT-N | Averaging Time (Non-Cancer) (days) | 365[4] | 9,125[4] | 2,190[4] | 8,760[4] | 2,190[4] | 8,760[4] |
| AT-C | Averaging Time (Cancer) (days) | 25,550[4] | 25,550[4] | 25,550[4] | 25,550[4] | 25,550[4] | 25,550[4] |
| **Incidental Ingestion/Dermal Contact with Soil** | | | | | | | |
| IR | Ingestion Rate (mg/day) | 330[5] | 100[3] | 200[3] | 100[3] | 200[3] | 100[3] |
| EF | Exposure Frequency (days/year) | 150/45[6] | 250[3] | 52[7] | 52[7] | 350[3] | 350[3] |
| FI | Fraction Ingested (unitless) | 1[5] | 1[3] | 0.5[2] | 0.5[2] | 1[3] | 1[3] |
| SA | Skin Surface Available for Contact ($cm^2$) | 3,300[8] | 3,300[5,8] | 3,300[9] | 9,070[10] | 2,800[8] | 5,700[8] |
| AF | Soil to Skin Adherence Factor ($mg/cm^2$/event) | 0.3[8] | 0.2[5,8] | 0.2[8] | 0.07[8] | 0.2[8] | 0.07[8] |
| ABS | Absorption Factor (unitless) | chemical-specific[8] | chemical-specific[8] | chemical-specific[8] | chemical-specific[8] | chemical-specific[8] | chemical-specific[8] |
| CF | Conversion Factor (kg/mg) | 1E-06 | 1E-06 | 1E-06 | 1E-06 | 1E-06 | 1E-06 |
| **Inhalation Fugitive Dust/Volatile Emissions from Soil** | | | | | | | |
| $C_{air}$ | Exposure concentration for air ($mg/m^3$) | calculated[5] | calculated[5] | calculated[5] | calculated[5] | calculated[5] | calculated[5] |
| ET | Exposure Time (hours/day) | 8[11] | 8[11] | 4[2] | 4[2] | 24[12] | 24[12] |
| EF | Exposure Frequency (days/year) | 150/45[6] | 250[3] | 52[7] | 52[7] | 350[3] | 350[3] |
| PEF | Particulate Emission Factor ($m^3$/kg) | 1.34E+06[5] | 1.316E+09[5,13] | 1.316E+09[5,13] | 1.316E+09[5,13] | 1.316E+09[5,13] | 1.316E+09[5,13] |

**Notes:**
1 - U.S. EPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional judgment.
3 - U.S. EPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.
4 - U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
5 - U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
6 - Assumes a 30 week construction project over one year. Construction workers are assumed to be exposed to soils 150 days a year and the sump/pits 45 days a year.
7 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.
8 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
9 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.
10 - Assume that head, arms, hands, lower legs, and feet are exposed, U.S. EPA, 1997a.
11 - Assume an 8-hour work shift.
12 - U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
13 - IDEM RISC Technical Guide – January 31, 2006 Appendix 1 (Revised May 1, 2009).

**TABLE 7-17**

**SUMMARY OF EXPOSURE INPUT PARAMETERS**
**CENTRAL TENDENCY EXPOSURES**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**

| Parameter Code | Exposure Parameter | Construction Worker | Industrial Worker | Child Recreational User | Adult Recreational User | On-Site Child Resident | On-Site Adult Resident |
|---|---|---|---|---|---|---|---|
| **All Exposures** | | | | | | | |
| $C_{soil}$ | Exposure concentration for soil (mg/kg) | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] | Maximum or 95% UCL[1] |
| ED | Exposure Duration (years) | 1[2] | 9[3] | 2[3] | 7[3] | 2[3] | 7[3] |
| BW | Body Weight (kg) | 70[3] | 70[3] | 15[3] | 70[3] | 15[3] | 70[3] |
| AT-N | Averaging Time (Non-Cancer) (days) | 365[4] | 3,285[4] | 730[4] | 2,555[4] | 730[4] | 2,555[4] |
| AT-C | Averaging Time (Cancer) (days) | 25,550[4] | 25,550[4] | 25,550[4] | 25,550[4] | 25,550[4] | 25,550[4] |
| **Incidental Ingestion/Dermal Contact with Soil** | | | | | | | |
| IR | Ingestion Rate (mg/day) | 165[5] | 50[3] | 100[3] | 50[3] | 100[3] | 50[3] |
| EF | Exposure Frequency (days/year) | 75/23[5] | 219[3] | 26[6] | 26[6] | 234[3] | 234[3] |
| FI | Fraction Ingested (unitless) | 1[3] | 1[3] | 0.5[2] | 0.5[2] | 1[3] | 1[3] |
| SA | Skin Surface Available for Contact ($cm^2$) | 3,300[7] | 3,300[7] | 3,300[8] | 9,070[9] | 2,800[7] | 5,700[7] |
| AF | Soil to Skin Adherence Factor ($mg/cm^2$/event) | 0.1[7] | 0.02[7] | 0.04[7] | 0.01[7] | 0.04[7] | 0.01[7] |
| ABS | Absorption Factor (unitless) | chemical-specific[7] | chemical-specific[7] | chemical-specific[7] | chemical-specific[7] | chemical-specific[7] | chemical-specific[7] |
| CF | Conversion Factor (kg/mg) | 1E-06 | 1E-06 | 1E-06 | 1E-06 | 1E-06 | 1E-06 |
| **Inhalation Fugitive Dust/Volatile Emissions from Soil** | | | | | | | |
| $C_{air}$ | Exposure concentration for air ($mg/m^3$) | calculated[10] | calculated[10] | calculated[10] | calculated[10] | calculated[10] | calculated[10] |
| ET | Exposure Time (hours/day) | 8[11] | 8[11] | 2[2] | 2[2] | 24[12] | 24[12] |
| EF | Exposure Frequency (days/year) | 75/23[5] | 219[3] | 26[6] | 26[6] | 234[3] | 234[3] |
| PEF | Particulate Emission Factor ($m^3$/kg) | 1.34E+06[13] | 1.316E+09[13] | 1.316E+09[10,13] | 1.316E+09[10,13] | 1.316E+09[10,13] | 1.316E+09[10,13] |

**Notes:**
1 - U.S. EPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.
2 - Professional judgment.
3 - U.S. EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
4 - U.S. EPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.
5 - Central tendency exposure is assumed to be one-half the reasonable maximum exposure value. Construction workers are assumed to be exposed to soils 75 days a year and the sump/pits 23 days a year.
6 - Assume 2 days a week in warm weather months for RME and one day a week for CTE.
7 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. PA/540/R/99/005.
8 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.
9 - Assume that head, arms, hands, lower legs, and feet are exposed (U.S. EPA, 1997a).
10 - U.S. EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9365.4-24.
11 - Assume an 8-hour work shift.
12 - U.S. EPA, 1997: Exposure Factors Handbook. EPA/600/8-95/002FA.
13 - IDEM RISC Technical Guide – January 31, 2006 Appendix 1 (Revised May 1, 2009).

## TABLE 7-18

## NON-CANCER TOXICITY DATA -- ORAL/DERMAL
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD | | Oral Absorption Efficiency for Dermal[1] | Absorbed RfD for Dermal[2] | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfD:Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | | | | |
| Ethylbenzene | Chronic | 1.0E-01 | mg/kg/day | 1 | 1.0E-01 | mg/kg/day | Liver, Kidney | 1000/1 | IRIS | 8/20/2012 |
| Xylenes | Subchronic | 4.0E-01 | mg/kg/day | 1 | 4.0E-01 | mg/kg/day | Body Weight | 300/1 | PPRTV | 9/30/2009 |
| | Chronic | 2.0E-01 | mg/kg/day | 1 | 2.0E-01 | mg/kg/day | Body Weight | 1000/1 | IRIS | 8/20/2012 |
| **Metals** | | | | | | | | | | |
| Aluminum | Chronic | 1.0E+00 | mg/kg/day | 1 | 1.0E+00 | mg/kg/day | Central Nervous System | 100 | PPRTV | 10/23/2006 |
| Barium | Chronic | 2.0E-01 | mg/kg/day | 0.07 | 1.4E-02 | mg/kg/day | Kidney | 300/1 | IRIS | 8/20/2012 |
| Cadmium | Chronic | 5.0E-04 | mg/kg/day | 0.05 | 2.5E-05 | mg/kg/day | Kidney | 10/1 | IRIS | 8/20/2012 |
| Chromium[3] | Subchronic | 2.0E-02 | mg/kg/day | 0.025 | 5.0E-04 | mg/kg/day | None Reported | 100/1 | HEAST | 7/1997 |
| | Chronic | 3.0E-03 | mg/kg/day | 0.025 | 7.5E-05 | mg/kg/day | None Reported | 300/3 | IRIS | 8/20/2012 |
| Copper | Subchronic | 1.0E-02 | mg/kg/day | 1 | 1.0E-02 | mg/kg/day | Gastrointestinal System | 3/1 | ATSDR | 10/2004 |
| | Chronic | 4.0E-02 | mg/kg/day | 1 | 4.0E-02 | mg/kg/day | Gastrointestinal System | NA | HEAST | 7/1997 |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese[4] | Chronic | 2.4E-02 | mg/kg/day | 0.04 | 9.6E-04 | mg/kg/day | Central Nervous System | 1 | IRIS | 8/20/2012 |
| Zinc | Chronic | 3.0E-01 | mg/kg/day | 1 | 3.0E-01 | mg/kg/day | Blood | 3/1 | IRIS | 8/20/2012 |

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Values are for hexavalent chromium.

4 - Adjusted IRIS value in accordance with IRIS.

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not Available.

PPRTV = Provisional Peer Reviewed Toxicity Value.

## TABLE 7-19

## NON-CANCER TOXICITY DATA -- INHALATION
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Chronic/ Subchronic | Inhalation RfC | | Extrapolated RfD[1] | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfC : Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | | | |
| Ethylbenzene | Subchronic | 9.0E+00 | $mg/m^3$ | 2.6E+00 | (mg/kg/day) | Ear | 100/1 | PPRTV | 9/10/2009 |
| | Chronic | 1.0E+00 | $mg/m^3$ | 2.9E-01 | (mg/kg/day) | Developmental | 300/1 | IRIS | 8/20/2012 |
| Xylenes | Subchronic | 4.0E-01 | $mg/m^3$ | 1.1E-01 | (mg/kg/day) | Central Nervous System | 300/1 | PPRTV | 9/30/2009 |
| | Chronic | 1.0E-01 | $mg/m^3$ | 2.9E-02 | (mg/kg/day) | Central Nervous System | 1000/1 | IRIS | 8/20/2012 |
| **Metals** | | | | | | | | | |
| Aluminum | Chronic | 5.0E-03 | $mg/m^3$ | 1.4E-03 | (mg/kg/day) | Central Nervous System | 300/1 | PPRTV | 10/23/2006 |
| Barium | Subchronic | 5.0E-03 | $mg/m^3$ | 1.4E-03 | (mg/kg/day) | Fetotoxicity | 100/1 | HEAST | 7/1997 |
| | Chronic | 5.0E-04 | $mg/m^3$ | 1.4E-04 | (mg/kg/day) | Fetotoxicity | 1000/1 | HEAST | 7/1997 |
| Cadmium | Chronic | 2.0E-05 | mg/m3 | 5.7E-06 | (mg/kg/day) | Kidney, Respiratory | NA | Cal EPA | 9/2009 |
| Chromium[2] | Chronic | 1.0E-04 | $mg/m^3$ | 2.9E-05 | (mg/kg/day) | Respiratory | 300/1 | IRIS | 8/20/2012 |
| Copper | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | Chronic | 5.0E-05 | $mg/m^3$ | 1.4E-05 | (mg/kg/day) | Central Nervous System | 1000/1 | IRIS | 8/20/2012 |
| Zinc | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Notes:

1 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg

2 - Values are for hexavalent chromium.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not Applicable

## TABLE 7-20

## CANCER TOXICITY DATA -- ORAL/DERMAL
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Oral Cancer Slope Factor | | Oral Absorption Efficiency for Dermal[1] | Absorbed Cancer Slope Factor for Dermal[2] | | Weight of Evidence/ Cancer Guideline Description | Oral CSF | |
|---|---|---|---|---|---|---|---|---|
| | Value | Units | | Value | Units | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | | |
| Ethylbenzene | 1.1E-02 | $(mg/kg/day)^{-1}$ | 0.025 | 4.4E-01 | $(mg/kg/day)^{-1}$ | D (Not classifiable as to human carcinogenicity) | Cal EPA | 9/2009 |
| Xylenes | NA | NA | NA | NA | NA | Data are inadequate for an assessment of human carcinogenic potential | IRIS | 8/20/2012 |
| **Metals** | | | | | | | | |
| Aluminum | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | NA | NA | NA | NA | NA | Not likely to be carcinogenic to humans | IRIS | 8/20/2012 |
| Cadmium | NA | NA | NA | NA | NA | B1 /Known/likely human carcinogen. | IRIS | 8/20/2012 |
| Chromium[3,4] | 5.0E-01 | $(mg/kg/day)^{-1}$ | 0.025 | 2.0E+01 | $(mg/kg/day)^{-1}$ | Carcinogenic potential cannot be determined | NJDEP | 4/8/2009 |
| Copper | NA | NA | NA | NA | NA | D (Not classifiable as to human carcinogenicity) | IRIS | 8/20/2012 |
| Lead | NA | NA | NA | NA | NA | B2 / Probable human carcinogen | IRIS | 8/20/2012 |
| Manganese | NA | NA | NA | NA | NA | D (Not classifiable as to human carcinogenicity) | IRIS | 8/20/2012 |
| Zinc | NA | NA | NA | NA | NA | Inadequate information to assess carcinogenic potential | IRIS | 8/20/2012 |

Notes:
1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.
2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.
3 - Hexavalent chromium is considered to act via the mutagenic mode of action. This chemical is evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).
4 - Values are for hexavalent chromium.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.
IRIS = Integrated Risk Information System.
NA = Not Available.
NJDEP = New Jersey Department of Environmental Protection.

## TABLE 7-21

## CANCER TOXICITY DATA -- INHALATION
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Unit Risk | | Inhalation Cancer Slope Factor[1] | | Weight of Evidence/ Cancer Guideline Description | Unit Risk : Inhalation CSF | |
|---|---|---|---|---|---|---|---|
| | Value | Units | Value | Units | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | |
| Ethylbenzene | 2.5E-06 | $(ug/m^3)^{-1}$ | 8.8E-03 | $(mg/kg/day)^{-1}$ | D (Not classifiable as to human carcinogenicity) | Cal EPA | 9/2009 |
| Xylenes | NA | NA | NA | NA | Data are inadequate for an assessment of human carcinogenic potential | IRIS | 8/20/2012 |
| **Metals** | | | | | | | |
| Aluminum | NA | NA | NA | NA | NA | NA | NA |
| Barium | NA | NA | NA | NA | Carcinogenic potential cannot be determined | IRIS | 8/20/2012 |
| Cadmium | 1.8E-03 | $(ug/m^3)^{-1}$ | 6.3E+00 | $(mg/kg/day)^{-1}$ | B1 /Known/likely human carcinogen. | IRIS | 8/20/2012 |
| Chromium[2,3] | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.9E+02 | $(mg/kg/day)^{-1}$ | Known/likely human carcinogen | IRIS | 8/20/2012 |
| Copper | NA | NA | NA | NA | D / Not classifiable as to human carcinogenicity | IRIS | 8/20/2012 |
| Lead | NA | NA | NA | NA | B2 / Probable human carcinogen | IRIS | 8/20/2012 |
| Manganese | NA | NA | NA | NA | D / Not classifiable as to human carcinogenicity | IRIS | 8/20/2012 |
| Zinc | NA | NA | NA | NA | Inadequate information to assess carcinogenic potential | IRIS | 8/20/2012 |

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Hexavalent chromium is considered to act via the mutagenic mode of action. This chemical is evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

3 - Values are for hexavalent chromium.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System.

NA = Not Available.

**TABLE 7-22**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 3E-07 | -- | -- | -- | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-06 | -- | -- | Chromium | 0.3 | -- |
| | | Total | 3E-06 | -- | -- | Chromium | 0.3 | -- |
| | Subsurface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.05 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 5E-06 | -- | -- | Chromium | 1 | -- |
| | | Total | 5E-06 | -- | -- | Chromium | 1 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 3E-06 | -- | -- | Chromium | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.0008 | -- |
| | | Total | 4E-06 | -- | -- | Chromium | 0.03 | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-06 | -- | -- | Chromium | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-07 | -- | -- | -- | 0.002 | -- |
| | | Total | 7E-06 | -- | -- | Chromium | 0.04 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 4E-06 | -- | -- | Chromium | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-08 | -- | -- | -- | 0.00009 | -- |
| | | Total | 4E-06 | -- | -- | Chromium | 0.02 | -- |
| | Subsurface Soil | Incidental Ingestion | 9E-06 | -- | -- | Chromium | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | 0.0002 | -- |
| | | Total | 9E-06 | -- | -- | Chromium | 0.04 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.003 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-08 | -- | -- | -- | 0.00009 | -- |
| | | Total | 7E-07 | -- | -- | -- | 0.003 | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-06 | -- | -- | -- | 0.004 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 4E-08 | -- | -- | -- | 0.0002 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.004 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 5E-06 | -- | -- | Chromium | -- | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | -- | -- |
| | | Total | 5E-06 | -- | -- | Chromium | -- | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-05 | -- | -- | Chromium | -- | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 7E-08 | -- | -- | -- | -- | -- |
| | | Total | 1E-05 | -- | -- | Chromium | -- | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 6E-05 | -- | Chromium | -- | 0.3 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 6E-07 | -- | -- | -- | 0.004 | -- |
| | | Total | 6E-05 | -- | Chromium | -- | 0.3 | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-04 | -- | Chromium | -- | 0.5 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | 0.009 | -- |
| | | Total | 1E-04 | -- | Chromium | -- | 0.5 | -- |

**TABLE 7-22**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 9E-06 | -- | -- | Chromium | 0.03 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 8E-07 | -- | -- | -- | 0.004 | -- |
| | | Total | 9E-06 | -- | -- | Chromium | 0.04 | -- |
| | Subsurface Soil | Incidental Ingestion | 2E-05 | -- | Chromium | -- | 0.05 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-06 | -- | -- | Chromium | 0.009 | -- |
| | | Total | 2E-05 | -- | Chromium | -- | 0.06 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 7E-05 | -- | Chromium | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | NA | -- |
| | | Total | 7E-05 | -- | Chromium | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-04 | -- | Chromium | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-06 | -- | -- | Chromium | NA | -- |
| | | Total | 1E-04 | -- | Chromium | -- | NA | -- |

**TABLE 7-23**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 7E-08 | -- | -- | -- | 0.009 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | 0.2 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.2 | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-06 | -- | -- | Chromium | 0.7 | -- |
| | | Total | 3E-06 | -- | -- | Chromium | 0.7 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | 0.0007 | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.01 | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-06 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 7E-08 | -- | -- | -- | 0.002 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.02 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00002 | -- |
| | | Total | 4E-07 | -- | -- | -- | 0.006 | -- |
| | Subsurface Soil | Incidental Ingestion | 9E-07 | -- | -- | -- | 0.009 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-09 | -- | -- | -- | 0.00006 | -- |
| | | Total | 9E-07 | -- | -- | -- | 0.009 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 4E-08 | -- | -- | -- | 0.0006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00002 | -- |
| | | Total | 4E-08 | -- | -- | -- | 0.0007 | -- |
| | Subsurface Soil | Incidental Ingestion | 8E-08 | -- | -- | -- | 0.001 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-09 | -- | -- | -- | 0.00006 | -- |
| | | Total | 8E-08 | -- | -- | -- | 0.001 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 5E-07 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 3E-09 | -- | -- | -- | -- | -- |
| | | Total | 5E-07 | -- | -- | -- | -- | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-06 | -- | -- | -- | -- | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 5E-09 | -- | -- | -- | -- | -- |
| | | Total | 1E-06 | -- | -- | -- | -- | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 8E-06 | -- | -- | Chromium | 0.1 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-07 | -- | -- | -- | 0.002 | -- |
| | | Total | 8E-06 | -- | -- | Chromium | 0.1 | -- |
| | Subsurface Soil | Incidental Ingestion | 2E-05 | -- | Chromium | -- | 0.2 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | 0.006 | -- |
| | | Total | 2E-05 | -- | Chromium | -- | 0.2 | -- |

**TABLE 7-23**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 7E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.002 | -- |
| | | Total | 8E-07 | -- | -- | -- | 0.01 | -- |
| | Subsurface Soil | Incidental Ingestion | 1E-06 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | 0.006 | -- |
| | | Total | 2E-06 | -- | -- | Chromium | 0.02 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 9E-06 | -- | -- | Chromium | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | NA | -- |
| | | Total | 9E-06 | -- | -- | Chromium | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 2E-05 | -- | Chromium | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 6E-07 | -- | -- | -- | NA | -- |
| | | Total | 2E-05 | -- | Chromium | -- | NA | -- |

**TABLE 7-24**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - INVESTIGATION AREA 1 - SUMPS/PITS**
**REASONABLE MAXIMUM EXPOSURES**
**NSA CRANE, CRANE, INDIANA**

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | 27SB029 | Incidental Ingestion | 1E-06 | -- | -- | -- | 0.06 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0008 | -- |
| | | Inhalation | 8E-08 | -- | -- | -- | 0.02 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.08 | -- |
| | 27SB030 | Incidental Ingestion | 8E-08 | -- | -- | -- | 0.05 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0002 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0 | -- |
| | | Total | 8E-08 | -- | -- | -- | 0.05 | -- |
| | 27SB031 | Incidental Ingestion | 2E-07 | -- | -- | -- | 3 | Manganese |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0010 | -- |
| | | Inhalation | 3E-09 | -- | -- | -- | 0.08 | -- |
| | | Total | 2E-07 | -- | -- | -- | 3 | Manganese |
| | 27SB032 | Incidental Ingestion | 0E+00 | -- | -- | -- | 5 | Manganese |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.1 | -- |
| | | Total | 0E+00 | -- | -- | -- | 5 | Manganese |
| | 27SB033 | Incidental Ingestion | 4E-13 | -- | -- | -- | 3 | Manganese |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-12 | -- | -- | -- | 0.08 | -- |
| | | Total | 4E-13 | -- | -- | -- | 3 | Manganese |
| | 27SB034 | Incidental Ingestion | 2E-07 | -- | -- | -- | 0.08 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0005 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.002 | -- |
| | | Total | 2E-07 | -- | -- | -- | 0.08 | -- |
| | 27SB035 | Incidental Ingestion | 6E-08 | -- | -- | -- | 0.03 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.001 | -- |
| | | Inhalation | 5E-10 | -- | -- | -- | 0.0002 | -- |
| | | Total | 6E-08 | -- | -- | -- | 0.03 | -- |
| | 27SB056 | Incidental Ingestion | 0E+00 | -- | -- | -- | 2 | Manganese |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0006 | -- |
| | | Inhalation | 6E-12 | -- | -- | -- | 0.04 | -- |
| | | Total | 6E-12 | -- | -- | -- | 2 | Manganese |
| | 27SB057 | Incidental Ingestion | 0E+00 | -- | -- | -- | 7 | Manganese |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0007 | -- |
| | | Inhalation | 8E-12 | -- | -- | -- | 0.2 | -- |
| | | Total | 8E-12 | -- | -- | -- | 7 | Manganese |
| | 27SB066 | Incidental Ingestion | 3E-06 | -- | -- | Chromium | 0.2 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.010 | -- |
| | | Inhalation | 2E-08 | -- | -- | -- | 0.0006 | -- |
| | | Total | 3E-06 | -- | -- | Chromium | 0.2 | -- |

**TABLE 7-25**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - INVESTIGATION AREA 1 - SUMPS/PITS**
**CENTRAL TENDENCY EXPOSURES**
**NSA CRANE, CRANE, INDIANA**

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | 27SB029 | Incidental Ingestion | 3E-07 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0001 | -- |
| | | Inhalation | 4E-08 | -- | -- | -- | 0.009 | -- |
| | | Total | 3E-07 | -- | -- | -- | 0.02 | -- |
| | 27SB030 | Incidental Ingestion | 2E-08 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00004 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0 | -- |
| | | Total | 2E-08 | -- | -- | -- | 0.01 | -- |
| | 27SB031 | Incidental Ingestion | 6E-08 | -- | -- | -- | 0.8 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0002 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.04 | -- |
| | | Total | 6E-08 | -- | -- | -- | 0.8 | -- |
| | 27SB032 | Incidental Ingestion | 0E+00 | -- | -- | -- | 1 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.07 | -- |
| | | Total | 0E+00 | -- | -- | -- | 1 | -- |
| | 27SB033 | Incidental Ingestion | 9E-14 | -- | -- | -- | 0.8 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 5E-13 | -- | -- | -- | 0.04 | -- |
| | | Total | 9E-14 | -- | -- | -- | 0.8 | -- |
| | 27SB034 | Incidental Ingestion | 4E-08 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00009 | -- |
| | | Inhalation | 8E-10 | -- | -- | -- | 0.0008 | -- |
| | | Total | 4E-08 | -- | -- | -- | 0.02 | -- |
| | 27SB035 | Incidental Ingestion | 1E-08 | -- | -- | -- | 0.007 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0002 | -- |
| | | Inhalation | 3E-10 | -- | -- | -- | 0.0001 | -- |
| | | Total | 1E-08 | -- | -- | -- | 0.007 | -- |
| | 27SB056 | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.4 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00009 | -- |
| | | Inhalation | 3E-12 | -- | -- | -- | 0.02 | -- |
| | | Total | 3E-12 | -- | -- | -- | 0.5 | -- |
| | 27SB057 | Incidental Ingestion | 0E+00 | -- | -- | -- | 2 | Manganese |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0001 | -- |
| | | Inhalation | 4E-12 | -- | -- | -- | 0.09 | -- |
| | | Total | 4E-12 | -- | -- | -- | 2 | Manganese |
| | 27SB066 | Incidental Ingestion | 7E-07 | -- | -- | -- | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Inhalation | 1E-08 | -- | -- | -- | 0.0003 | -- |
| | | Total | 7E-07 | -- | -- | -- | 0.05 | -- |

**TABLE 7-26**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.03 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.3 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.3 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.0005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.02 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.01 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.002 | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.2 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.2 | -- |
| Adult Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.02 | -- |

**TABLE 7-27**

**SUMMARY OF CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.007 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.2 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.2 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.0005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.007 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.004 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.004 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.0004 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.0004 | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.06 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.07 | -- |
| Adult Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.007 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | -- | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.01 | -- |

**TABLE 7-28**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 6E-08 | -- | -- | -- | 0.009 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | 0.5 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.5 | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-08 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | 0.9 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.9 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 5E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | 0.001 | -- |
| | | Total | 5E-07 | -- | -- | -- | 0.01 | -- |
| | Subsurface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | 0.003 | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.02 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00004 | -- |
| | | Total | 4E-07 | -- | -- | -- | 0.006 | -- |
| | Subsurface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00008 | -- |
| | | Total | 5E-07 | -- | -- | -- | 0.01 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 4E-08 | -- | -- | -- | 0.0006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00004 | -- |
| | | Total | 4E-08 | -- | -- | -- | 0.0007 | -- |
| | Subsurface Soil | Incidental Ingestion | 4E-08 | -- | -- | -- | 0.001 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00008 | -- |
| | | Total | 4E-08 | -- | -- | -- | 0.001 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 2E-09 | -- | -- | -- | NA | -- |
| | | Total | 4E-07 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 5E-07 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-09 | -- | -- | -- | NA | -- |
| | | Total | 5E-07 | -- | -- | -- | NA | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 7E-06 | -- | -- | Chromium | 0.1 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.004 | -- |
| | | Total | 7E-06 | -- | -- | Chromium | 0.1 | -- |
| | Subsurface Soil | Incidental Ingestion | 8E-06 | -- | -- | Chromium | 0.2 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-07 | -- | -- | -- | 0.009 | -- |
| | | Total | 8E-06 | -- | -- | Chromium | 0.2 | -- |

**TABLE 7-28**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.004 | -- |
| | | Total | 8E-07 | -- | -- | -- | 0.02 | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-07 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.009 | -- |
| | | Total | 9E-07 | -- | -- | -- | 0.03 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 8E-06 | -- | -- | Chromium | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | NA | -- |
| | | Total | 8E-06 | -- | -- | Chromium | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 9E-06 | -- | -- | Chromium | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | NA | -- |
| | | Total | 9E-06 | -- | -- | Chromium | NA | -- |

**TABLE 7-29**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**



| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.1 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0006 | -- |
| | | Inhalation | 7E-09 | -- | -- | -- | 4 | Manganese |
| | | Total | 7E-09 | -- | -- | -- | 4 | Manganese |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.03 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.3 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.3 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.08 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0006 | -- |
| | | Inhalation | 3E-10 | -- | -- | -- | 0.006 | -- |
| | | Total | 3E-10 | -- | -- | -- | 0.08 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.0005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.01 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.07 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0006 | -- |
| | | Inhalation | 7E-12 | -- | -- | -- | 0.0006 | -- |
| | | Total | 7E-12 | -- | -- | -- | 0.07 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.01 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.008 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0001 | -- |
| | | Inhalation | 3E-11 | -- | -- | -- | 0.0006 | -- |
| | | Total | 3E-11 | -- | -- | -- | 0.009 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00005 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.002 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-11 | -- | -- | -- | NA | -- |
| | | Total | 3E-11 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | NA | -- |
| | | Total | 0E+00 | -- | -- | -- | NA | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 1.0 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.004 | -- |
| | | Inhalation | 3E-10 | -- | -- | -- | 0.03 | -- |
| | | Total | 3E-10 | -- | -- | -- | 1 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.2 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.2 | -- |

**TABLE 7-29**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**



| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks $> 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-5}$ and $\leq 10^{-4}$ | Chemicals with Cancer Risks $> 10^{-6}$ and $\leq 10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.1 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0005 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.03 | -- |
| | | Total | 1E-09 | -- | -- | -- | 0.1 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.02 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | NA | -- |
| | | Total | 1E-09 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | NA | -- |
| | | Total | 0E+00 | -- | -- | -- | NA | -- |

**TABLE 7-30**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**



| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00010 | -- |
| | | Inhalation | 3E-09 | -- | -- | -- | 2 | Manganese |
| | | Total | 3E-09 | -- | -- | -- | 2 | Manganese |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.007 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.2 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.2 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.03 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00006 | -- |
| | | Inhalation | 9E-11 | -- | -- | -- | 0.005 | -- |
| | | Total | 9E-11 | -- | -- | -- | 0.04 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.0004 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.007 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00006 | -- |
| | | Inhalation | 6E-13 | -- | -- | -- | 0.0002 | -- |
| | | Total | 6E-13 | -- | -- | -- | 0.02 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.004 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.004 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.002 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.000009 | -- |
| | | Inhalation | 2E-12 | -- | -- | -- | 0.0002 | -- |
| | | Total | 2E-12 | -- | -- | -- | 0.002 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.0004 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.00001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.0004 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-12 | -- | -- | -- | NA | -- |
| | | Total | 3E-12 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | NA | -- |
| | | Total | 0E+00 | -- | -- | -- | NA | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.3 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.0005 | -- |
| | | Inhalation | 6E-11 | -- | -- | -- | 0.02 | -- |
| | | Total | 6E-11 | -- | -- | -- | 0.3 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.06 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.06 | -- |

**TABLE 7-30**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0.00005 | -- |
| | | Inhalation | 2E-10 | -- | -- | -- | 0.02 | -- |
| | | Total | 2E-10 | -- | -- | -- | 0.05 | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | 0.007 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | 0.001 | -- |
| | | Total | 0E+00 | -- | -- | -- | 0.008 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-10 | -- | -- | -- | NA | -- |
| | | Total | 3E-10 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 0E+00 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 0E+00 | -- | -- | -- | NA | -- |
| | | Total | 0E+00 | -- | -- | -- | NA | -- |

**TABLE 7-31**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 2E-07 | -- | -- | -- | 0.04 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-06 | -- | -- | Chromium | 0.9 | -- |
| | | Total | 2E-06 | -- | -- | Chromium | 1 | -- |
| | Subsurface Soil | Incidental Ingestion | 3E-07 | -- | -- | -- | 0.09 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-06 | -- | -- | Chromium | 2 | Aluminum, Manganese |
| | | Total | 3E-06 | -- | -- | Chromium | 2 | Aluminum, Manganese |
| Industrial Workers | Surface Soil | Incidental Ingestion | 3E-06 | -- | -- | Chromium | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 9E-08 | -- | -- | -- | 0.002 | -- |
| | | Total | 3E-06 | -- | -- | Chromium | 0.03 | -- |
| | Subsurface Soil | Incidental Ingestion | 4E-06 | -- | -- | Chromium | 0.05 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.003 | -- |
| | | Total | 4E-06 | -- | -- | Chromium | 0.05 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 4E-06 | -- | -- | Chromium | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-08 | -- | -- | -- | 0.0002 | -- |
| | | Total | 4E-06 | -- | -- | Chromium | 0.02 | -- |
| | Subsurface Soil | Incidental Ingestion | 4E-06 | -- | -- | Chromium | 0.05 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-08 | -- | -- | -- | 0.0003 | -- |
| | | Total | 4E-06 | -- | -- | Chromium | 0.05 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.002 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-08 | -- | -- | -- | 0.0002 | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.003 | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-07 | -- | -- | -- | 0.005 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-08 | -- | -- | -- | 0.0003 | -- |
| | | Total | 7E-07 | -- | -- | -- | 0.006 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 4E-06 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | NA | -- |
| | | Total | 5E-06 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 5E-06 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | NA | -- |
| | | Total | 5E-06 | -- | -- | -- | NA | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 5E-05 | -- | Chromium | -- | 0.3 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 5E-07 | -- | -- | -- | 0.007 | -- |
| | | Total | 5E-05 | -- | Chromium | -- | 0.3 | -- |
| | Subsurface Soil | Incidental Ingestion | 6E-05 | -- | Chromium | -- | 0.7 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 6E-07 | -- | -- | -- | 0.01 | -- |
| | | Total | 6E-05 | -- | Chromium | -- | 0.7 | -- |

**TABLE 7-31**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 8E-06 | -- | -- | Chromium | 0.03 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 7E-07 | -- | -- | -- | 0.007 | -- |
| | | Total | 8E-06 | -- | -- | Chromium | 0.04 | -- |
| | Subsurface Soil | Incidental Ingestion | 9E-06 | -- | -- | Chromium | 0.07 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 8E-07 | -- | -- | -- | 0.01 | -- |
| | | Total | 1E-05 | -- | -- | Chromium | 0.08 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 6E-05 | -- | Chromium | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | NA | -- |
| | | Total | 6E-05 | -- | Chromium | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-05 | -- | Chromium | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | NA | -- |
| | | Total | 7E-05 | -- | Chromium | -- | NA | -- |

**TABLE 7-32**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**

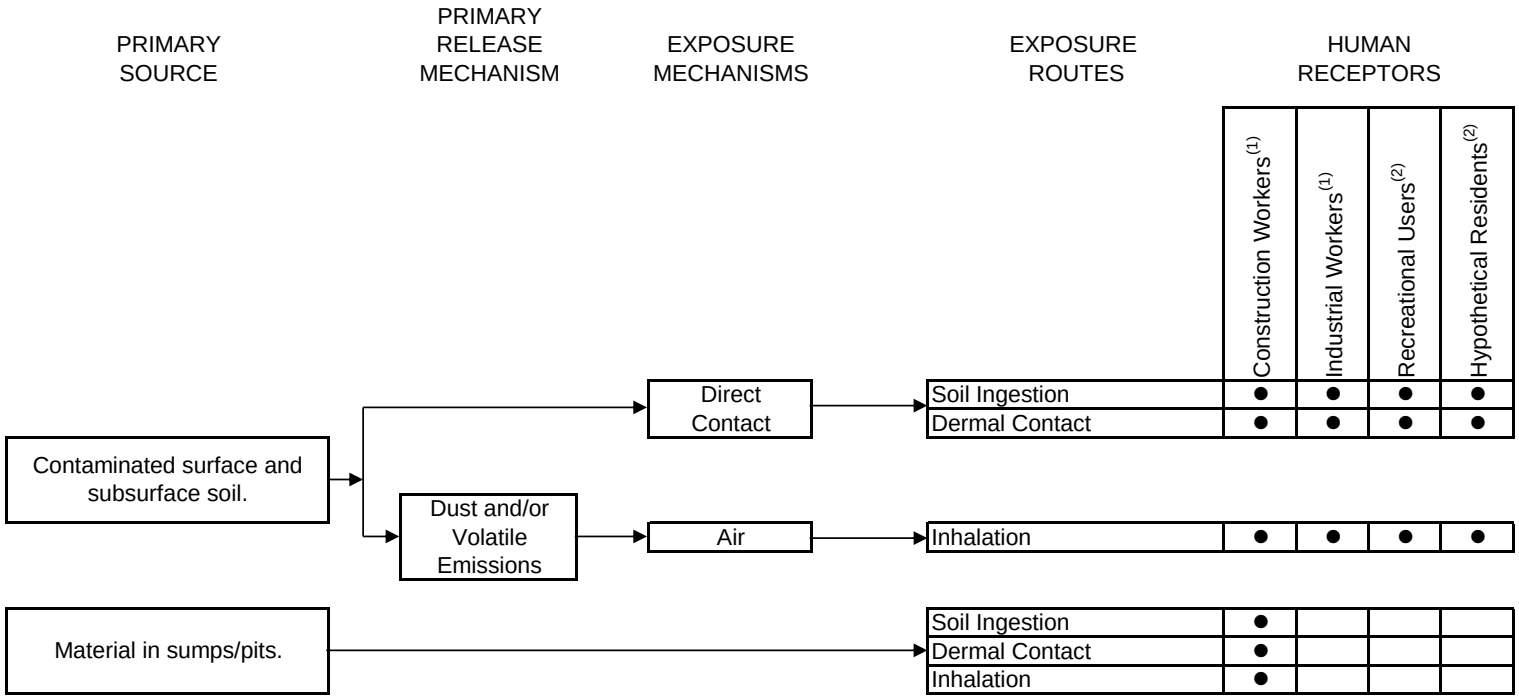

| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Construction Workers | Surface Soil | Incidental Ingestion | 6E-08 | -- | -- | -- | 0.009 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | 0.5 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.5 | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-08 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-06 | -- | -- | -- | 0.9 | -- |
| | | Total | 1E-06 | -- | -- | -- | 0.9 | -- |
| Industrial Workers | Surface Soil | Incidental Ingestion | 5E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | 0.001 | -- |
| | | Total | 5E-07 | -- | -- | -- | 0.01 | -- |
| | Subsurface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 3E-08 | -- | -- | -- | 0.003 | -- |
| | | Total | 6E-07 | -- | -- | -- | 0.02 | -- |
| Child Recreational Users | Surface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00004 | -- |
| | | Total | 4E-07 | -- | -- | -- | 0.006 | -- |
| | Subsurface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00008 | -- |
| | | Total | 5E-07 | -- | -- | -- | 0.01 | -- |
| Adult Recreational Users | Surface Soil | Incidental Ingestion | 4E-08 | -- | -- | -- | 0.0006 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00004 | -- |
| | | Total | 4E-08 | -- | -- | -- | 0.0007 | -- |
| | Subsurface Soil | Incidental Ingestion | 4E-08 | -- | -- | -- | 0.001 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-09 | -- | -- | -- | 0.00008 | -- |
| | | Total | 4E-08 | -- | -- | -- | 0.001 | -- |
| Lifelong Recreational Users | Surface Soil | Incidental Ingestion | 4E-07 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 2E-09 | -- | -- | -- | NA | -- |
| | | Total | 4E-07 | -- | -- | -- | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 5E-07 | -- | -- | -- | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-09 | -- | -- | -- | NA | -- |
| | | Total | 5E-07 | -- | -- | -- | NA | -- |
| Child Residents | Surface Soil | Incidental Ingestion | 7E-06 | -- | -- | Chromium | 0.1 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.004 | -- |
| | | Total | 7E-06 | -- | -- | Chromium | 0.1 | -- |
| | Subsurface Soil | Incidental Ingestion | 8E-06 | -- | -- | Chromium | 0.2 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 2E-07 | -- | -- | -- | 0.009 | -- |
| | | Total | 8E-06 | -- | -- | Chromium | 0.2 | -- |

**TABLE 7-32**

**SUMMARY OF BACKGROUND CANCER RISKS AND HAZARD INDICES - CENTRAL TENDENCY EXPOSURES - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE INDIANA**


| Receptor | Media | Exposure Route | Cancer Risk | Chemicals with Cancer Risks > $10^{-4}$ | Chemicals with Cancer Risks > $10^{-5}$ and ≤ $10^{-4}$ | Chemicals with Cancer Risks > $10^{-6}$ and ≤ $10^{-5}$ | Hazard Index | Chemicals Contributing to an Target Organ HI > 1 |
|---|---|---|---|---|---|---|---|---|
| Adult Residents | Surface Soil | Incidental Ingestion | 6E-07 | -- | -- | -- | 0.01 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.004 | -- |
| | | Total | 8E-07 | -- | -- | -- | 0.02 | -- |
| | Subsurface Soil | Incidental Ingestion | 7E-07 | -- | -- | -- | 0.02 | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | 0 | -- |
| | | Inhalation | 1E-07 | -- | -- | -- | 0.009 | -- |
| | | Total | 9E-07 | -- | -- | -- | 0.03 | -- |
| Lifelong Residents | Surface Soil | Incidental Ingestion | 8E-06 | -- | -- | Chromium | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | NA | -- |
| | | Total | 8E-06 | -- | -- | Chromium | NA | -- |
| | Subsurface Soil | Incidental Ingestion | 9E-06 | -- | -- | Chromium | NA | -- |
| | | Dermal Contact | 0E+00 | -- | -- | -- | NA | -- |
| | | Inhalation | 3E-07 | -- | -- | -- | NA | -- |
| | | Total | 9E-06 | -- | -- | Chromium | NA | -- |

**FIGURE 7-1**
**CONCEPTUAL SITE MODEL**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**




LEGEND
● = Complete exposure pathway.

KEY
1 Potential receptor under current and future site use.

2 Recreational/Residential development of SWMU 27 is not anticipated. Evaluated for risk management decision-making purposes only.

**FIGURE 7-2**
**SUMMARY OF HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES**
**INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

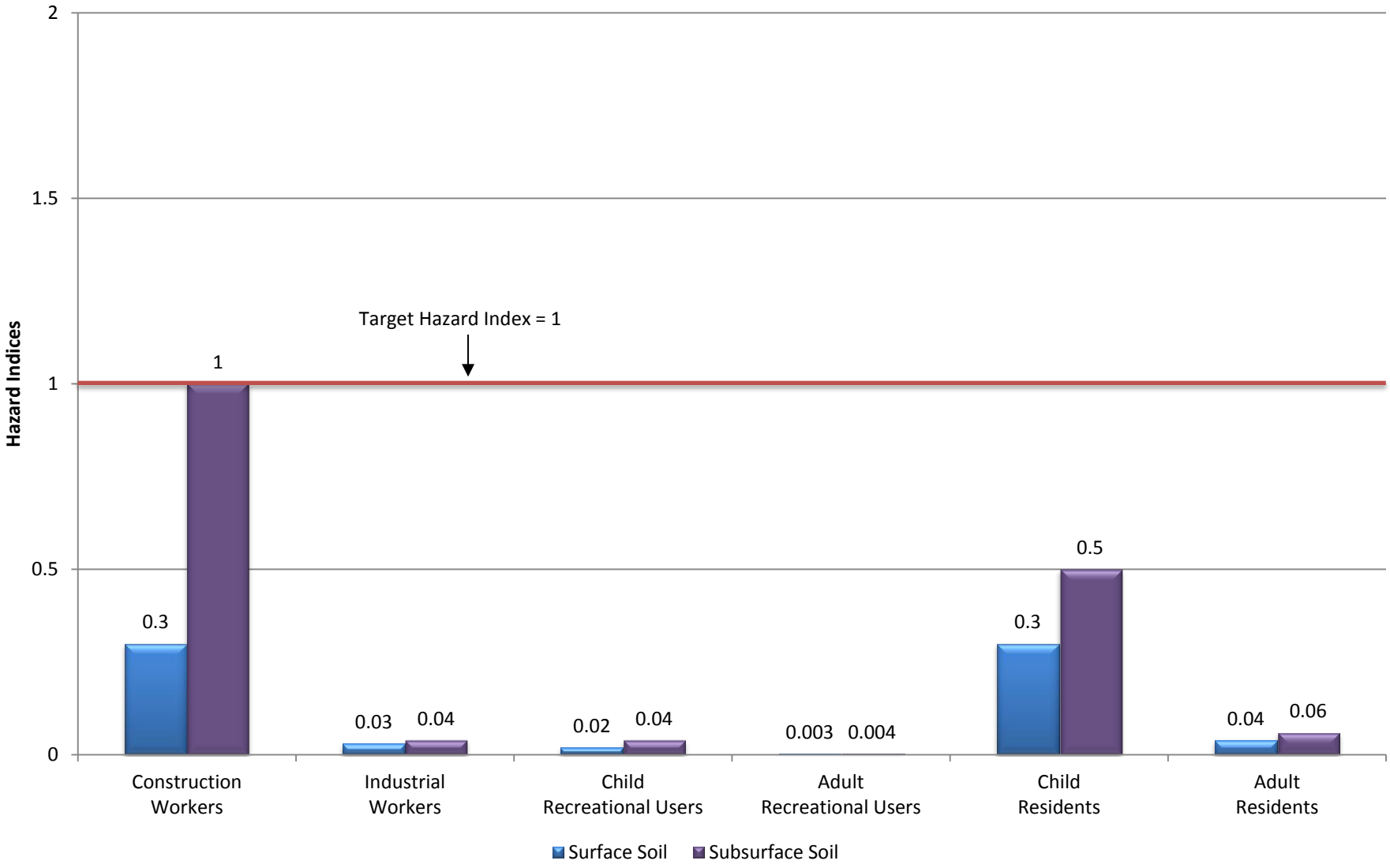


**FIGURE 7-3**
**SUMMARY OF HAZARD INDICES - CENTRAL TENDENCY EXPOSURES**
**INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

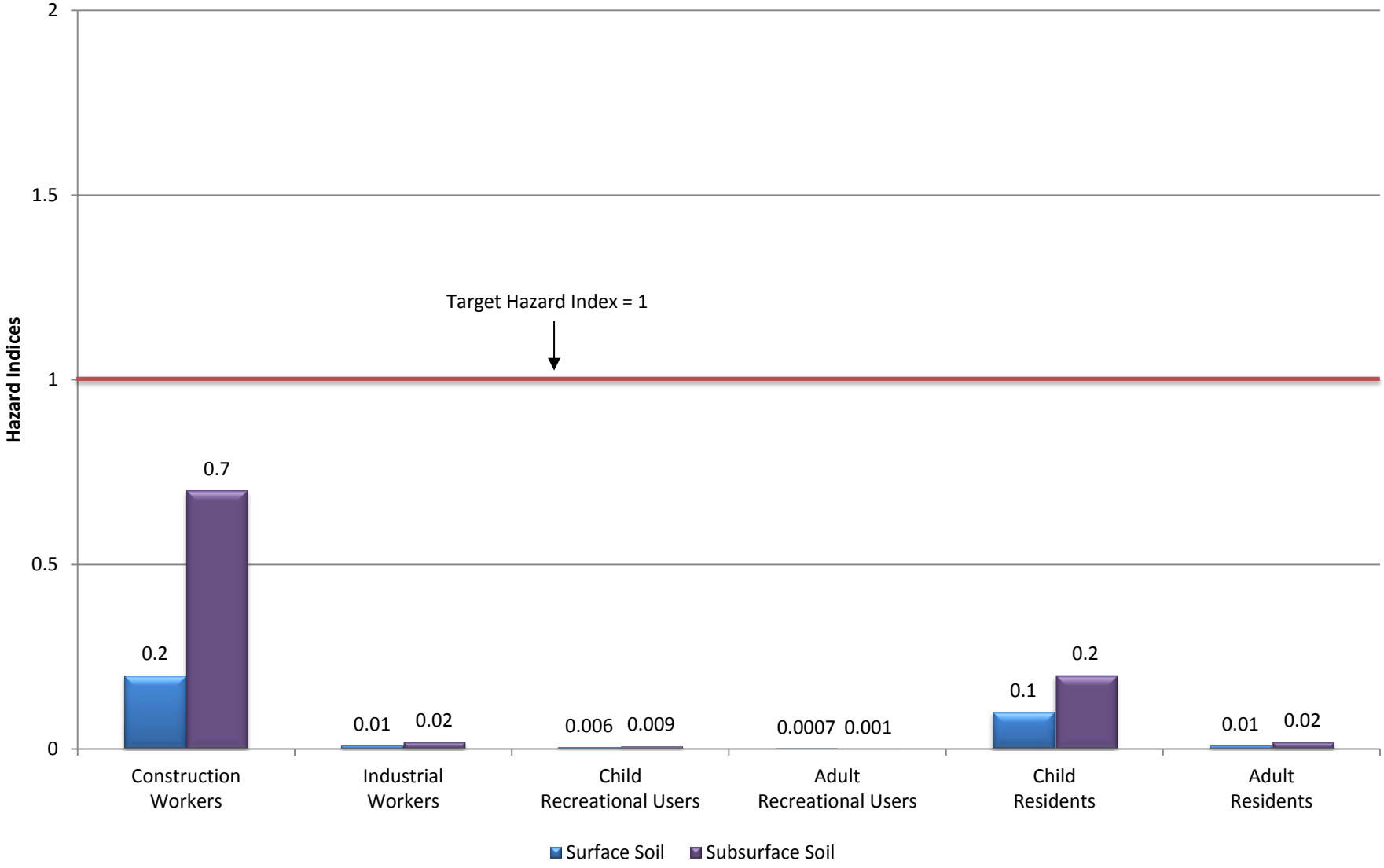


**FIGURE 7-4**
**SUMMARY OF CANCER RISKS - REASONABLE MAXIMUM EXPOSURES**
**INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

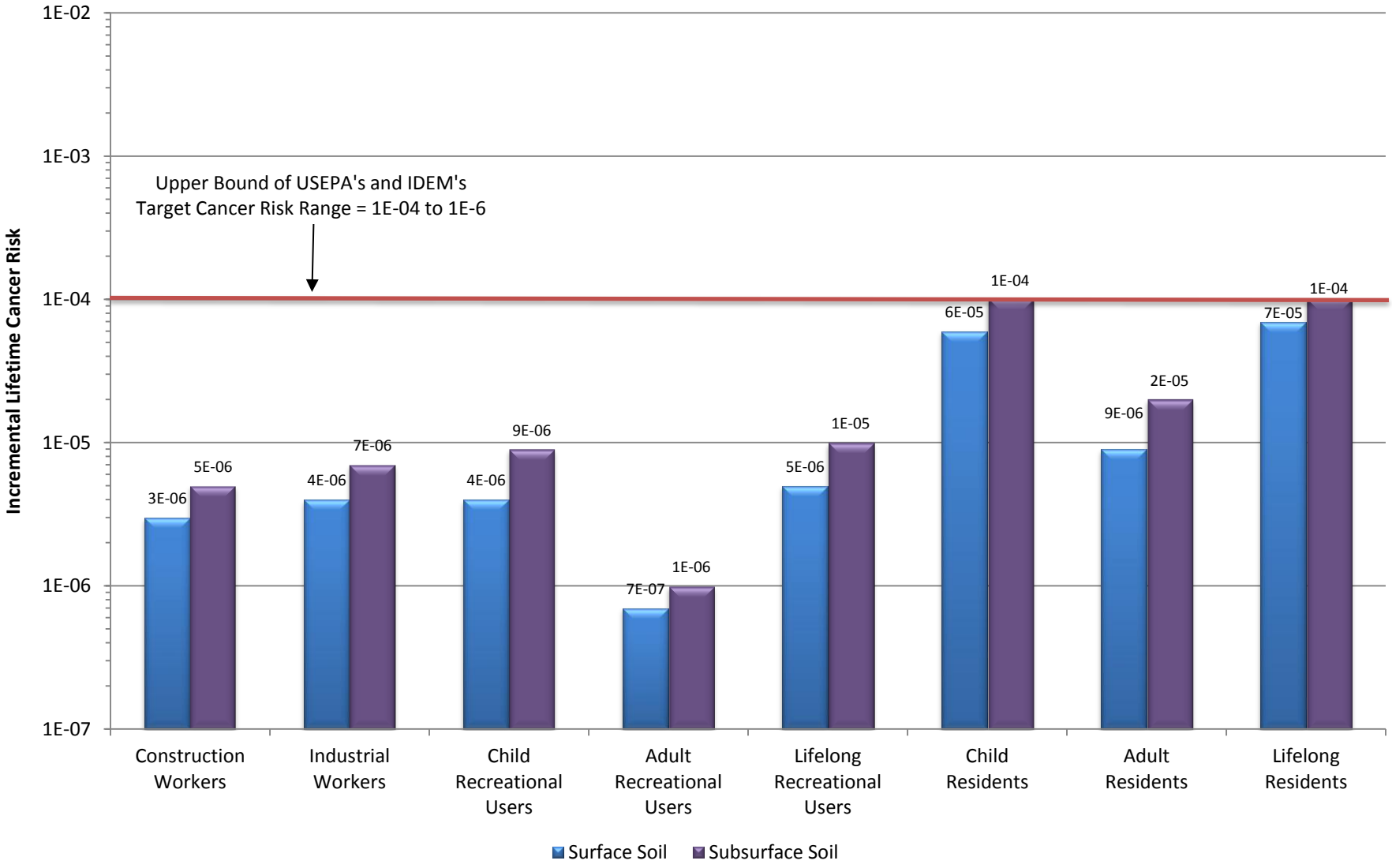


**FIGURE 7-5**
**SUMMARY OF CANCER RISKS - CENTRAL TENDENCY EXPOSURES**
**INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

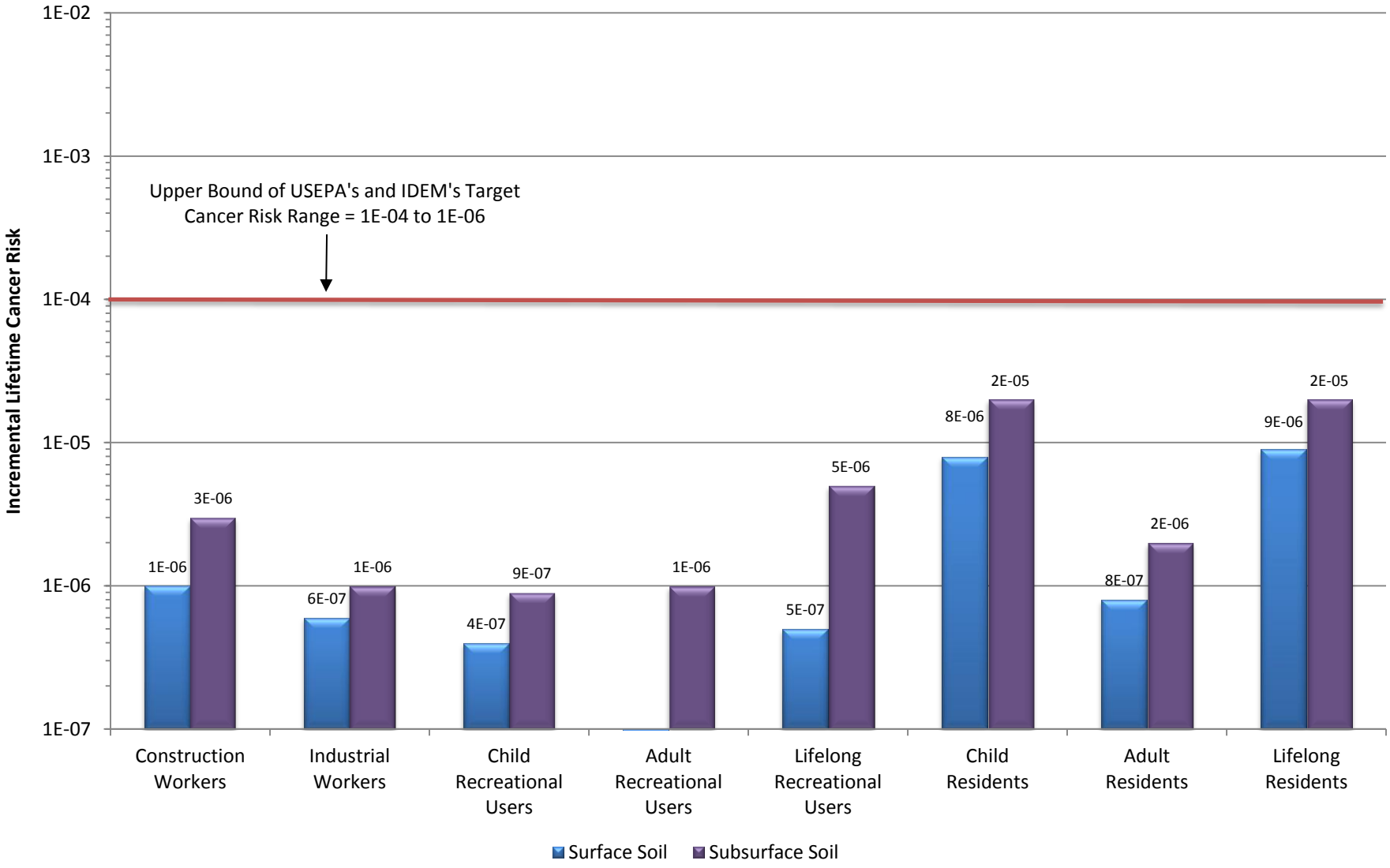


**FIGURE 7-6**
**SUMMARY OF HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES**
**INVESTIGATION AREA 1 - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

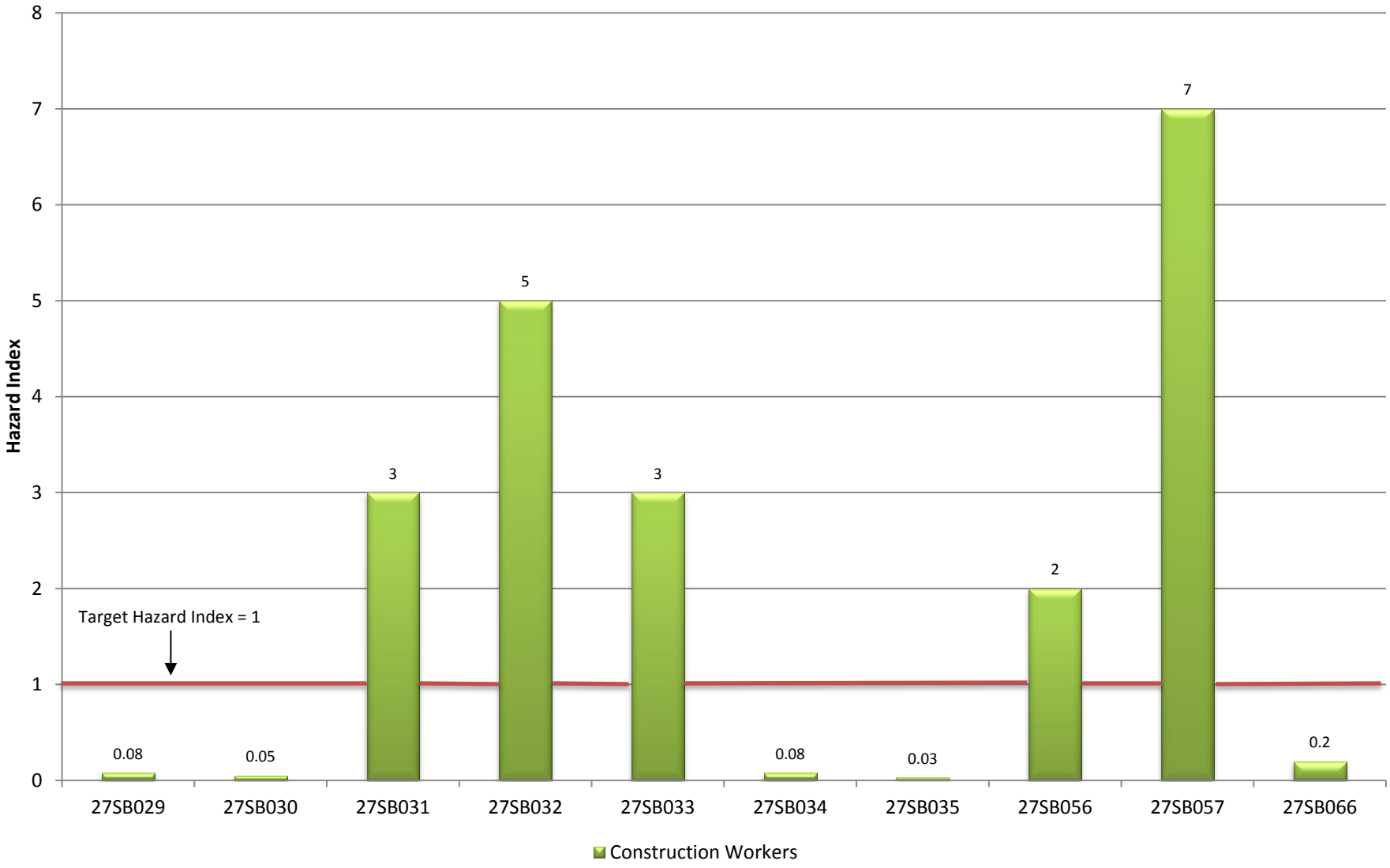


**FIGURE 7-7**
**SUMMARY OF HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES**
**INVESTIGATION AREA 1 - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

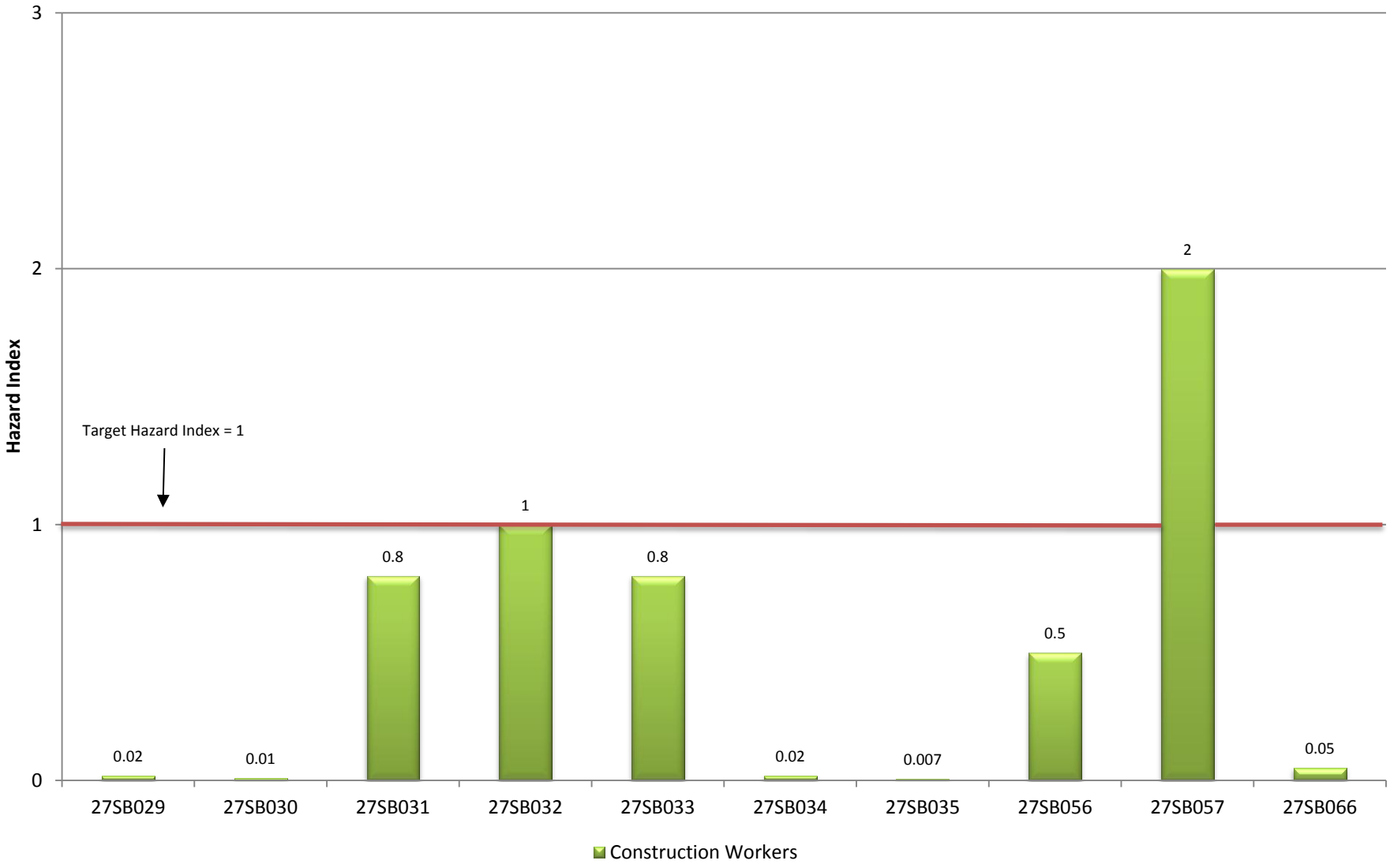


**FIGURE 7-8**
**SUMMARY OF CANCER RISKS - REASONABLE MAXIMUM EXPOSURES**
**INVESTIGATION AREA 1 - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

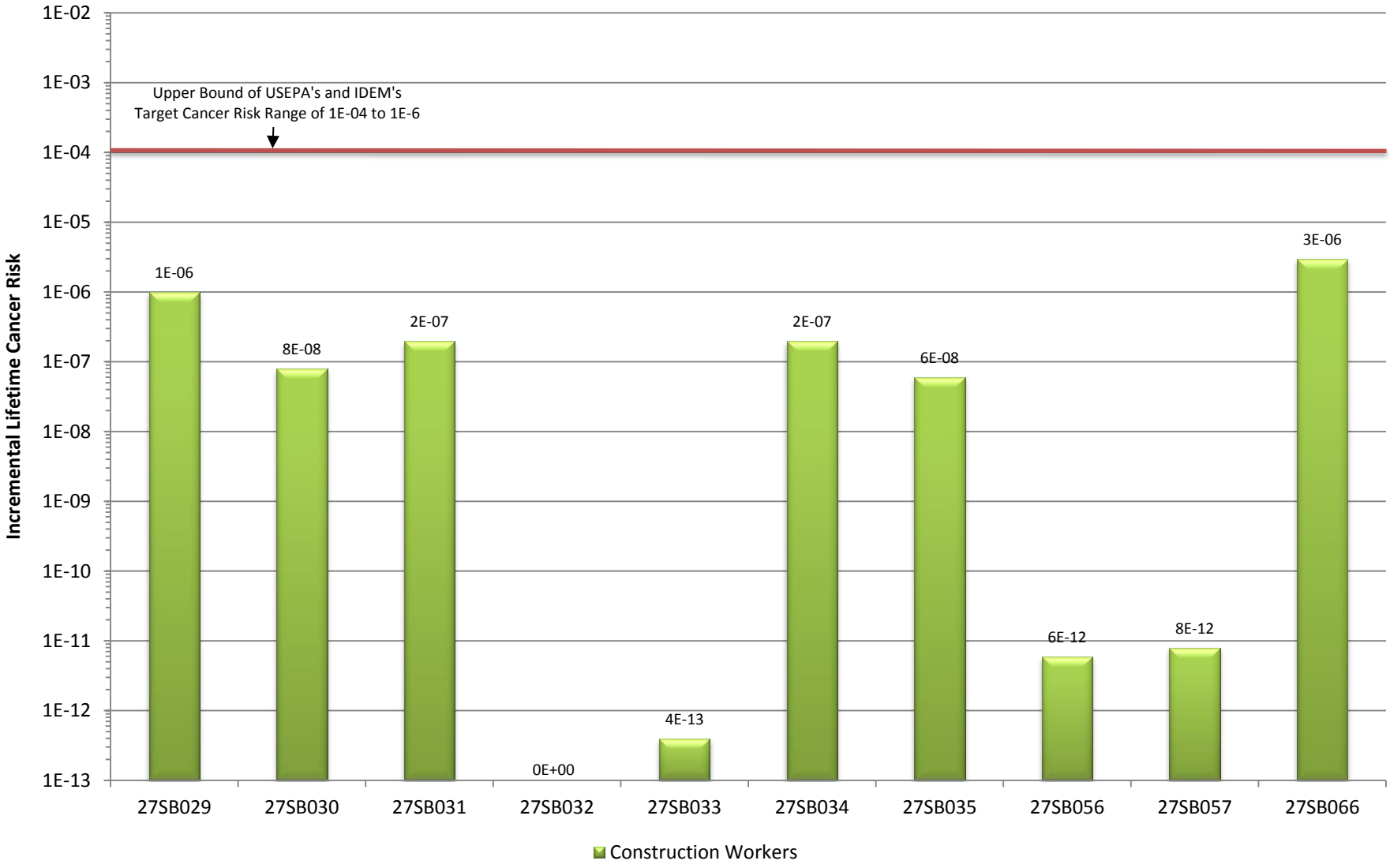


**FIGURE 7-9**
**SUMMARY OF CANCER RISKS - CENTRAL TENDENCY EXPOSURES**
**INVESTIGATION AREA 1 - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

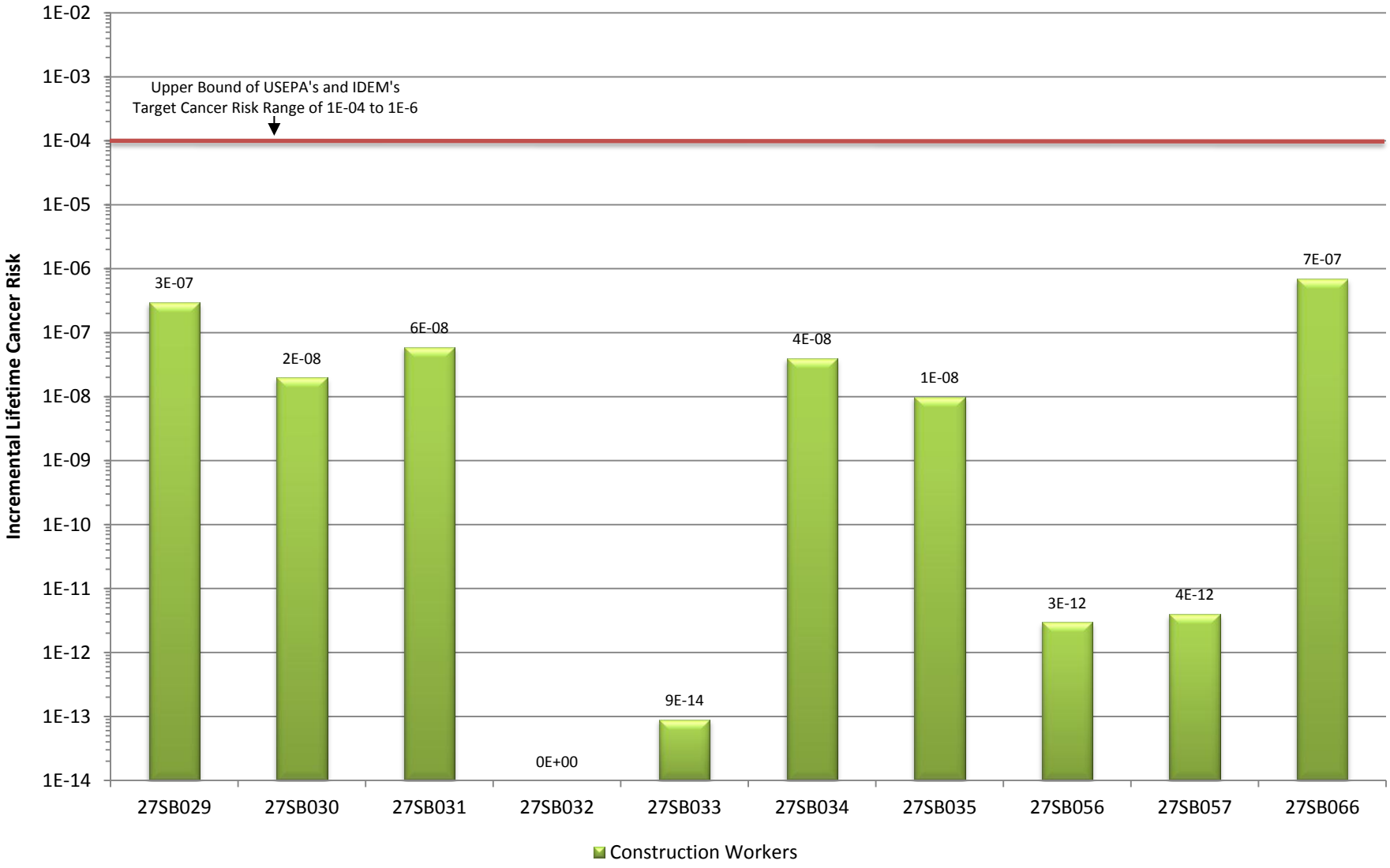


**FIGURE 7-10**
**SUMMARY OF HAZARD INDICES - REASONABLE MAXIMUM EXPOSURES**
**INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

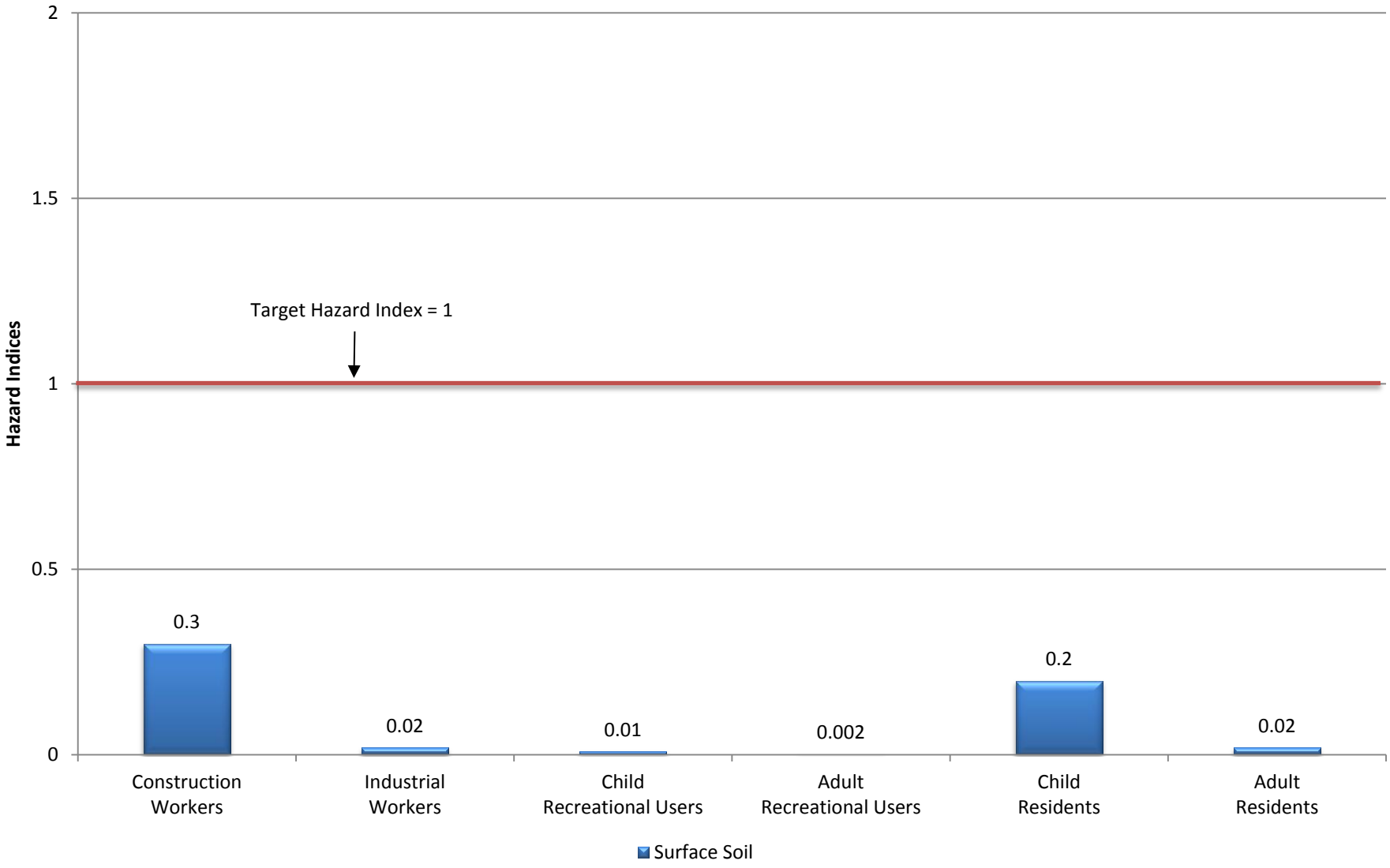
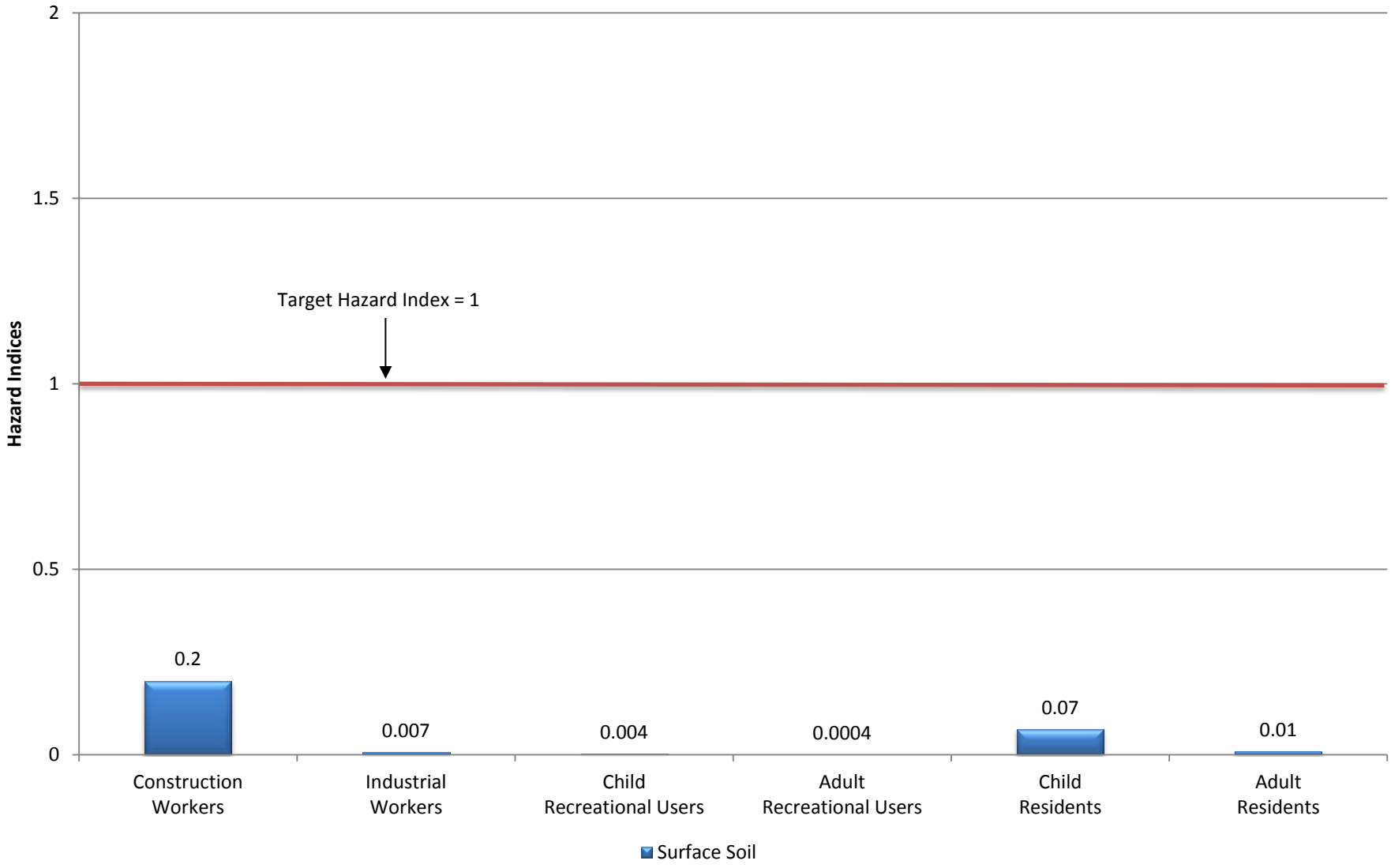


**FIGURE 7-11**
**SUMMARY OF HAZARD INDICES - CENTRAL TENDENCY EXPOSURES**
**INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**



# 8.0 ECOLOGICAL RISK ASSESSMENT

The goal of this ERA for SWMU 27 was to evaluate the potential for adverse ecological impacts which are the result of site-related contamination. This goal was accomplished by identifying COPCs detected at concentrations that exceed screening levels, identifying the locations of these exceedances, and concluding whether or not further investigation and/or remedial action at SWMU 27 at NSA Crane is warranted from an ecological perspective.

## 8.1 INTRODUCTION

The screening-level ERA methodology used at NSA Crane is in accordance with the following guidance documents: (Navy, 1997 and 1999), and (USEPA, 1997 and 1998).

This ERA consists of Steps 1, 2, and 3a of the eight-step ecological risk evaluation process discussed in USEPA guidance (USEPA, 1997 and 1998) and the Navy Policy for Conducting ERAs (Navy, 1999). The first two screening steps comprise the screening-level ERA, and correspond with Tier 1 of the Navy Policy (Navy, 1999), where conservative exposure estimates are compared to screening-level and threshold toxicity values. Step 3a is the first step of a baseline ecological risk assessment (BERA) and consists of refining the Tier 1 assumptions following Steps 1 and 2 to further focus the ERA process on the chemicals of greatest concern at a site. Step 3a corresponds with the first part of Tier 2 of the Navy Policy (Navy, 1999). Steps 3b through 7 are conducted if additional evaluations or investigations are necessary. Aspects of Step 8, risk management, are addressed throughout the ERA process, in cooperation with Region 5 regulators.

A schematic diagram of the general risk assessment process is provided on Figure 8-1.

## 8.2 TIER 1, STEP 1: SCREENING-LEVEL PROBLEM FORMULATION

The screening-level problem formulation is the first step of the ERA and includes identification of potential receptor groups, COPCs, and the mechanisms for contaminant fate, transport, and toxicity. The complete exposure pathways that exist at a site are determined at this point to facilitate receptor selection. The problem formulation process identifies: the ecological resources to be protected (known as assessment endpoints); the measures that were used to evaluate risks to those resources (known as measurement endpoints); and the chemicals, geographic areas, and environmental media relevant to the risk assessment.

As part of receptor identification, site habitats and potential ecological receptors (as they apply to ecological risk) are described in the following subsections.

### 8.2.1 Environmental Setting

#### 8.2.1.1 Basewide Environmental Setting

A biological characterization of NSA Crane, including a list of plants and animals found at the facility, is presented in the Installation Assessment (Army, 1978) and the Initial Assessment Study (IAS) (NEESA, 1983), and is summarized in the Environmental Monitoring Reports (EMRs) (Halliburton NUS, 1992a and 1992b). A list of the species that may inhabit NSA Crane and that are protected under the United States Endangered Species Act, Indiana Department of Natural Resources Heritage Data Center, or the United States Fish and Wildlife Service (USFWS) is summarized in the RCRA Facility Permit and below. The following paragraphs briefly summarize the environmental setting at the base.

Eighty percent of NSA Crane's approximately 63,000 acres is classified as Central Hardwoods Forest of the United States (NEESA, 1983). In addition, some former agricultural fields are in various stages of succession. Open spaces on dry upland sites contain almost pure stands of grasses with some clumps of woody plants such as persimmon, sassafras, and sumac. Wetter sites have river birch, willow, sycamore, and cottonwood. Hillside communities have mostly hickory, white and black oak, red maple, sugar maple, tulip poplar, ash, and beech (NEESA, 1983).

The great variety of habitats at NSA Crane (i.e., many stages of forest succession, streams, ponds, Lake Greenwood, grassy open spaces) lead to great diversity of animal species (NEESA, 1983). These species include, but are not limited to: mammals such as white-tailed deer, beaver, coyote, hawks, red fox, rabbits, raccoons, and mice; birds such as ducks, geese, wild turkey, bobwhite quail, red-tailed hawks, and American robins; and various amphibians, reptiles, fish, and invertebrates.

Six main creeks receive drainage in five separate drainage basins at NSA Crane: First Creek, Sulphur Creek, Little Sulphur Creek, Boggs Creek, Turkey Creek, and Seed Tick Creek. There are also many smaller streams, creeks, and drainage ditches located at the facility, along with several small man-made ponds and one large lake (Lake Greenwood). Lake Greenwood is the source of potable water for NSA Crane. Surface water from the facility eventually discharges to the East Fork of the White River, which is located south of the facility.

Threatened and Endangered Species

The Endangered Species Management Plan for NSA Crane (Comarco Systems, 2000) identified the federal and state threatened and endangered species and species of special concern potentially present at the facility. Information included in the Endangered Species Management Plan was obtained from studies and surveys conducted by the Navy and other agencies and groups such as universities and research institutions. A small subset of these studies includes the inventory of neotropical migratory birds, mist net and radiotelemetry surveys for the Indiana Bat, bobcat trapping, rattlesnake survey, Purdue University wildlife studies, and several fish surveys and bird counts. These studies and others that were used in compiling the list of endangered species present at NSA Crane are described in more detail in the Endangered Species Management Plan (Comarco Systems, 2000) and below.

The Indiana bat is the only federally threatened or endangered species documented to occur at NSA Crane. No mist nets were located at SWMU 27 during the mist net and radiotelemetry surveys for the Indiana Bat; however, one mist net site was located approximately 1 mile east of SWMU 27 (ESI, 2005). Three Indiana bats were captured at the location east of SWMU 27 in June 2005.

The USFWS issued a notice in the Federal Register (72 FR 37346 et seq.) on July 9, 2007, that effective August 8, 2007, the American Bald Eagle would be removed from the federal List of Endangered and Threatened Wildlife and Plants. The American Bald Eagle is still protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The bald eagle is known to be present in Lake Greenwood approximately 1 mile north of SWMU 27.

In addition, a number of state endangered and federal and state species of concern have been listed for NSA Crane (Comarco Systems, 2000). The state endangered species list includes two mammals (bobcat and Indiana bat), one reptile (timber rattlesnake), and several birds (bald eagle, osprey, loggerhead shrike, yellow-crowned night-heron, Virginia rail, king rail, and Henslow's sparrow).

#### 8.2.1.2 Site-Specific Environmental Setting

SWMU 27, Illuminant Building 126, is located in the central-northwest portion of the base. Within the general vicinity of SWMU 27 are IA 1, the PPA, and IA 2, the former Flare Test Area. IA 1 covers approximately 31-acres and is an active production facility that is enclosed by a fence and bounded by highways on all sides. A large portion of the IA 1 is paved or covered with buildings, but portions of the site consist of mowed grass (see Figure 1-2). IA 2 covers approximately 2.6 acres. Over half of the site

is a paved lot. The edges of the site to the north, east, and west are wooded, while IA 1 is located to the south across Highway 5 (see Figure 2-1).

Surface water from IA 1 flows south towards Highway 99. The nearest streams are to the west and drain into the Boggs Creek Watershed. Surface water from IA 2 drains into channels that parallel the north side of Highway 5 or down the culvert north of the area.

Drainage swales and ditches convey surface water within IA 1 to the south and west (near the point where the railroad track R-1 crosses Highway 99), and throughout IA 1. Additionally, drainage swales adjacent to several concrete basins/pits allowed for collection of surface water overflow if it occurred.

As presented in the SAP, due to the industrial nature of SWMU 27, the area is not regarded an ecological habitat, and ecological receptors will not be considered unless contamination has been shown to have migrated beyond the SWMU 27 perimeter. Therefore, the only data evaluated in the ERA are from samples collected from areas where contamination may have migrated off-site.

### 8.2.2 Potential Sources of Contamination

Several buildings associated with pyrotechnic production are located throughout IA 1. A metal plating shop is located on the edge of IA 1. Process water from concrete basins/pits overflowed onto surface soil and to tributaries of Boggs Creek. IA 2 was previously used for flare testing activities.

### 8.2.3 Physical and Chemical Characteristics

Based on historical site data, VOCs, metals, and perchlorate are among the site-related chemical contaminants known to be present or potentially present in environmental media at SWMU 27. Physical and chemical characteristics of contaminants may affect their mobility, transport, and bioavailability in the environment. These characteristics include bioaccumulation factors (BAFs), $K_{OC}$s, and $K_{OW}$s. The physical and chemical characteristics of the chemical classes present or potentially present in SWMU 27 media are presented in Appendix G.

### 8.2.4 Potential Exposure Pathways

Section 1.2 of this RFI describes the operational history, descriptions of previous investigations and the potential sources of contamination for SWMU 27. Chemicals may have entered surface soil from overflow of process water at IA 1 and flare testing activities at IA 2.

Several groups of terrestrial ecological receptors can be exposed to contaminants in surface soil. Invertebrates such as earthworms are exposed to contaminants as they move through the soil and ingest soil particles while searching for food. Plants are exposed to contaminants via direct contact as contaminants are absorbed through the roots, and contaminants are then translocated to different parts of the plants (e.g., leaves, seeds). These pathways are evaluated in the ERA.

Small mammals may be exposed to contaminants in soil via several exposure routes. They may be exposed by direct contact as they search for food or burrow into the soil. Exposure of terrestrial wildlife to contaminants in the soil via dermal contact is unlikely to represent a major exposure pathway because fur, feathers, and chitinous exoskeletons are expected to minimize transfer of contaminants across dermal tissue. Therefore, the dermal pathway was not evaluated in the ERA. Small mammals also may be exposed to contaminants in soil via incidental ingestion of soil and ingestion of plants and/or invertebrates that have accumulated contaminants from the soil. These pathways are evaluated in the ERA.

Larger predatory species such as the red fox and red-tailed hawk can be indirectly exposed to soil contaminants by ingesting small mammals that have accumulated contaminants from soil.

Terrestrial receptors are not substantially exposed to subsurface soils, so that pathway was not evaluated in the ERA. For this project, the surface soil depth interval was 0 to 2 feet below the ground surface.

### 8.2.5 Assessment Endpoints and Measurement Endpoints

Assessment endpoints are explicit expressions of the environmental value that is to be protected (USEPA, 1997). The selection of these endpoints is based on the habitats present, migration pathways of probable contaminants, and relevant exposure routes for the receptors. Measurement endpoints are estimates of measurable biological impacts (e.g., mortality, growth, and reproduction) that are used to evaluate the assessment endpoints. The assessment endpoints and measurement endpoints used to evaluate SWMU 27 data are presented in Table 8-1.

#### 8.2.5.1 Assessment Endpoints

Based on the habitat at SWMU 27 (which consists of mostly grass with nearby forested areas) and the chemicals present at the site, the assessment endpoints include protection of the following groups of receptors from adverse effects of contaminants on their growth, survival, and reproduction:

- Terrestrial vegetation
- Soil invertebrates
- Herbivorous birds and mammals
- Invertivorous birds and mammals

The following paragraphs discuss the above assessment endpoints.

*Terrestrial Vegetation*: Terrestrial vegetation at SWMU 27 consists of grasses, shrubs, and trees. They serve as a food source and provide shade and cover for many organisms, and they help to prevent soil erosion, among other important functions. They also can accumulate some contaminants that can then be transferred to the higher trophic-level organisms that consume plants.

*Soil Invertebrates*: Soil invertebrates are present in soil at SWMU 27. They aid in the formation of soil and the redistribution and decomposition of organic matter in the soil, and they serve as a food source for higher trophic-level organisms. They also can accumulate bioaccumulative contaminants that can then be transferred to the higher trophic-level organisms that consume soil invertebrates.

*Herbivorous Birds and Mammals*: Herbivorous birds and mammals (i.e., animals that consume only plant tissue) forage in some portions of SWMU 27. Their role in the community is essential because, without them, higher trophic levels could not exist (Smith, 1966). They may be exposed to and accumulate contaminants present in the plants they consume.

*Invertivorous Birds and Mammals:* Invertivorous birds and mammals are present throughout the base in different terrestrial habitats (e.g., forested, open field) and are present at SWMU 27. These are considered first-level carnivores, and they serve as a food source for higher trophic-level carnivores. They may be exposed to and accumulate contaminants present in the food items they consume.

As indicated in USEPA guidance (USEPA, 1997), “it is not practical or possible to directly evaluate risks to all of the individual components of the ecosystem at a site. Instead, assessment endpoints focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site.” Therefore, the ERA will focus on the endpoints that will tend to yield the highest risks, which should then account for endpoints that will have lower risks.

Omnivores were not selected as assessment endpoints because exposure to contaminants in plants is greatest for herbivores, and exposure to contaminants in animals is greatest for invertivores. Therefore,

omnivores are protected by protecting herbivores and invertivores. Large carnivorous birds and mammals were not selected as assessment endpoints because their home range (hundreds of acres) is much larger than SWMU 27 including nearby areas of IA 1 (approximately 31 acres) and IA 2 (approximately 2.6 acres), so they would only consume a small portion of food from the site. Therefore, risks would be greater to small mammals and birds that may obtain all of their food from the site. Although reptiles may be present, they were not selected as assessment endpoints because of the general lack of toxicity information and the lack of methods to evaluate their exposure to chemicals.

#### 8.2.5.2 Measurement Endpoints

The following measurement endpoints were used to evaluate the assessment endpoints in the ERA:

- Soil screening values - Mortality, growth, and reproduction of plants and soil invertebrates were evaluated by comparing the measured concentrations of chemicals in surface soil to screening values designed to be protective of ecological receptors.

- Wildlife toxicity reference values (TRVs) - Mortality, reproductive, and/or developmental effects of birds and mammals were evaluated by comparing the estimated dose incurred (based on conservative and average assumptions) from ingestion of contaminants in surface soil, plants, and invertebrates, to wildlife TRVs.

#### 8.2.5.3 Selection of Receptor Species

Many receptors in the soil environment at SWMU 27 are typically grouped into general categories such as invertebrates and vegetation. This is a reflection of the nature of the threshold values, effects values, or criteria typically used to characterize risk for such organisms. However, for vertebrate receptors, selection of a representative species is required so that risks to these upper-level species incurred by intake through eating and drinking can be estimated.

Ingestion is the primary route of exposure for most mammals and birds. The selection of species used to represent the receptor groups identified in Section 8.2.5.1 was based on considerations of their preferred habitat, body size, sensitivity to contaminants, home range, abundance, commercial or sport utilization, legal status, and functional role (e.g., predators). The availability of exposure parameters such as body mass, feeding rate, and drinking rate was also a factor in selecting surrogate species. The following surrogate species were used in the food chain modeling conducted as part of this ERA:

- Herbivorous mammal - Meadow vole
- Herbivorous bird - Bobwhite quail
- Invertivorous mammal - Short-tailed shrew
- Invertivorous bird - American woodcock

Receptor profiles for each of the species above are presented in Appendix G.

### 8.2.6 Conceptual Site Model

A CSM in ERA problem formulation is a written description of predicted relationships between ecological entities and the stressors to which they may be exposed (USEPA, 1998). The CSM consists of two primary components: predicted relationships among stressor, exposure, and assessment endpoint response; and a diagram that illustrates the relationships (USEPA, 1998). At SWMU 27, sources of the chemicals include the pyrotechnic production facility and flare testing activities. VOCs, metals, and perchlorate were released to the environment via disposal of process water and testing activities. In the past, process wastewaters and rinsates from the metal-plating building were discharged to open ditches. Currently, treated wastewater from metal-plating operations is discharged to the sanitary sewer system under a NPDES permit. The primary stressors to ecological receptors are contaminants in surface soil. The primary receptors for contaminants in surface soil are plants and soil invertebrates, and secondary receptors are birds and mammals. Figure 8-2 represents the ecological CSM for SWMU 27.

## 8.3 TIER 1, STEP 2: SCREENING-LEVEL EXPOSURE ESTIMATE AND RISK QUOTIENTS

### 8.3.1 Ecological Effects Evaluation

The preliminary ecological effects evaluation is an investigation of the relationship between the magnitude of exposure to a chemical, and the nature and magnitude of adverse effects resulting from exposure. In addition to being a toxicological evaluation, it may also include descriptions of apparent effects seen during the site visit (e.g., stressed vegetation). Toxicity thresholds are usually expressed in units of concentration when the medium of concern is in intimate contact with the receptor, such as soil for soil invertebrates. For other receptors, such as terrestrial vertebrates, toxicity data are typically available as doses, with units equal to mass of contaminant per unit of body mass per unit of time (usually mg/kg-day).

### 8.3.2 Exposure Characterization

As the first step in the ecological effects evaluation, COPCs were selected by comparing contaminant concentrations in surface soil to ecological screening levels. For surface soil, chemical concentrations

were compared to USEPA Ecological Soil Screening Levels (Eco SSLs) (USEPA, 2005a and supporting documents) because they are the most current screening levels. If USEPA Eco SSLs were not available, Region 5 soil ecological screening levels (ESLs) (USEPA, 2003) were used next in order of preference, followed by the values from Canadian Soil Quality Guidelines (CCME, 1999, 2006) and the ORNL Toxicological Benchmarks for plants (Efroymson et al., 1997a) and invertebrates (Efroymson et al., 1997b). Region 5 soil ESLs are based on the lowest value for plant, soil invertebrates, meadow vole, or masked shrew. If no alternate screening level was available, the Region 5 value was presented for all receptors. Table 8-2 presents the soil screening levels for plants, invertebrates, mammals, and birds for each chemical, and the sources of each value. As presented in Section 2.1.2.2, only data from a subset of samples were evaluated in the ERA. This consisted of samples from locations 27SB001G, 27SB003G, and 27SB008G at IA 1 and samples from locations 27SB058G and 27SB063G at IA 2.

The doses in mg/kg-day were estimated for terrestrial wildlife (mammals and birds) using exposure dose equations. Note that the food chain models were conducted on a dry-weight basis to be consistent with the soil concentrations which are reported on a dry-weight basis. Therefore, the concentrations in the food items were estimated on a dry-weight basis. The following generic equation was used to calculate the EPCs for terrestrial wildlife from exposure to chemicals in soil, and associated food items such as plants and soil invertebrates:

$$CDI = \frac{[(Cf * If) + (Cs * Is)] * H}{BW}$$

| | | | |
|---|---|---|---|
| Where: | CDI | = | Chronic daily intake [milligrams per kilogram (mg/kg)-day] |
| | Cf | = | Chemical concentration in food – (see discussion below) |
| | Cs | = | Chemical concentration in surface soil (mg/kg) |
| | If | = | Food ingestion rate [kilograms per day (kg/day)] |
| | Is | = | Incidental surface soil ingestion rate (kg/day) |
| | H | = | Portion of food intake from the contaminated area (unitless) |
| | BW | = | Body weight (kg) |

The exposure factors used for the food chain model, their derivation, and the receptor profiles for the surrogate species are presented in Appendix G. The exposure assumptions (i.e., ingestion rate, body weight) were obtained primarily from the Wildlife Exposure Factors Handbook (USEPA, 1993) and USEPA Eco SSL Guidance Attachment 4-1 (USEPA, 2007a, b, c) with other sources used as necessary. Food ingestion rates are on a dry-weight basis as discussed above.

Chemical concentrations in food items for soil invertivorous and herbivorous receptors were calculated using soil-to-invertebrate or soil-to-plant BAFs, and regression equations from the USEPA Eco SSL Guidance Document Attachment 4-1 (USEPA, 2007a, b, c) or BAFs from published sources. The following equation was used to calculate chemical concentrations in plants or invertebrates when BAFs were used:

$$Cf = Cs * BAF$$

Where: Cf = Contaminant concentration in food (mg/kg)
Cs = Contaminant concentration in surface soil (mg/kg)
BAF = Biota-soil bioaccumulation factor (unitless)

A default value of 1.0 was used for the BAF when chemical-specific data were not available. Sources of BAFs are documented in Appendix G.

The food chain model scenarios were calculated using various exposure assumptions to present a range of potential risks. For selecting chemicals as COPCs, the following Tier 1 exposure assumptions were used:

- Maximum soil concentrations.
- 90$^{th}$ percentile BAFs (or maximum value if a 90$^{th}$ percentile value was not available) or regression equations.
- Conservative receptor body weight and ingestion rates.
- Receptors spend 100 percent of their time at the Site.

### 8.3.3 Risk Characterization

An Ecological Effects Quotient (EEQ) approach was used to characterize the risk to ecological receptors. This approach characterizes potential effects by comparing exposure concentrations with effects data. The EEQs for terrestrial receptors were calculated as follows:

$$EEQ = \frac{Css}{SSSL}$$

where: EEQ = Ecological Effects Quotient (unitless)

$C_{ss}$ = contaminant concentration in surface soil (µg/kg or mg/kg)

SSSL = surface soil screening level (µg/kg or mg/kg)

The EEQs for terrestrial wildlife were calculated as follows:

$$EEQ = \frac{CDI}{TRV}$$

where: EEQ = Ecological effects Quotient (unitless)

CDI = Chronic daily intake dose (mg/kg-day)

TRV = Toxicity reference value (NOAEL or LOAEL) (mg/kg-day)

An EEQ of greater than 1.0 was considered to indicate potential risk. Such values do not necessarily indicate that an effect will occur, but only that a low (i.e., conservative) threshold has been exceeded.

### 8.3.4 Tier 1, Step 2: Selection of Contaminants of Potential Concern

Tables 8-3 and 8-4 provide the results of the COPC selection for surface soil near IA 1 and IA 2, respectively. Tables 8-5 and 8-6 present the results of the Tier 1 food chain model for surface soil from IA 1 and IA 2, respectively. The following rules were used to select COPCs for SWMU 27:

- A contaminant was selected as a COPC for risks to terrestrial plants and soil invertebrates if the maximum detected concentration in surface soil exceeded the associated screening level or a screening level was not available.

- If a contaminant had a maximum detected concentration that exceeded an associated screening level for birds or mammals, or a screening level was not available for a bioaccumulative chemical, then the chemical was retained for food chain modeling for wildlife. If the EEQs were greater than 1.0 based on the conservative food chain model, the chemical was selected as a COPC.

Contaminants retained as COPCs were further evaluated as part of Step 3a of the eight-step ERA process.

#### 8.3.4.1 Terrestrial Plants

One inorganic was selected as a COPC for terrestrial plants in IA 1 surface soil because it was detected at a maximum concentration that resulted in an EEQ greater than 1.0 (see Table 8-3). Two inorganics were selected as COPCs because no screening level was available.

Two inorganics were selected as COPCs for terrestrial plants in IA 2 surface soil because they were detected at a maximum concentration that resulted in an EEQ greater than 1.0 (see Table 8-4). One inorganic was selected as a COPC because no screening level was available.

#### 8.3.4.2 Soil Invertebrates

One inorganic was selected as a COPC for soil invertebrates in IA 1 surface soil because it was detected at a maximum concentration that resulted in an EEQ greater than 1.0 (see Table 8-3). Two inorganics were selected as COPCs because no screening level was available.

Two inorganics were selected as COPCs for soil invertebrates in IA 2 surface soil because no screening level was available (see Table 8-4).

#### 8.3.4.3 Wildlife

Tables 8-5 and 8-6 summarize the results of the Tier 1 food chain modeling for terrestrial soil receptors for IA 1 and IA 2, respectively. Appendix G presents the calculation worksheets.

The following summarizes the results of the food chain modeling for terrestrial receptors for IA 1 using maximum concentrations and Tier 1 input parameters:

- Herbivorous mammals and birds: No chemicals had EEQs greater than 1.0 in the food chain model.
- Invertivorous mammals and birds: Two inorganics had EEQs greater than 1.0 in the food chain model for the mammals, and two inorganics had EEQs greater than 1.0 for the birds which were selected as COPCs.

The following summarizes the results of the food chain modeling for terrestrial receptors for IA 2 using maximum concentrations and Tier 1 input parameters:

- Herbivorous mammals and birds: No chemicals had EEQs greater than 1.0 in the food chain model.
- Invertivorous mammals and birds: One inorganic had an EEQ greater than 1.0 in the food chain model for the mammals, and one inorganic had an EEQ greater than 1.0 for the birds, which were selected as COPCs.

## 8.4 TIER 2, STEP 3A – COPC REFINEMENT

Step 3a consists of refining the conservative exposure assumptions/concentrations used to evaluate potential risks to ecological receptors and re-evaluating the analytical data using benchmarks that are more appropriate for the assessment endpoints. The objective of the Step 3a refinement was to better determine which chemicals contribute to potentially unacceptable levels of ecological risk, and to identify and eliminate from further consideration those COPCs that were initially selected as COPCs because of the use of very conservative exposure scenarios, but are not likely causing a significant risk. The Step 3a evaluation can also be used to eliminate chemicals from further evaluation for certain groups of receptors that are not at significant risk. For example, a chemical might not be retained as a COPC in soil for plants based on low risks to plants, but the same chemical might be retained as a COPC based on risks to invertebrates or wildlife. This is important because if the site proceeds further to a BERA, the studies in the BERA should only focus on the receptors that are at potential risk.

For chemicals evaluated further in Step 3a, the following factors were evaluated, as appropriate, to determine if the risks are great enough to warrant additional evaluations [i.e., proceed to a BERA, develop cleanup levels, proceed to a Corrective Measures Study (CMS)]. All of these factors may not be discussed for each chemical and/or receptor group.

- Magnitude of criterion exceedance: Although the magnitude of risks may not relate directly to the magnitude of a criterion exceedance, the magnitude of the criterion exceedance may be one item used in a lines-of-evidence approach to determine the need for further site evaluation. The greater the criterion exceedance, the greater the probability and concern that an unacceptable risk exists.

- Frequency of chemical detection and spatial distribution: A chemical detected at a low frequency typically is of less concern than a chemical detected at higher frequency if toxicity and concentrations and spatial areas represented by the data are similar. All else being equal, chemicals detected frequently were given greater consideration than those detected relatively infrequently. In addition, the spatial distribution of a chemical may be evaluated to determine the area that a sample represents.

- Contaminant bioavailability: Many contaminants (especially inorganics) are present in the environment in forms that are typically not bioavailable, and limited bioavailability was considered when evaluating exposures of receptors to site contaminants. Contaminants with generally less bioavailability are considered to be less toxic than more bioavailable contaminants, all other factors being equal.

- Habitat: Although exceedances of criteria may occur, potential risks to ecological receptors may be minimal if there is little habitat for those receptors. Therefore, the extent of habitat was used qualitatively when considering additional evaluation. Areas with little habitat were less of a concern than areas with suitable habitat to support the receptors of interest.

- Alternate benchmarks: These benchmarks are used to further evaluate risks to specific groups of ecological receptors (e.g., plants, invertebrates).

- Food Chain Modeling: Exposure via the food chain is a major pathway of concern for chemicals known to significantly bioaccumulate and/or biomagnify. Thus, potential risk to upper level receptors was evaluated using food chain models. The Tier 1 exposure doses calculated for terrestrial wildlife were re-calculated using the following Tier 2, Step 3a exposure assumptions and chemical concentrations:

  - Average soil/sediment/surface water concentrations
  - Median or mean BAFs (if available)
  - Average receptor body weights and ingestion rates

- Background: Concentrations of chemicals in surface soil were compared to background concentration data. If the maximum concentration of a detected chemical was not greater than the maximum background concentration, the chemical was considered similar to background, not site-related, and was eliminated as a COPC. Because only a small portion of the data set was used for the ERA (only the samples in ecological habitat collected from off-site areas or areas heading off-site), it was not appropriate to use the statistical comparison of all surface soil samples to the background data set. Therefore, the maximum concentrations in the samples used for the ERA were compared to the maximum concentrations in the background data set to determine whether the chemicals needed to be evaluated further in Step 3a. For IA 1, cadmium and strontium are eliminated as COPCs in surface soil based on comparison to background. For IA 2, barium, cadmium, lead, manganese, and

zinc are eliminated as COPCs in surface soil based on comparison to background. These chemicals are not further evaluated.

Summaries of the Step 3a evaluation for terrestrial plants and soil invertebrates are presented in Table 8-7. As part of the Step 3a evaluation for terrestrial wildlife, Table 8-8 presents the results of the food chain models for surface soil using Step 3a exposure assumptions and chemical concentrations. A detailed discussion of the Step 3a evaluation is presented in the following sections.

### 8.4.1 Tier 2, Step 3a: Terrestrial Plants

**IA 1**

Aluminum was initially selected as a COPC for terrestrial plants because the maximum concentration exceeded the background value, and a screening value was not available. Manganese was initially selected as a COPC for terrestrial plants because the maximum concentration exceeded the screening value and background value.

Aluminum is only selected as a COPC when soil pH is less than 5.5. Although pH data are not available, it is not likely that aluminum at the site is present in a highly bioavailable form that is impacting plants, because it is most likely in the form of metallic aluminum. While total aluminum concentrations were measured, only soluble aluminum may result in the toxicity to plants and invertebrates (USEPA, 2003b). This is the form of aluminum that is typically used in toxicity tests, which is not the same form typically found in the environment. Usually a large fraction of the soluble aluminum is found in the form of organic and fluoride complexes, and these complexed forms of aluminum are much less toxic to plants than soluble $Al^{3+}$ or Al-hydroxy cations (USEPA, 2003b). Also, although the maximum detected concentration (21,400 mg/kg) exceeded the background concentration (17,400 mg/kg), the maximum concentration is similar to the background concentration and so it does not appear that aluminum is site-related. Finally, the site is vegetated, so it does not appear that plants are being significantly impacted. For these reasons, aluminum is eliminated as a COPC.

Concentrations of manganese exceeded the screening value (220 mg/kg) in all three samples evaluated. Only one sample concentration (5,550 J mg/kg) from 21SS001G exceeded the background concentration (3,040 mg/kg). This sample was collected from a drainage ditch adjacent to a highway, in an area vegetated with grass. Manganese was detected at elevated concentrations across the site, so it is possible that the manganese is site-related. Although risks to plants in this area cannot be ruled out, the area that is impacted is relatively small and bounded by roads on all sides; therefore, any impacts would

be limited to this area. Also, because the site is vegetated, it does not appear that plants are being significantly impacted. For these reasons, manganese is eliminated as a COPC.

**IA 2**

Aluminum and strontium were initially selected as COPCs for terrestrial plants because their maximum concentrations exceeded the background value and a screening value was not available.

Aluminum is eliminated as a COPC for the reasons discussed for IA 1. In fact, the maximum detected concentration (17,800 mg/kg) only very slightly exceeded the background concentration. Strontium exceeded background in one of two samples evaluated. Strontium nitrate was stored in the southern area of the PPA and is used to produce red flares; therefore, strontium present in soil at IA 2, the former flare test area is likely site-related. The sample was taken from the edge of a paved lot. A large portion of the site is paved; therefore, limited habitat is available, so any impacts to plants would be limited to a small area. Although plants do not need strontium, they can readily absorb it from soil via their normal calcium uptake pathway (Watts et al., 2010). No documentation was found, however, to indicate that non-radioactive strontium is toxic to plants. One document noted that non-radioactive strontium has usually not been thought of as being particularly hazardous (Irwin et al., 1997), but the reference is not specific to plants. The site is vegetated, so it does not appear that plants are being significantly impacted. For those reasons, strontium is not retained as a COPC for plants.

### 8.4.2 Tier 2, Step 3a: Soil Invertebrates

**IA 1**

Aluminum was initially selected as a COPC for soil invertebrates because the maximum concentration exceeded the background value, and a screening value was not available. Manganese was initially selected as a COPC for soil invertebrates because the maximum concentration exceeded the screening value and background value.

Aluminum is eliminated as a COPC for soil invertebrates for the same reasons discussed for plants.

Only the maximum manganese concentration (5,550 J mg/kg) exceeded its screening value (450 mg/kg) and background concentration (3,040 mg/kg) in one of three samples (at 21SS001G). The sample from 21SS001G is located in a drainage ditch adjacent to a highway, in an area vegetated with grass. Manganese was detected at elevated concentrations across the site so it is possible that the manganese is site-related. Although risks to soil invertebrates in this area cannot be ruled out, the area that is

impacted is relatively small and bounded by roads on all sides; therefore, any impacts would be limited to this area. Therefore, manganese is eliminated as a COPC for soil invertebrates.

**IA 2**

Aluminum and strontium were initially selected as COPCs for soil invertebrates because the maximum concentration exceeded the background value and a screening value was not available. Aluminum is eliminated as a COPC for soil invertebrates for the same reasons discussed for plants. Strontium exceeded background in one of two samples evaluated. The sample was taken from the edge of a paved lot. An alternate benchmark was not available for strontium. Strontium nitrate was stored in the southern area of the PPA and is used to produce red flares; therefore, strontium present in soil at IA 2, the former flare test area, is likely site-related. The only toxicity data found for invertebrates was a study cited in Watts et al., (2010). The study found that there was no effect on body weight of earthworms (*Eisenia foetida)* exposed to a mixture of peaty marshland soil and horse manure spiked at different strontium concentrations for 10 weeks; however, a strontium concentration of 10,600 mg/kg dry weight resulted in a significant reduction in reproduction. This concentration is much greater than the maximum detection in the surface soil samples used for the ERA of 234 mg/kg. Also, as indicated above, non-radioactive strontium has usually not been thought of as being particularly hazardous. Therefore, it is unlikely that strontium will impact soil invertebrates at the site, and strontium was not retained as a COPC for soil invertebrates.

### 8.4.3 Tier 2, Step 3a: Terrestrial Wildlife

As presented in Section 8.3.4.3, the EEQs from the terrestrial food chain modeling were greater than 1.0 for several inorganics using maximum chemical concentrations and Tier 1 exposure assumptions. Therefore, as part of the Step 3a refinement, risks were recalculated using average chemical concentrations and the Tier 2, Step 3a exposure parameters as presented in Appendix G. These parameters are summarized on the exposure factors table in Appendix G. The food chain model calculation sheets are also provided in Appendix G. Chemicals eliminated as COPCs based on a comparison to background values were not evaluated in the Step 3 a refinement.

**IA 1**

Table 8-8 presents the result of the less conservative food chain model for surface soil from IA 1. A discussion of the risks to mammal and birds for IA 1 is presented below.

- Herbivorous receptors: No EEQs were greater than 1.0; therefore, impacts to herbivorous mammals and birds are not expected from chemicals detected in surface soil at SWMU 27.

- Invertivorous mammal: No EEQs were greater than 1.0; therefore, impacts to invertivorous mammals are not expected from chemicals detected in surface soil at SWMU 27.

- Invertivorous bird: The EEQ for lead (1.1) for the woodcock was only slightly greater than 1.0 using the no observed adverse effects level (NOAEL) as the TRV. The lowest observed adverse effects level (LOAEL) EEQ was less than to 1.0. Impacts to invertivorous birds are expected to be minimal; therefore, lead is eliminated as a COPC.

**IA 2**

A less conservative food chain model for surface soil from IA 2 is not presented because the chemicals had EEQs less than 1.0 using the conservative food chain model, or the chemicals were eliminated as COPCs based on a comparison to background values.

## 8.5 ECOLOGICAL RISK UNCERTAINTY ANALYSIS

This section discusses some of the uncertainties associated with the SWMU 27 ERA.

### 8.5.1 Uncertainty in Assessment Endpoints and Measurement Endpoints

Measurement endpoints were used to evaluate the assessment endpoints selected for the ERA. For the ERA, the measurement endpoints were not the same as the assessment endpoints. Measurement endpoints were used to predict effects to the assessment endpoints by selecting surrogate species to be evaluated. For example, a decrease in reproduction of a shrew was used to assess a decrease in reproduction of the small mammal population. However, predicting a decrease in reproduction of a shrew may either underprotect or overprotect the small mammal population based on differences in ingestion rates, toxicity, food preferences, home ranges, etc. between different species.

As discussed in Section 8.2.1.1, several endangered and threatened species or species of special concern are present at NSA Crane and potentially may inhabit SWMU 27. Risks to these species were not specifically calculated; therefore, the uncertainties of not calculating risks to these species are presented here. Unacceptable risks to the bobcat, bald eagle, Northern harrier, and osprey are not expected because habitat is not available. The bobcat has a significantly larger home range. The bald

eagle and osprey require open water habitat, which is not available at SWMU 27, but is available in Lake Greenwood. The Northern harrier prefers wetlands habitat, which is not available at SWMU 27. However, there is uncertainty with this conclusion because risks were not quantitatively evaluated.

Loggerhead shrikes and the sedge wren consume mostly aboveground insects such as caterpillars, beetles, spiders, and flies, as opposed to the worms that are consumed by the American woodcock in the food-chain model. Because worms are in direct contact with soil, it is expected that they would have greater levels of contaminants at SWMU 27 than aboveground insects; therefore, risks to the woodcock from consuming worms are expected to be greater than risks to the loggerhead shrike and sedge wren from consuming aboveground insects. By protecting the woodcock, these other invertivorous birds will also be protected. As mentioned in Section 8.2.1.1, the presence of the Indiana bat has not been documented at SWMU 27; however, three Indiana bats were captured approximately 1 mile from the site. Because the site contains several buildings and is mainly paved with a forested area only at the edge of IA 2, limited habitat exists for the Indiana bat at SWMU 27.

Finally, there are uncertainties in risks to reptiles because there is a lack of exposure factors for reptiles and a lack of reptile toxicity data for the detected chemicals. As discussed in Section 8.2.1.1, one threatened reptilian species is listed as potentially present at NSA Crane. Based on the preferred habitat of the timber rattlesnake and the ecology of SWMU 27, this species likely does not inhabit areas of SWMU 27. Risks to carnivorous reptiles were not specifically calculated; however, risks are accounted for by using invertivorous birds and mammals as surrogates.

### 8.5.2 Uncertainty in Exposure Characterization

The contaminant dose to terrestrial wildlife is calculated using an equation that incorporates ingestion rates, body weights, BAFs, and other exposure factors. The exposure factors were obtained from literature studies or predicted using various equations. Ingestion rates and body weights vary among species, especially among species inhabiting different areas. This was taken into account when selecting exposure parameters from USEPA (USEPA, 1993), and an attempt was made to minimize the uncertainties associated with the exposure characterization by selecting exposure parameters from studies conducted in Indiana and surrounding states.

Bioaccumulation of contaminants into various biological media (e.g., plants, invertebrates, small mammals) depends on characteristics of the media such as pH, organic carbon, etc. Therefore, actual BAFs at the sites may be different than those used in the ERA and obtained from the literature. Also, the bioavailability of contaminants reported in toxicity studies is typically greater than the contaminants in

environmental media. Typically, highly bioavailable forms of the chemicals are used when conducting toxicity tests and/or conducting dosing studies for wildlife.

There is uncertainty in the chemical data collected at the site. Measured levels of chemicals are only estimates of true site chemical concentrations. At SWMU 27, samples were deliberately biased toward known or suspected high concentrations, so predicted doses are probably higher than actual doses. Whereas this is a conservative approach in predicting exposure concentrations, actual exposure of ecological receptors to chemical concentrations at SWMU 27 is likely overestimated. In particular, wildlife that typically roam over multiple sample locations are unlikely to obtain all of their food from within the most contaminated areas at SWMU 27. Also, large portions of the site are covered with buildings and paved lots, and some areas are fenced which limits habitat and food at the site.

### 8.5.3 Uncertainty in Ecological Effects Data

Uncertainty exists in the ecological effects data, including the screening levels and wildlife TRVs. Several of the screening levels are very conservative, and typically are based on studies where the bioavailability of the chemical is much greater than it is in the environment. Also, toxicity data were not available or were limited for some chemicals.

The NOAELs/LOAELs used for the wildlife endpoints species are based on species other than the endpoint species (e.g., rats, mice). Uncertainty exists in the application of toxicity data across species because the contaminant may be more or less toxic to the endpoint species than it was to the test study species.

There are very few toxicity data available for strontium, so there is a lot of uncertainty in the evaluation of risks from this metal. Irwin et al., (1997) noted that non-radioactive strontium has usually not been thought of as being particularly hazardous, and the only toxicity data available for invertebrates showed that effects were not observed until soil concentrations were over 10,000 mg/kg.

### 8.5.4 Uncertainty in Risk Characterization

Risks are possible if an EEQ is greater than or equal to 1.0, regardless of the magnitude of the EEQ. However, the magnitude of effects to ecological receptors cannot be inferred based on the magnitude of the EEQ. Rather, an EEQ greater than 1.0 simply indicates that the dose used to derive the toxicity reference value was exceeded.

Finally, there is uncertainty in how the predicted risks to a species at a site translate into risk to the population in the area as a whole.

## 8.6 ECOLOGICAL RISK SUMMARY AND CONCLUSIONS

This ERA evaluated surface soil from IA 1 and IA 2. Based on the initial screening of the chemical data, several chemicals were initially selected as COPCs in surface soil because they were detected at concentrations that exceeded conservative screening levels and background values, had EEQs greater than 1.0 in the conservative food chain model, or did not have screening levels.

These chemicals were then further evaluated to refine the list of COPCs, and to better characterize risks to ecological receptors. Following are the results of the ERA.

### 8.6.1 Terrestrial Plants and Soil Invertebrates

No chemicals were retained as COPCs for potential risks to terrestrial plants and soil invertebrates.

### 8.6.2 Mammals and Birds

No chemicals were retained as COPCs for mammals and birds.

**TABLE 8-1**

**ASSESSMENT ENDPOINTS AND MEASUREMENT ENDPOINTS**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**

| Assessment Endpoint | Measurement Endpoint |
|---|---|
| Adverse effects on the survival, reproduction, and/or growth of soil invertebrates | • Survival, growth, and/or reproduction of soil invertebrates were evaluated by comparing the measured concentrations of chemicals in the surface soil to invertebrate soil screening levels. |
| Adverse effects on the survival, reproduction, and/or growth of terrestrial plants | • Survival, growth, and/or reproduction of terrestrial plants were evaluated by comparing the measured concentrations of chemicals in the surface soil to plant soil screening levels. |
| Adverse effects on the survival, reproduction, and/or increase in development effects of invertivorous birds | • Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the surface soil and earthworms to No Observed Adverse Effects Levels (NOAELs) and Lowest Observed Adverse Effects Levels (LOAELs) for surrogate wildlife species. |
| Adverse effects on the survival, reproduction, and/or increase in development effects of invertivorous mammals | • Survival, reproduction, and/or increase in development effects of mammals were evaluated by comparing the estimated ingested dose of contaminants in the surface soil and earthworms to NOAELs and LOAELs for surrogate wildlife species. |
| Adverse effects on the survival, reproduction, and/or increase in development effects of herbivorous birds | • Survival, reproduction, and/or increase in development effects of birds were evaluated by comparing the estimated ingested dose of contaminants in the surface soil and plants to NOAELs and LOAELs for surrogate wildlife species. |
| Adverse effects on the survival, reproduction, and/or increase in development effects of herbivorous mammals | • Survival, reproduction, and/or increase in development effects of mammals will be evaluated by comparing the estimated ingested dose of contaminants in the surface soil and plants to NOAELs and LOAELs for surrogate wildlife species. |

**TABLE 8-2**

**SOIL SCREENING LEVELS**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**

| Parameter | Ecological Soil Screening Level | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Plant | | Invertebrate | | Avian | | Mammal | |
| | Value | Source | Value | Source | Value | Source | Value | Source |
| **METALS (MG/KG)** | | | | | | | | |
| ALUMINUM | NA(1) | EcoSSL | NA(1) | EcoSSL | NA(1) | EcoSSL | NA(1) | EcoSSL |
| BARIUM | 500 | ORNL | 330 | EcoSSL | 1.04 | Region 5(2) | 2000 | EcoSSL |
| CADMIUM | 32 | EcoSSL | 140 | EcoSSL | 0.77 | EcoSSL | 0.36 | EcoSSL |
| CHROMIUM | 78 | CCME | 78 | CCME | 26 | EcoSSL | 34 | EcoSSL |
| COPPER | 70 | EcoSSL | 80 | EcoSSL | 28 | EcoSSL | 49 | EcoSSL |
| LEAD | 120 | EcoSSL | 1700 | EcoSSL | 11 | EcoSSL | 56 | EcoSSL |
| MAGNESIUM | NA | NA | NA | NA | NA | NA | NA | NA |
| MANGANESE | 220 | EcoSSL | 450 | EcoSSL | 4300 | EcoSSL | 4000 | EcoSSL |
| POTASSIUM | NA | NA | NA | NA | NA | NA | NA | NA |
| SODIUM | NA | NA | NA | NA | NA | NA | NA | NA |
| STRONTIUM | NA | NA | NA | NA | NA | NA | NA | NA |
| ZINC | 160 | EcoSSL | 120 | EcoSSL | 46 | EcoSSL | 79 | EcoSSL |
| **VOLATILES (MG/KG)** | | | | | | | | |
| CIS-1,2-DICHLOROETHENE | 0.784 | Region 5(3) | 0.784 | Region 5(3) | 0.784 | Region 5(3) | 0.784 | Region 5(3) |
| TRICHLOROETHENE | 3 | CCME | 3 | CCME | 12.4 | Region 5(2) | 12.4 | Region 5(2) |

Ecological Screening Level sources used in the order of preference:

EcoSSL - EPA Ecological Soil Screening Levels (USEPA, 2003b, 2005a-d, 2007b-d, 2008)

Region 5 - USEPA Region 5 Ecological Screening Levels (USEPA, 2003a). Screening level based on the lowest value for plant, soil invertebrates, meadow vole, or masked shrew. If no alternate screening level is available, Region 5 value is presented for all receptors.

CCME - Canadian Soil Quality Guidelines (CCME, 1999, 2006)

ORNL - Oak Ridge National Laboratory Toxicological Benchmarks for plants (Efroymson et al., 1997a)

Footnotes:

1 - Aluminum is considered a COPC only when the soil pH is less than 5.5.

2 - Value based on exposure to a shrew.

3 - Trans-1,2-dichloroethene used as surrogate. Value based on exposure to a shrew.

NA - Not available.

**TABLE 8-3**

**SURFACE SOIL COPC SELECTION FOR IA 1**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**

| Parameter | Frequency of Detection | Minimum Concentration | Maximum Concentration | Sample of Maximum Concentration | Average of Positive Concentrations(1) | Average of All Results(2) | Maximum Background Concentration(3) | Ecological Screening Level(4) | | | | Ecological Effects Quotient(5) | | | | Deletion or Selection of COPCs for Invertebrates/Plants | | Further Evaluated in Terrestrial Food Chain Modeling(6) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Plant | Invertebrate | Avian | Mammal | Plant | Invertebrate | Avian | Mammal | COPC (yes/no)? | Rationale | Evaluated (yes/no)? | Rationale |
| **METALS (MG/KG)** | | | | | | | | | | | | | | | | | | | |
| **ALUMINUM** | 3/3 | 6890 | 21400 | 27SS001G0001 | 13630 | 13630 | **17400** | NA | NA | NA | NA | **NA** | **NA** | **NA** | **NA** | **YES** | NSL | NO | NONBIO |
| **BARIUM** | 3/3 | 80.9 J | 192 J | 27SS001G0001 | 132 | 132.3 | **153** | 500 | 330 | 1.04 | 2000 | 0.38 | 0.58 | **185** | 0.10 | NO | BSL | **YES** | ASL |
| **CADMIUM** | 2/3 | 0.312 J | 0.783 | 27SS003G0001 | 0.55 | 0.58 | 3.6 | 32 | 140 | 0.77 | 0.36 | 0.024 | 0.0056 | **1.0** | **2.2** | NO | BSL | **YES** | ASL |
| **CHROMIUM** | 3/3 | 17.2 | 32.2 | 27SS001G0001 | 24.6 | 24.6 | **21.7** | 78 | 78 | 26 | 34 | 0.41 | 0.41 | **1.2** | 0.95 | NO | BSL | **YES** | ASL |
| COPPER | 3/3 | 15.2 | 18.3 | 27SS003G0001 | 16.3 | 16.3 | **17.1** | 70 | 80 | 28 | 49 | 0.26 | 0.23 | 0.65 | 0.37 | NO | BSL | NO | BSL |
| **LEAD** | 3/3 | 20.8 J | 32 J | 27SS001G0001 | 26.2 | 26.2 | **21.5** | 120 | 1700 | 11 | 56 | 0.27 | 0.019 | **2.9** | 0.57 | NO | BSL | **YES** | ASL |
| MAGNESIUM | 3/3 | 715 J | 4190 J | 27SS003G0001 | 2155 | 2155 | **2250** | NA | NA | NA | NA | NA | NA | NA | NA | NO | NUT | NO | NUT |
| **MANGANESE** | 3/3 | 374 J | 5550 J | 27SS001G0001 | 2124 | 2124 | **3040** | 220 | 450 | 4300 | 4000 | **25.2** | **12.3** | **1.3** | **1.4** | **YES** | ASL | **YES** | ASL |
| POTASSIUM | 3/3 | 535 J | 755 J | 27SS008G0001 | 661 | 661 | 1490 | NA | NA | NA | NA | NA | NA | NA | NA | NO | NUT | NO | NUT |
| SODIUM | 1/3 | 216 J | 216 J | 27SS003G0001 | 216 | 135 | **23.7** | NA | NA | NA | NA | NA | NA | NA | NA | NO | NUT | NO | NUT |
| **STRONTIUM** | 3/3 | 7.1 J | 12.3 J | 27SS003G0001 | 9.8 | 9.8 | 63.2 | NA | NA | NA | NA | **NA** | **NA** | **NA** | **NA** | **YES** | NSL | NO | NONBIO |
| **ZINC** | 3/3 | 53.8 J | 73.7 J | 27SS008G0001 | 62.5 | 62.5 | **60.2** | 160 | 120 | 46 | 79 | 0.46 | 0.61 | **1.6** | 0.93 | NO | BSL | **YES** | ASL |
| **VOLATILES (MG/KG)** | | | | | | | | | | | | | | | | | | | |
| CIS-1,2-DICHLOROETHENE | 1/3 | 0.0018 J | 0.0018 J | 27SS003G0001 | 0.0018 | 0.0015 | -- | 0.784 | 0.784 | 0.784 | 0.784 | 0.0023 | 0.0023 | 0.0023 | 0.0023 | NO | BSL | NO | BSL |
| TRICHLOROETHENE | 1/3 | 0.0043 J | 0.0043 J | 27SS003G0001 | 0.0043 | 0.0023 | -- | 3 | 3 | 12.4 | 12.4 | 0.0014 | 0.0014 | 0.00035 | 0.00035 | NO | BSL | NO | BSL |

Shaded criterion indicates that the maximum detected concentration exceeds screening criterion or criterion is not available. Shaded chemical name indicates that the chemical was retained as a COPC or retained for food chain modeling..

NA - Not applicable/not available

J - Estimated concentration

COPC Selection Rationale:

ASL = Above Screening Level
BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level
NUT = Essential Nutrient

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - To determine whether chemical concentrations were within background levels, maximum detected concentrations were compared to maximum background concentrations. The results of a statistical analysis were not used because only a limited set of samples are evaluated in this ecological
4 - Sources of ecological screening levels presented in Table 8-2.
5 - Ecological Effects Quotients (EEQs) were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
6 - Chemicals with EEQs for birds or mammals greater than 1.0 or bioaccumulative chemicals without bird or mammal screening values are retained for food chain modeling.

**TABLE 8-4**

**SURFACE SOIL COPC SELECTION FOR IA 2**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**

| Parameter | Frequency of Detection | Minimum Concentration | Maximum Concentration | Sample of Maximum Concentration | Average of Positive Concentrations(1) | Average of All Results(2) | Background Concentration(3) | Ecological Screening Level(4) | | | | Ecological Effects Quotient(5) | | | | Deletion or Selection of COPCs for Invertebrates/Plants | | Further Evaluated in Terrestrial Food Chain Modeling(6) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Plant | Invertebrate | Avian | Mammal | Plant | Invertebrate | Avian | Mammal | COPC (yes/no)? | Rationale | Evaluated (yes/no)? | Rationale |
| **METALS (MG/KG)** | | | | | | | | | | | | | | | | | | | |
| **ALUMINUM** | 2/2 | 7740 | 17800 | 27SS058G0001 | 12770 | 12770 | **17400** | NA | NA | NA | NA | **NA** | **NA** | **NA** | **NA** | **YES** | NSL | NO | NONBIO |
| **BARIUM** | 2/2 | 88.8 | 132 | 27SS063G0002 | 110.4 | 110.4 | 153 | 500 | 330 | 1.04 | 2000 | 0.26 | 0.40 | **127** | 0.066 | NO | BSL | **YES** | ASL |
| **CADMIUM** | 1/2 | 0.798 J | 0.798 J | 27SS063G0002 | 0.798 | 0.43 | 3.6 | 32 | 140 | 0.77 | 0.36 | 0.025 | 0.0057 | **1.0** | **2.2** | NO | BSL | **YES** | ASL |
| CHROMIUM | 2/2 | 11.3 J | 19.7 J | 27SS058G0001 | 15.5 | 15.5 | 21.7 | 78 | 78 | 26 | 34 | 0.25 | 0.25 | 0.76 | 0.58 | NO | BSL | NO | BSL |
| COPPER | 2/2 | 9.71 | 18.2 | 27SS058G0001 | 13.955 | 13.955 | **17.1** | 70 | 80 | 28 | 49 | 0.26 | 0.23 | 0.65 | 0.37 | NO | BSL | NO | BSL |
| **LEAD** | 2/2 | 13.6 | 15.8 | 27SS063G0002 | 14.7 | 14.7 | 21.5 | 120 | 1700 | 11 | 56 | 0.13 | 0.0093 | **1.4** | 0.28 | NO | BSL | **YES** | ASL |
| MAGNESIUM | 2/2 | 3520 J | 11000 J | 27SS063G0002 | 7260 | 7260 | **2250** | NA | NA | NA | NA | NA | NA | NA | NA | NO | NUT | NO | NUT |
| **MANGANESE** | 2/2 | 231 | 426 | 27SS063G0002 | 328.5 | 328.5 | 3040 | 220 | 450 | 4300 | 4000 | **1.9** | 0.95 | 0.10 | 0.11 | **YES** | ASL | NO | BSL |
| POTASSIUM | 2/2 | 695 J | 878 J | 27SS058G0001 | 786.5 | 786.5 | 1490 | NA | NA | NA | NA | NA | NA | NA | NA | NO | NUT | NO | NUT |
| SODIUM | 1/2 | 773 J | 773 J | 27SS063G0002 | 773 | 433 | **23.7** | NA | NA | NA | NA | NA | NA | NA | NA | NO | NUT | NO | NUT |
| **STRONTIUM** | 2/2 | 28.3 | 234 | 27SS063G0002 | 131.15 | 131.15 | **63.2** | NA | NA | NA | NA | **NA** | **NA** | **NA** | **NA** | **YES** | NSL | NO | NONBIO |
| **ZINC** | 2/2 | 51.6 J | 60.2 J | 27SS063G0002 | 55.9 | 55.9 | 60.2 | 160 | 120 | 46 | 79 | 0.38 | 0.50 | **1.3** | 0.76 | NO | BSL | **YES** | ASL |

Shaded criterion indicates that the maximum detected concentration exceeds screening criterion or criterion is not available. Shaded chemical name indicates that the chemical was retained as a COPC or retained for food chain modeling.

NA - Not applicable/not available

J - Estimated concentration

COPC Selection Rationale:

ASL = Above Screening Level
BSL = Below Screening Level
NONBIO = Non-bioaccumulative chemical
NSL = No Screening Level
NUT = Essential Nutrient

Footnotes:
1 - Average of detected concentrations only.
2 - Average of all analytical results including one-half of the detection limit for non-detects.
3 - To determine whether chemical concentrations were within background levels, maximum detected concentrations were compared to maximum background concentrations. The results of a statistical analysis were not used because only a limited set of samples are evaluated in this
4 - Sources of ecological screening levels presented in Table 8-2.
5 - Ecological Effects Quotients (EEQs) were calculated by dividing the maximum detected concentration by the ecological screening level. Values are unitless.
6 - Chemicals with EEQs for birds or mammals greater than 1.0 or bioaccumulative chemicals without bird or mammal screening values are retained for food chain modeling.

**TABLE 8-5**

**TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO**
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS**
**SWMU 27 - IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| | Herbivorous Receptors EEQs | | | | Invertivorous Receptors EEQs | | | |
|---|---|---|---|---|---|---|---|---|
| | Bobwhite Quail | | Meadow Vole | | Woodcock | | Short-Tailed Shrew | |
| **Chemical** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** |
| **INORGANICS** | | | | | | | | |
| BARIUM | 2.8E-01 | 1.4E-01 | 4.1E-02 | 2.5E-02 | 4.3E-01 | 2.1E-01 | 7.6E-02 | 4.8E-02 |
| CADMIUM | 4.5E-02 | 1.0E-02 | 4.3E-02 | 4.8E-03 | 8.6E-01 | 2.0E-01 | 1.5E+00 | 1.7E-01 |
| CHROMIUM | 2.2E-01 | 3.8E-02 | 5.7E-02 | 2.4E-03 | 1.0E+00 | 1.8E-01 | 7.7E-01 | 3.2E-02 |
| MANGANESE | 6.8E-01 | 3.3E-01 | 7.0E-01 | 2.5E-01 | 1.1E+00 | 5.2E-01 | 1.1E+00 | 3.8E-01 |
| LEAD | 3.9E-01 | 6.6E-02 | 3.6E-02 | 5.6E-03 | 2.1E+00 | 3.5E-01 | 5.1E-01 | 8.0E-02 |
| ZINC | 9.6E-02 | 3.7E-02 | 4.2E-02 | 1.1E-02 | 1.0E+00 | 3.9E-01 | 8.0E-01 | 2.0E-01 |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

**TABLE 8-6**

**TERRESTRIAL FOOD CHAIN MODEL - TIER 1 SCENARIO**
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS**
**SWMU 27 - IA 2**
**NSA CRANE**
**CRANE, INDIANA**

| | Herbivorous Receptors EEQs | | | | Invertivorous Receptors EEQs | | | |
|---|---|---|---|---|---|---|---|---|
| | Bobwhite Quail | | Meadow Vole | | Woodcock | | Short-Tailed Shrew | |
| **Chemical** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** |
| **INORGANICS** | | | | | | | | |
| BARIUM | 1.9E-01 | 9.5E-02 | 2.8E-02 | 1.8E-02 | 3.0E-01 | 1.5E-01 | 5.2E-02 | 3.3E-02 |
| CADMIUM | 4.6E-02 | 1.1E-02 | 4.4E-02 | 4.9E-03 | 8.8E-01 | 2.0E-01 | 1.5E+00 | 1.7E-01 |
| LEAD | 2.1E-01 | 3.6E-02 | 2.2E-02 | 3.4E-03 | 1.1E+00 | 1.9E-01 | 2.9E-01 | 4.5E-02 |
| ZINC | 8.4E-02 | 3.3E-02 | 3.8E-02 | 9.5E-03 | 9.3E-01 | 3.6E-01 | 7.4E-01 | 1.9E-01 |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient

**TABLE 8-7**

**STEP 3A EVALUATION FOR RISKS TO PLANTS AND INVERTEBRATES**
**SURFACE SOIL COPCs**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**

| Area | Chemical of Potential Concern (COPC) | Frequency of Detection | Maximum Detected Concentration | Screening Level[1] | | Maximum EEQ[2] | | Step 3a Evaluation[3] | | | | | Risk Determination (Acceptable/ Unacceptable) | Retained as a COPC? | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Maximum Background | Alternate Benchmark[4] | | Step 3a Factors Considered in Evaluation | | | | |
| | | | | Plants | Invertebrates | Plants | Invertebrates | Value | Value | Source | Plants | Invertebrates | | Plants | Invertebrates |
| IA 1 | **Inorganics (mg/kg)** | | | | | | | | | | | | | | |
| | ALUMINUM | 3/3 | 21400 | 50 | NA | 428.0 | NA | 17400 | NA | NA | Chemical not considered bioavailable. | Chemical not considered bioavailable. | Acceptable | No | No |
| | MANGANESE | 3/3 | 5550 | 220 | 450 | 25.2 | 12.3 | 3040 | NA | NA | Limited habitat available. | Exceeded screening value and background in one sample. Limited area impacted. | Acceptable | No | No |
| | STRONTIUM | 3/3 | 12.3 | NA | NA | NA | NA | 63.2 | NA | NA | Less than background. | Less than background. | Acceptable | No | No |
| IA 2 | **Inorganics (mg/kg)** | | | | | | | | | | | | | | |
| | ALUMINUM | 2/2 | 17800 | 50 | NA | 356.0 | NA | 17400 | NA | NA | Chemical not considered bioavailable. | Chemical not considered bioavailable. | Acceptable | No | No |
| | MANGANESE | 2/2 | 426 | 220 | 450 | 1.9 | 0.9 | 3040 | NA | NA | Less than background | Not a COPC for invertebrates. | Acceptable | No | No |
| | STRONTIUM | 2/2 | 234 | NA | NA | NA | NA | 63.2 | NA | NA | Limited habitat available. | Exceeded background. Not particularly hazardous. | Acceptable | No | No |

**Footnotes:**

1 Sources of ecological screening levels presented in Table 8-2.
2 Maximum detection divided by screening level.
3 See Section 8.4 for a more detailed Step 3a evaluation.
4 Canadian and ORNL benchmarks considered in Step 3a evaluation.

**Acronyms:**

COPC = Chemical of Potential Concern
EEQ = Ecological Effects Quotient
NA = Not Available or Not Applicable
ORNL = Oak Ridge National Laboratory
SQG = Soil Quality Guideline
Canadian SQG = Guideline for protection of plants and soil invertebrates (CCME, 1999).
ORNL plant = Benchmark for toxicity of chemicals to plants (Efroymson et al. 1997a).

**TABLE 8-8**

**TERRESTRIAL FOOD CHAIN MODEL - TIER 2, STEP 3A SCENARIO**
**INSECTIVOROUS AND HERBIVOROUS RECEPTORS**
**SWMU 27 - IA 1**
**NSA CRANE**
**CRANE, INDIANA**

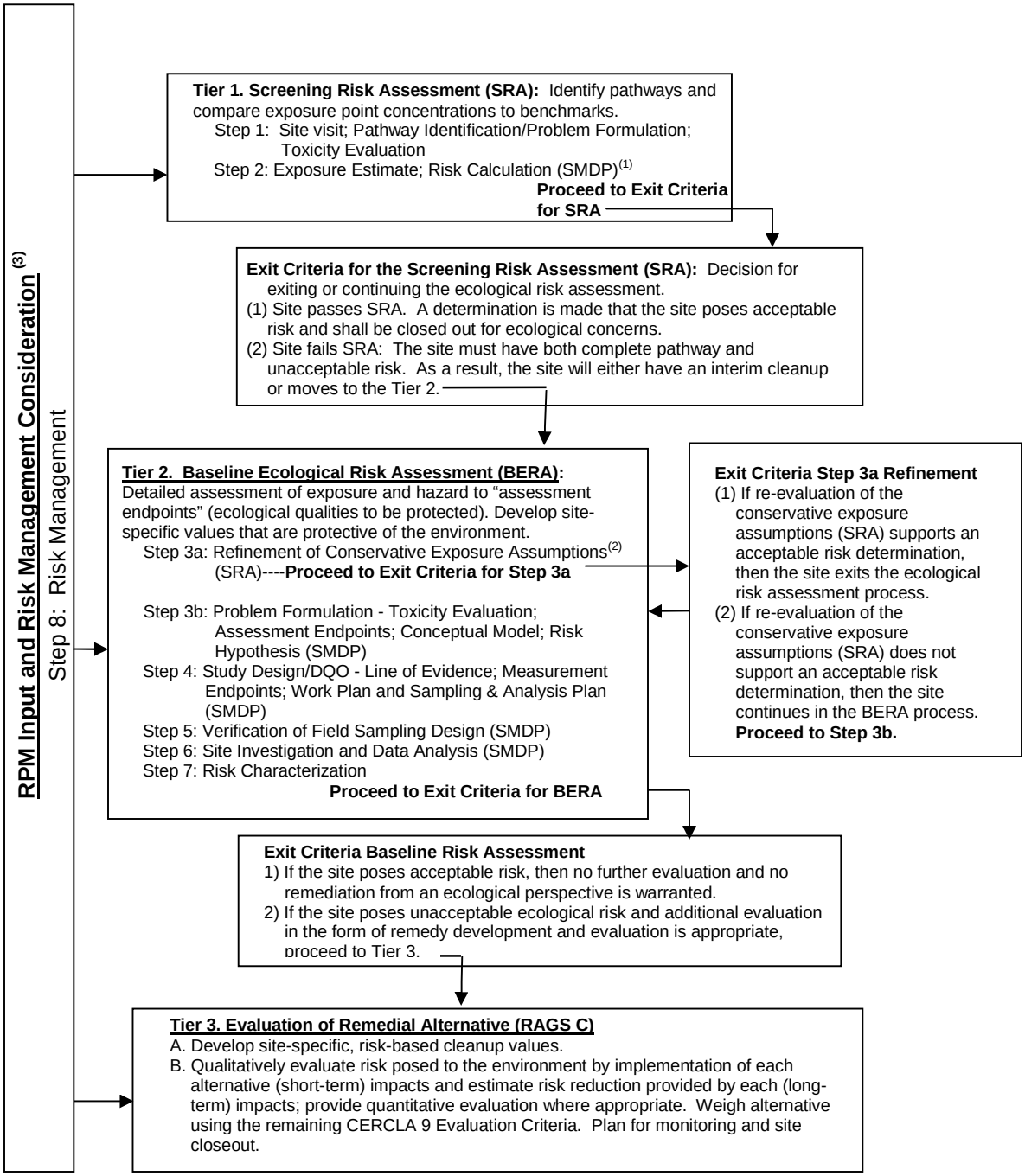
| | Herbivorous Receptors EEQs | | | | Invertivorous Receptors EEQs | | | |
|---|---|---|---|---|---|---|---|---|
| | Bobwhite Quail | | Meadow Vole | | Woodcock | | Short-Tailed Shrew | |
| **Chemical** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** | **NOAEL-based** | **LOAEL-based** |
| **INORGANICS** | | | | | | | | |
| MANGANESE | 1.4E-01 | 6.4E-02 | 1.8E-01 | 6.5E-02 | 1.6E-01 | 7.7E-02 | 1.9E-01 | 6.8E-02 |
| LEAD | 1.6E-01 | 2.7E-02 | 2.0E-02 | 3.2E-03 | 1.1E+00 | 1.8E-01 | 2.4E-01 | 3.7E-02 |

Cells are shaded if the value is greater than 1.0

NOAEL - No Observed Adverse Effects Level
LOAEL - Lowest Observed Adverse Effects Level
EEQ - Ecological Effects Quotient
NV - No value determined

# FIGURE 8-1

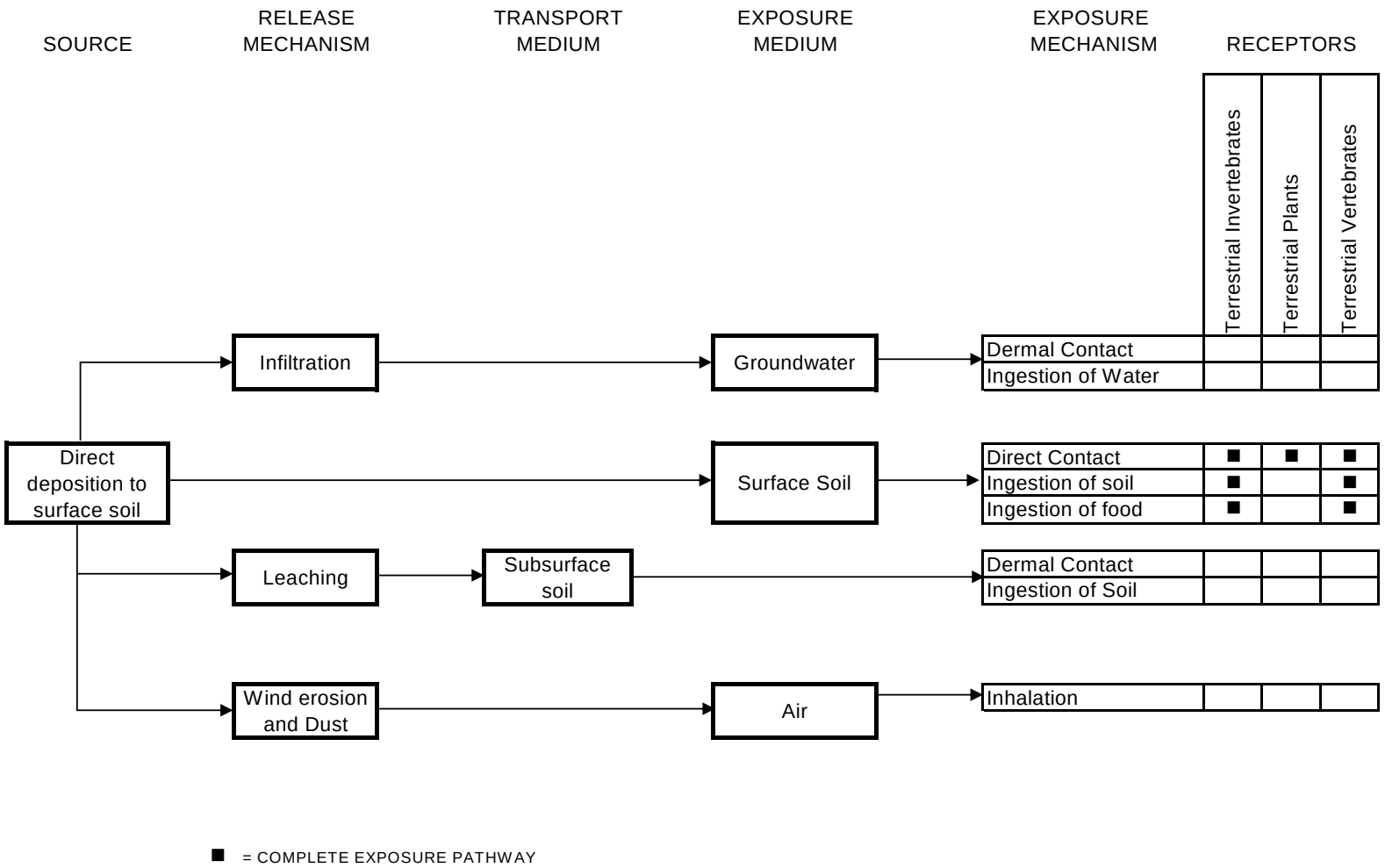
## NAVY ECOLOGICAL RISK ASSESSMENT TIERED APPROACH
## SWMU 27
## NSA CRANE
## CRANE, INDIANA




Notes: 1 See USEPA's 8 Steps ERA Process for requirements for each Scientific Management Decision Point (SMDP).
2 Refinement includes but is not limited to background, bioavailability, detection frequency, etc.
3 Risk management is incorporated throughout the tiered approach.

**FIGURE 8-2**

**ECOLOGICAL CONCEPTUAL SITE MODEL**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**




Blank space indicates incomplete exposure pathway or relatively insignificant or not applicable potential exposure.

# REFERENCES

Army, 1978. Installation Assessment of the NSWC Crane, Record of Evaluation Report No. 117. Aberdeen Proving Ground, Maryland, March.

A.T. Kearney, 1987. Preliminary Review/Visual Site Inspection Report of Naval Weapons Support Center. Crane, Indiana. USEPA ID IN5170023498. Prepared for U.S. Environmental Protection Agency Region V by A. T. Kearney, Inc. March.

Braun, E.L., 1950. Deciduous Forests of Eastern North America. Blakiston Company, Philadelphia, Pennsylvania.

CCME, 1999. Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Chromium. Updated In: Canadian Environmental Quality Guidelines, 1999, Canadian Council of Ministers of the Environmental, Winnipeg.

Comarco Systems, 2000. Endangered Species Management Plan for the Crane Division, Naval Surface Warfare Center. Comarco Systems, Inc., October.

Deam, Charles C., 1940. Flora of Indiana. Indiana Department of Conservation, Division of Forestry, Indianapolis, Indiana, Wm. B. Burford Printing Company, Indianapolis.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory. November. ES/ER/TM-85/R3.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory. November. ES/ER/TM-126/R2.

ESI, 2005. 2005 Summer Mist Net Survey for Bats at the Naval Support Activity, Crane, Indiana. December.

Halliburton NUS, 1992a. RFI Phase I, Environmental Monitoring Report, SWMUs 19/00, 08/17. 12/14, 13/14. Navy Northern Division, CTO 15, August.

Halliburton NUS, 1992b. RFI Phase I, Environmental Monitoring Report, SWMUs 15/06, 14/10, 16/16, NorthDiv, CTO 15, November.

Hengeveld, D., 1987. "Results of the Survey of Bird Species at the Naval Weapons Support Center, Crane." In An Inventory of Natural Areas and Rare Plant Species at the Naval Weapons Support Center Crane, Indiana. Indiana Department of Natural Resources, Division of Natural Preserves, Indianapolis, Indiana.

IDEM, 2009. Risk Integrated System of Closure Users Technical Resource Guidance Document. Indiana Department of Environmental Management, Revised May 1, 2009.

IDEM, 2012. Remediation Closure Guide. Office of Land Quality. Indiana Department of Environmental Management, March 12.

Irwin, R.J., M. VanMouwerik, L. Stevens, M.D. Seese, and W. Basham. 1997. Environmental Contaminants Encyclopedia. National Park Service, Water Resources Division, Fort Collins, Colorado. Distributed within the Federal Government as an Electronic Document (Projected public availability on the internet or NTIS: 1998).

Kuchler, A.W., 1964. Potential Natural Vegetation of the Conterminous United States. American Geographical Society, Special Publication No. 36, New York, New York.

Kvale, E.P., 1992, Report on the Surface Geological Mapping of Crane Naval Surface Warfare Center, Crane Indiana, Indiana University, Open File Report 92-10 (with enclosures).

Kvale, E.P., and M.L. Barnhill, 1994. Evolution of Lower Pennsylvanian Estuarine Facies Within Two Adjacent Paleo Valleys, Illinois Basin, Indiana, In Incised—Valley Systems: Origin and Sedimentary Sequences, Society of Sedimentary Geology, Special Publications No. 51, pp. 191-207.

Lindsey, A.A., D.V. Schmelz, and S.A. Nichols, 1970. Natural Areas in Indiana and Their Preservation. American Midland Naturalist, Department of Biology, University of Notre Dame, Indiana. 594 pp.

Mitchell, Wayne R. and Elizabeth P. Burrows, 1990. Assessment of Red Phosphorus in the Environment. US Army Biomedical Research and Development Laboratory. Fort Detrick, Frederick, Maryland. Technical Report AD-A221 704. March.

Murphy, W.L., and R. Wade, 1998. Final Report, RCRA Facility Investigation, Phase II Groundwater Release Assessment, SWMU 06/09 Demolition Area, and Phase III Release Characterization, SWMU 07/09 Old Rifle Range, Naval Surface Warfare Center, Crane, Indiana. Technical Report GL-98-8, U. S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, MS.

Navy, 1997. Environmental Policy Memorandum 97 04: Use of Ecological Risk Assessments. May 16.

Navy, 1999. Navy Policy For Conducting Ecological Risk Assessments. Memo from Chief of Naval Operations to Commander, Naval Facilities Engineering Command. Department of the Navy, Washington, DC, April 5.

Navy, 2001. Conducting Human Health Risk Assessments Under the Environmental Restoration Program, Chief of Naval Operations (N45) 5090 Ser N453E/1U595168. February

Navy, 2002. Guidance for Environmental Background Analysis, Volume I: Soil. Prepared by Battelle Memorial Institute, Earth Tech, Inc., and Newfields for the Naval Facilities Engineering Command, Washington D.C., April 2002.

Navy, 2004. Navy Policy on the Use of Chemical Background Levels, Ser N 45C/N4U732212, Washington, D.C. January.

Navy, 2008. U.S. Navy Human Health Risk Assessment Guidance. December

NEESA (Naval Energy and Environmental Support Activity), 1983. Initial Assessment Study of Naval Weapons Support Center Crane. Crane, Indiana. NEESA 13-003. May.

Nelson, C.E., M.A. Ewert, and S.A. Cortwright, 1987. "A Field Survey of Amphibians and Reptiles at Crane Naval Weapons Support Center, Martin County, Indiana with Emphasis on Rare and Unusual Species." In An Inventory of Natural Areas and Rare Plant Species at the Naval Weapons Support Center Crane, Indiana. Indiana Department of Natural Resources, Division of Nature Preserves, Indianapolis, Indiana.

NOAA, 1988. National Oceanic and Atmospheric Administration, National Climatic Data Center, Local Climatological Data, Part III — Central Region, Indianapolis, Indiana, March.

ORNL, 1998. Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants. BJC/OR-133 (for aluminum in soil). September.

Smith, Robert L. 1966. Ecology and Field Biology. Harper and Row, Publishers, Inc.

Tetra Tech, 2001. Final Basewide Background Soil Investigation Report, Naval Surface Warfare Center Crane, Crane, Indiana. January.

Tetra Tech, 2010. Health and Safety Plan. Resource Conservation and Recovery Act Facility Investigation. SWMU 27 – Illuminant Building 126. Naval Support Activity (NSA) Crane. Crane, Indiana. August.

Tetra Tech, 2011a. Site Inspection Report Addendum, Area of Concern (AOC) 2 – Pyrotechnics (Pyro) Area Outside Test Burn Pads at Naval Support Activity, Crane, CTO F272, for Naval Support Activity Crane, Crane, Indiana, November.

Tetra Tech, 2011b. Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) for SWMU 27 – Illuminant Building 126, Resource Conservation and Recovery Act Facility Investigation, Naval Support Activity Crane, Crane, Indiana, January.

USEPA,1986. Test Methods for Evaluating Solid Waste; Physical/Chemical Methods (SW-846), 3rd Edition (including Update III). Office of Solid Waste and Emergency Response, Washington, DC.

USEPA, 1989. Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A). EPA 540/1-89/002, Office of Emergency and Remedial Response, Washington, D.C., December

USEPA, 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Directive 9285.6 03, Office of Solid Waste and Emergency Response, Washington, D.C. March.

USEPA, February 1992. “Guidance and Risk Characterization for Risk Managers and Risk Assessors.” Memorandum from F. Henry Habicht, Deputy Administrator, Washington, D.C.

USEPA, 1993a. Distribution of Preliminary Review Draft: Superfund’s Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure. Office of Solid Waste and Emergency Response, Washington, D.C., May

USEPA, 1993b. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. EPA/600/R-93/089. Office of Research and Development, Washington, D.C., July

USEPA, 1993c. Wildlife Exposure Factors Handbook. EPA/600/R-93/187a. Office of Research and Development. Washington, DC, 1993.

USEPA, 1994. Revised Interim Guidance on Establishing Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive 9355.4-12, July 14, 1994. July.

USEPA, 1997a. Exposure Factors Handbook. EPA/600/P 95/002Ba, National Center for Environmental Assessment, Washington, D.C., August

USEPA, 1997b. Health Effects Assessment Summary Tables FY 1997. Office of Solid Waste and Emergency Response, Washington, D.C. July.

USEPA, 1997c. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. Environmental Response Team, June 5.

USEPA, 1998. Final Guidelines for Ecological Risk Assessment. Risk Assessment Forum, Washington, DC, EPA/630/R095/002F. April.

USEPA, 2001. Risk Assessment Guidance for Superfund: Volume 1 - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments), December.

USEPA, 2002a. Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Publication EPA530-D-02-052, November.

USEPA, 2002b. Guidance for Quality Assurance Project Plans (EPA QA/G-5). USEPA/240/R-02/009. USEPA Office of Environmental Information, Washington DC. December.

USEPA, 2002c. Guidance for Characterizing Background Chemicals in Soil at Superfund Sites. Office of Solid Waste and Emergency Response and Office of Emergency and Remedial Response, EPA/540/R-01/003. OSWER 9285.7-41, September .

USEPA, 2002d. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. Office of Emergency and Remedial Response. OSWER Publication No. 9285.6-10, December.

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

USEPA, 2003a. Ecological Screening Levels (ESLs) (for water and soil). USEPA Region 5 (http://www.epa.gov/reg5rcra/ca/edql.htm). August.

USEPA, 2003b. Ecological Soil Screening Level for Aluminum, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-60. November.

USEPA, 2003c. Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. EPA-540-R-03-001. December 1996 finalized January.

USEPA, 2003d. Human Health Toxicity Values in Superfund Risk Assessments. Office of Superfund Remediation and Technology Innovation, OSWER 9285.7-53, Washington, DC, December .

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005, Office of Emergency and Remedial Response, Washington, D.C. July.

U.S. EPA, 2005a. Guidance for Developing Ecological Soil Screening Levels. Office of Solid Waste and Emergency and Response. OSWER Directive 92857-55. February.

USEPA, 2005b. Ecological Soil Screening Level for Barium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-63. February.

USEPA, 2005c. Ecological Soil Screening Level for Cadmium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-65. March.

USEPA, 2005d. Ecological Soil Screening Level for Lead, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-70. March.

USEPA, 2005e. Uniform Federal Policy for Quality Assurance Plans (UFP-QAPP), Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs (Final Version 1), EPA-505-B-04-900A. March.

USEPA, 2005f. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum, Washington, DC, March.

USEPA, 2005g. Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum, Washington, DC, March .

USEPA, 2006. National Recommended Water Quality Criteria: 2006 (for copper). Office of Water.

USEPA, 2007a. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

USEPA, 2007b. Ecological Soil Screening Level for Copper, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-68. February.

USEPA, 2007c. Ecological Soil Screening Level for Manganese, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-71. April.

USEPA, 2007d. Ecological Soil Screening Level for Zinc, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-73. November.

USEPA, 2008. Ecological Soil Screening Level for Chromium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-66. April.

USEPA, 2009a. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment), Final. Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA-540-R-070-002, OSWER 9285.7-82. January .

USEPA, 2009b. Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameters. Office of Superfund Remediation and Technology Innovation, Washington, D.C. OSWER 9200.2-82. June.

USEPA, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites, prepared by Oak Ridge National Laboratory. http://epa prgs.ornl.gov/chemicals/index.shtml. May.

Watts, P., P. Howe, and M. Wood. 2010 Concise International Chemical Assessment Document 77, Strontium and Strontium Compounds. Published under the joint sponsorship of the United Nations Environment Programme, the International Labour Organization and the World Health Organization.

# APPENDIX A

## A.1 SAMPLING LOG SHEETS

## A.2 CHAIN-OF-CUSTODY FORMS

## A.1 SAMPLING LOG SHEETS

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS001G0001
Sample Location: 27SB001
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1430 | 0-1' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | | | | |
| Method: | | | | |
| Monitor Readings (Range in ppm): | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected near concrete drainage culvert.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS002G0001
Sample Location: 27SB002
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | 0-1' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | X | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected on SW side of B-1884.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS003G0001
Sample Location: 27SB003
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1440 | 0-1' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected outside fence line in drainage channel.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS004G0001
Sample Location: 27SB004
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | 0-1' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected west of B-134 on north side of road

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS005G0001
Sample Location: 27SB005
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | 0-1' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected west of B-134 on south side of road

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS006G0001
Sample Location: 27SB006
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | 0-1' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected east of B-135 on north side of road

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS007G0001
Sample Location: 27SB007
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | 0-1' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected east of B-135 on south side of road

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS008G0001
Sample Location: 27SB008
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1450 | 0-1' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected in drainage channel south of SB007 (outside fence) just before beginning of concrete culvert

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS009G0001
Sample Location: 27SB009
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | | | |
| Time: | 1435 | 0-1' | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected in wrong place. GPS indicated sample location in asphalt parking lot. Later added sample SB063 in correct location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS010C0002
Sample Location: 27SB010
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/11/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Samples collected along side of former concrete pad in grass.

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS011G0002
Sample Location: 27SB011
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/9/2011 | 0.-2' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected north of B-3297 in grassy area.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS012G0002
Sample Location: 27SB012
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/9/2011 | | | |
| Time: | | 0.-2' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected north of B-3297 in grassy area.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS013G0002
Sample Location: 27SB013
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0.-2' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected just off asphalt parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS014G0002
Sample Location: 27SB014
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | | | |
| Time: | | 0.-2' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected just off asphalt parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS015G0002
Sample Location: 27SB015
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: 4/7/2011 | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | 0.-2' | | |
| Method: DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected beneath asphalt parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS016G0002
Sample Location: 27SB016
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | 0.-2' | | |
| Time: | | | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected beneath asphalt parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS017G0002
Sample Location: 27SB017
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-1' | | asphalt |
| Time: | | 1-2' | tan | sandy gravel, dry |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected under asphalt in parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB017G0204
Sample Location: 27SB017
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 2-4' | grey | clay w/ brown mottling, moist |
| Time: | | | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB017G0406
Sample Location: 27SB017
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 4-6' | brown | clay, wet |
| Time: | | | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS018G0002
Sample Location: 27SB018
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-0.5' | | asphalt |
| Time: | | 0.5-2' | white/grey | gravel, dry |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected under asphalt in parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB018G0204
Sample Location: 27SB018
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 2-4' | white | sandy gravel |
| Time: | | | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB018G0406
Sample Location: 27SB018
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 4-6' | grey | consolidated clay, moist |
| Time: | | | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS019C0002
Sample Location: 27SB019
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample aliquots collected around B-130 pit. Dark soil.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS020C0002
Sample Location: 27SB020
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Collected aliquots from around B-133 pit.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS021C0002
Sample Location: 27SB021
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample aliquots collected around B-1885 pit. Dark soil.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS022C0002
Sample Location: 27SB022
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample aliquots collected around B-1886 pit. Dark soil.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS023C0002
Sample Location: 27SB023
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Collected aliquots from around what was believed B-2698 pit; however, turned out this was incorrect pit. Additional sample (27SB064) was later collected from correct location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS024C0002
Sample Location: 27SB024
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | X | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Aliquots collected around B-122 pit.

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS025C0002
Sample Location: 27SS025
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Aliquots collected around B-126 pit B

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS026C0002
Sample Location: 27SS026
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Aliquots collected around B-126 pit B

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS027C0002
Sample Location: 27SS027
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Aliquots collected around B-126 pit B

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS028C0002
Sample Location: 27SS028
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Aliquots collected around B-126 pit B

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS029C0002
Sample Location: 27SS029
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/8/2011 | 1100 | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | X | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Heavy petroleum like odor inside it w/ very thick black sludge.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS030C0002
Sample Location: 27SS030
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/11/2011 | 1630 | 0-2' | | |
| Method: | | | | |
| HT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample aliquots from B-126 Pit A. Eastern side of pit (closest to roadway) had large boulders placed around it presumably for erosion control. Unable to collect 4 aliquots on this side, so collected 2 (1 on NE side and 1 on SE side).

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS031C0002
Sample Location: 27SS031
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/8/2011 | 1455 | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

6 aliquots within B-130 pit. Samples collected from individual chambers in pit.
More residue/sediment found in lower end of pit. Thick, black.

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS032C0002
Sample Location: 27SS032
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/8/2011 | 900 | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Collected aliquots from within B-133 pit. East end had approx 6" of sludge.
West end had approx. 12-16" sludge. Approx 3-4' of water in pit.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS033C0002
Sample Location: 27SS033
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/8/2011 | 945 | 0-2' | | |
| Method: | | | | |
| HT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

6 aliquots within B-1885 pit. Samples collected from individual chambers in pit. More residue/sediment found in lower end of pit. Thick, black. Pit was 4' deep with approx 2' of water init. Less than 1" of sludge in compartments 1-3 (west end); approx 2" sludge in compartments 4 and 5; approx 4" sludge in cmpartment 6. majority of sample collected from compartment 6 (east end). Brown w/ purplish sheen.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS034C0002
Sample Location: 27SS034
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/8/2011 | 1000 | 0-2' | | |
| Method: | | | | |
| HT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

6 aliquots within B-1886 pit. Samples collected from individual chambers in pit. More residue/sediment found in lower end of pit. Thick, black. Pit was 4' deep with approx 2' of water in it. Majority of sample aliquots collected from compartments 1, 4, and 5 (west to east). Other compartments had very little material. Black with sheen.

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS035C0002
Sample Location: 27SS035
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/8/2011 | 1200 | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Collected aliquots from what was believed B-2698 pit; however, turned out this was incorrect pit. Additional sample (27SB066) was later collected from correct location.

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB036G0406
Sample Location: 27SB036
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-0.5' | | top soil |
| Time: | 1145 | 0.5-1.5' | brown | clay w/ red mottling, rock frag, dry |
| Method: | DPT | 1.5-3' | brown | clay, dry |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | 3-4.5' | red | clayey sand, rocks, dry |
| Method: | | 4.5-5' | grey | hard clay, dry |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | X | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Pit depth was approx 5'. Refusal @ 4'3"

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB037G0507
Sample Location: 27SB037
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-0.5' | | top soil, moist |
| Time: | 1140 | 0.5-3' | brown | silty clay w/ rock frag, dry |
| Method: | DPT | 3-5' | brown/grey | sandy clay, dry |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected on NW side of pit. Pit depth was 8'5". Took several tries to get to depth.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB038G0406
Sample Location: 27SB038
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-2' | brown | topsoil, dry |
| Time: | 920 | 2-3' | brown | rocky sandy clay |
| Method: | DPT | 3-6' | brown | clay/sand, red mottling |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | 6-7' | brown | sandy clay w/ rock fragments, dry |
| Method: | | 7-10' | lt brown | silty clay, dry |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Grab sample collected from down gradient side (south) of Pit 130.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB039G0709
Sample Location: 27SB039
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1505 | 7-9' | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Collected sample down slope of B-133 (NW corner). Pit depth was 7'2".

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB040G0406
Sample Location: 27SB040
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-0.5' | | gravel |
| Time: | 935 | 0.5-4' | brown | clay w/ rock frag; grey mottling, dry |
| Method: | DPT | 4-5' | brown/grey | clay mottling, dry |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | 5-7' | grey | clay, brown mottling dry |
| Method: | | 7-8' | rusty | sandy clay w/ rocks, red mottling, moist |
| | | 8-10' | brown | silty clay, dry |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB041G0406
Sample Location: 27SB041
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | 0-0.5' | brown | top soil |
| Time: | 945 | 0.5-3.5' | brown | clay, dry |
| Method: | DPT | 3.5-5' | brown/grey | clay, wet |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | 5-7' | grey | clay, brown mottling moist |
| Method: | | 7-8' | brown | clay w/ red mottling |
| | | 8-9.5' | brown | clay, wet |
| Monitor Readings | | 9.5-10' | brown | clayey sand, fine |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB042G0406
Sample Location: 27SB042
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/77/11 | | | |
| Time: | 1445 | 4-6' | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Collected sample downslope of what was believed B-2698 pit; however, turned out this was incorrect pit. Additional sample (27SB065) was later collected from correct location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS043C0002
Sample Location: 27SB043
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| DPT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS044C0002
Sample Location: 27SB044
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| DPT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS045C0002
Sample Location: 27SB045
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| DPT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS046C0002
Sample Location: 27SB046
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| DPT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS047C0002
Sample Location: 27SB047
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| DPT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS048C0002
Sample Location: 27SB048
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/7/2011 | | 0-2' | | |
| Method: | | | | |
| DPT | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS049C0002
Sample Location: 27SB049
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected approx 12-inches from slab. Concrete on other side. Sample 14-30". Three aliquots due to utility line.

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS050C0002
Sample Location: 27SB050
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-1.5' | | gravel |
| Method: | | 1.5-2' | brown | clay |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

4 aliquots. Avg sample depth ~ 18-20" bgs

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS051C0002
Sample Location: 27SB051
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-1.5' | | gravel |
| Method: | | 1.5-2' | brown | sandy soil w/ some lt brown clay |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

4 aliquots. Avg sample depth was 18-24" bgs. Sample collected approx 5-ft from transformer (unknown electrical)

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS052C0002
Sample Location: 27SB052
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-1.5' | | gravel |
| Method: | | 1.5-2' | brown | sandy soil w/ some clay |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

4 aliquots. Avg sample depth ~ 16" bgs

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS053G0002
Sample Location: 27SB053
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1410 | 0-2' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | X | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS054G0002
Sample Location: 27SB054
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1405 | 0-2' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | X | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS055G0002
Sample Location: 27SB055
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1400 | 0-2' | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | X | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Attempted to install temp well at this location. Encountered refusal at ~5 ft bgs at 2 separate locations. Both cores were extremely hard packed and dry. A third attemp was tried after stepping out about 5-ft, but with same result. No temp well installed.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SB055G0406
Sample Location: 27SB055
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | | | |
| Time: | 1325 | 4-6' | | |
| Method: | DPT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | X | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS056G0002
Sample Location: 27SB056
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1515 | 0-2' | | |
| Method: | HT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS057G0002
Sample Location: 27SB057
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/7/2011 | | | |
| Time: | 1525 | 0-2' | | |
| Method: | HT | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS058G0001
Sample Location: 27SB058
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/8/2011 | | | |
| Time: | 1445 | 0-1' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected in grassy area just off asphalt parking lot.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS0059C0002
Sample Location: 27SB059
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected around "old" concrete slab. New transformer on new concrete slab adjacent to the old slab. Two aliquots collected instead of 4 due to the small size of the concrete slab (~4-6' long). Gravel to 6". Damp clay underneath. brn/orange

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS0060C0002
Sample Location: 27SB060
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected around "old" concrete slab. New transformer on new concrete slab adjacent to the old slab. Two aliquots collected instead of 4 due to the small size of the concrete slab (~4-6' long). Gravel to 4".

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS0061C0002
Sample Location: 27SB061
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected around "old" concrete slab. New transformer on new concrete slab adjacent to the old slab. Two aliquots collected instead of 4 due to the small size of the concrete slab (~4-6' long). Gravel to 4". Moist clay brn/orange

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS0062C0002
Sample Location: 27SB062
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| Date: | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Time: | | | |
| Method: | | | |
| | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| 4/9/2011 | | 0-2' | | |
| Method: | | | | |
| HA | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | | |
| Perchlorate | (1) 4-oz jar | | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | | |
| PCBs | (1) 4-oz jar | X | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample collected around "old" concrete slab. New transformer on new concrete slab adjacent to the old slab. Two aliquots collected instead of 4 due to the small size of the concrete slab (~4-6' long). Hole became saturated during digging. Gravel to 10"

**MAP:**

**Circle if Applicable:**

| MS/MSD: | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS063G0002
Sample Location: 27SB063
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/9/2011 | 0.-2' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample added to replace SB009 which was collected in wrong location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS064G0002
Sample Location: 27SB064
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 8/26/2011 | | | |
| Time: | 1440 | 0-2' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample added to replace SB023 which was collected in wrong location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS065G0406
Sample Location: 27SB065
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 4/27/2011 | 4-6' | | |
| Time: | | | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample added to replace SB042 which was collected in wrong location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

Tetra Tech, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET



Project Site Name: NSA Crane SWMU 27
Project No.: 112G02162

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 27SS066G0002
Sample Location: 27SB063
Sampled By: Berklite/Losekamp
C.O.C. No.:

Type of Sample:
[X] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | 8/26/2011 | | | |
| Time: | | 0-2' | | |
| Method: | HA | | | |

**COMPOSITE SAMPLE DATA:**

| Date: | Time | Depth Interval | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings | | | | |
| (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| VOCs | (3) vials | X | |
| Perchlorate | (1) 4-oz jar | X | |
| Cyanide | (1) 4-oz jar | | |
| Metals | (1) 4-oz jar | X | |
| PCBs | (1) 4-oz jar | | |
| Solvents | (1) 4-oz jar | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OBSERVATIONS / NOTES:**

HA = Hand Auger
HT = Hand Trowel
DPT = Direct-push Technology

Sample added to replace SB035 which was collected in wrong location.

**MAP:**

**Circle if Applicable:**

**MS/MSD:**

**Duplicate ID No.:**

**Signature(s):**

## A.2 CHAIN-OF-CUSTODY FORMS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 2202 | PAGE _2_ OF _3__

| PROJECT NO: | FACILITY: | PROJECT MANAGER | PHONE NUMBER | LABORATORY NAME AND CONTACT: |
|---|---|---|---|---|
| 112G02162 | NSA Crane (SWMU 27) | Rick Barringer | 412-921-8524 | Empirical Labs / Brian Richards |
| SAMPLERS (SIGNATURE) | | FIELD OPERATIONS LEADER<br>Jim Goerdt | PHONE NUMBER<br>412-443-0244 | ADDRESS<br>621 Mainstream Dr Suite 270 |
| | | CARRIER/WAYBILL NUMBER<br>Fed Ex / 863138884773 | | CITY, STATE<br>Nashville, TN 37228 |

STANDARD TAT ☐X
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

| DATE YEAR: 2011 | TIME | SAMPLE ID | LOCATION ID | TOP DEPTH (FT) | BOTTOM DEPTH (INCHES) | MATRIX (GW, SO, SW, SD, QC, ETC.) | COLLECTION METHOD GRAP (G) COMP (C) | No. OF CONTAINERS | Container Type Plastic (P) or Glass (G) | G | G | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Preservative Used | 4ºC | 4ºC | | | | | |
| | | | | | | | | | | VOCs SW-846 8260B | Chlorinated Solvents SW 846 8260B | | | | | |
| 4/7 | 1430 | 27SS001G0001 | 001 | 0 | 1 | SO | G | 9 | | 9 | | | | | | MS/MSD |
| 4/7 | 1440 | 27SS003G0001 | 003 | 0 | 1 | SO | G | 3 | | 3 | | | | | | |
| 4/7 | 1450 | 27SS008G0001 | 008 | 0 | 1 | SO | G | 3 | | 3 | | | | | | |
| 4/8 | 1435 | 27SS009G0001 | 009 | 0 | 1 | SO | G | 3 | | 3 | | | | | | |
| 4/8 | 1100 | 27SS029C0002 | 029 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 1455 | 27SS031C0002 | 031 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 0900 | 27SS032C0002 | 032 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 0945 | 27SS033C0002 | 033 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 1000 | 27SS034C0002 | 034 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 1200 | 27SS035C0002 | 035 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 1145 | 27SB036G0406 | 036 | 4 | 6 | SO | G | 9 | | 9 | | | | | | MS/MSD |
| 4/8 | 1140 | 27SB037G0507 | 037 | 5 | 7 | SO | G | 3 | | 3 | | | | | | |
| 4/8 | 0920 | 27SB038G0406 | 038 | 4 | 6 | SO | G | 3 | | 3 | | | | | | |

| | | | | |
|---|---|---|---|---|
| 1. RELINQUISHED BY | DATE | TIME | 1. RECEIVED BY | DATE / TIME |
| 2. RELINQUISHED BY | DATE | TIME | 2. RECEIVED BY | DATE / TIME |
| 3. RELINQUISHED BY | DATE | TIME | 3. RECEIVED BY | DATE / TIME |

COMMENTS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 2201 | PAGE _1_ OF _3__

| PROJECT NO: | FACILITY: | PROJECT MANAGER | PHONE NUMBER | LABORATORY NAME AND CONTACT: |
|---|---|---|---|---|
| 112G02162 | NSA Crane (SWMU 27) | Rick Barringer | 412-921-8524 | Empirical Labs / Brian Richards |
| SAMPLERS (SIGNATURE) | | FIELD OPERATIONS LEADER<br>Jim Goerdt | PHONE NUMBER<br>412-443-0244 | ADDRESS<br>621 Mainstream Dr Suite 270 |
| | | CARRIER/WAYBILL NUMBER<br>Fed Ex / 863138884773 | | CITY, STATE<br>Nashville, TN 37228 |

STANDARD TAT ☐X
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

| DATE YEAR: 2011 | TIME | SAMPLE ID | LOCATION ID | TOP DEPTH (FT) | BOTTOM DEPTH (INCHES) | MATRIX (GW, SO, SW, SD, QC, ETC.) | COLLECTION METHOD GRAP (G) COMP (C) | No. OF CONTAINERS | Container Type Plastic (P) or Glass (G) | G | G | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Preservative Used | 4ºC | 4ºC | | | | | |
| | | | | | | | | | | VOCs SW-846 8260B | Chlorinated Solvents SW 846 8260B | | | | | |
| 4/7 | 1505 | 27SB039G0709 | 039 | 0 | 1 | SO | G | 9 | | 9 | | | | | | |
| 4/8 | 0935 | 27SB040G0406 | 040 | 0 | 1 | SO | G | 3 | | 3 | | | | | | |
| 4/8 | 0945 | 27SB041G0406 | 041 | 0 | 1 | SO | G | 3 | | 3 | | | | | | |
| 4/7 | 1445 | 27SB042G0406 | 042 | 0 | 1 | SO | G | 3 | | 3 | | | | | | |
| 4/7 | 1410 | 27SS053G0002 | 053 | 0 | 2 | SO | C | 3 | | | 3 | | | | | |
| 4/7 | 1405 | 27SS054G0002 | 054 | 0 | 2 | SO | C | 3 | | | 3 | | | | | |
| 4/8 | 1325 | 27SB055G0406 | 055 | 0 | 2 | SO | C | 3 | | | 3 | | | | | |
| 4/7 | 1400 | 27SS055G0002 | 055 | 0 | 2 | SO | C | 9 | | | 9 | | | | | MS/MSD |
| 4/7 | 1515 | 27SS056G0002 | 056 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/7 | 1525 | 27SS057G0002 | 057 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/8 | 1445 | 27SS058G0001 | 058 | 0 | 1 | SO | G | 9 | | 3 | | | | | | |
| 4/7 | 0000 | 27FD04071102 | QC | - | - | SO | G | 3 | | | 3 | | | | | |
| 4/8 | 0000 | 27FD04081101 | QC | - | - | SO | G | 3 | | 3 | | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 1. RELINQUISHED BY | DATE | TIME | 1. RECEIVED BY | DATE | TIME |
| 2. RELINQUISHED BY | DATE | TIME | 2. RECEIVED BY | DATE | TIME |
| 3. RELINQUISHED BY | DATE | TIME | 3. RECEIVED BY | DATE | TIME |

COMMENTS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 2203 | PAGE 3 OF 3

| PROJECT NO: | FACILITY: | PROJECT MANAGER | PHONE NUMBER | LABORATORY NAME AND CONTACT: |
|---|---|---|---|---|
| 112G02162 | NSA Crane (SWMU 27) | Rick Barringer | 412-921-8524 | Empirical Labs / Brian Richards |
| SAMPLERS (SIGNATURE) | | FIELD OPERATIONS LEADER: Jim Goerdt | PHONE NUMBER: 412-443-0244 | ADDRESS: 621 Mainstream Dr Suite 270 |
| | | CARRIER/WAYBILL NUMBER: Fed Ex / 863138884773 | | CITY, STATE: Nashville, TN 37228 |

STANDARD TAT ☐X
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

| DATE YEAR: 2011 | TIME | SAMPLE ID | LOCATION ID | TOP DEPTH (FT) | BOTTOM DEPTH (INCHES) | MATRIX (GW, SO, SW, SD, QC, ETC.) | COLLECTION METHOD GRAP (G) COMP (C) | No. OF CONTAINERS | Container Type Plastic (P) or Glass (G) | G | G | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Preservative Used | 4ºC | 4ºC | | | | | |
| | | | | | | | | | | VOCs SW-846 8260B | Chlorinated Solvents SW 846 8260B | | | | | |
| 4/7 | 0805 | 27TB04071102 | QC | | | QC | G | 2 | | 1 | 1 | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

| 1. RELINQUISHED BY | DATE | TIME | 1. RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|
| 2. RELINQUISHED BY | DATE | TIME | 2. RECEIVED BY | DATE | TIME |
| 3. RELINQUISHED BY | DATE | TIME | 3. RECEIVED BY | DATE | TIME |

COMMENTS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 2204 | PAGE _1_ OF _1__

| PROJECT NO: | FACILITY: | PROJECT MANAGER | PHONE NUMBER | LABORATORY NAME AND CONTACT: |
|---|---|---|---|---|
| 112G02162 | NSA Crane (SWMU 27) | Rick Barringer | 412-921-8524 | Empirical Labs / Brian Richards |
| SAMPLERS (SIGNATURE) | | FIELD OPERATIONS LEADER<br>Jim Goerdt | PHONE NUMBER<br>412-443-0244 | ADDRESS<br>621 Mainstream Dr Suite 270 |
| | | CARRIER/WAYBILL NUMBER<br>Fed Ex / 8631 3888 4729 | | CITY, STATE<br>Nashville, TN 37228 |

STANDARD TAT ☐X
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

| DATE YEAR: 2011 | TIME | SAMPLE ID | LOCATION ID | TOP DEPTH (FT) | BOTTOM DEPTH (INCHES) | MATRIX (GW, SO, SW, SD, QC, ETC.) | COLLECTION METHOD GRAP (G) COMP (C) | No. OF CONTAINERS | Container Type Plastic (P) or Glass (G) | G | G | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Preservative Used | 4ºC MeO H +DI | 4ºC HCL | | | | | |
| | | | | | | | | | | VOCs SW-846 8260B | VOCs SW-846 8260B | Metals / % Moisture | | | | |
| 4/11 | 1630 | 27SS030C0002 | 030 | 0 | 2 | SO | C | 3 | | 3 | | | | | | |
| 4/11 | 1705 | 27TB04111102 | QC | - | - | QC | G | 2 | | | 2 | | | | | |
| 4/11 | 1630 | 27SS030C0002 | 030 | 0 | 2 | SO | C | 1 | | | | 1 | | | | |

| 1. RELINQUISHED BY | DATE | TIME | 1. RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|
| Jim Goerdt | DATE: 4/11/11 | TIME: 1830 | | | |
| 2. RELINQUISHED BY | DATE | TIME | 2. RECEIVED BY | DATE | TIME |
| 3. RELINQUISHED BY | DATE | TIME | 3. RECEIVED BY | DATE | TIME |

COMMENTS

TETRA TECH NUS, INC. | CHAIN OF CUSTODY | NUMBER 2226 | PAGE _1_ OF _1__

| PROJECT NO: | FACILITY: | PROJECT MANAGER | PHONE NUMBER | LABORATORY NAME AND CONTACT: |
|---|---|---|---|---|
| 112G02162 | NSA Crane (SWMU 27) | Rick Barringer | 412-921-8524 | Empirical Labs / Brian Richards |
| SAMPLERS (SIGNATURE) | | FIELD OPERATIONS LEADER<br>Jim Goerdt | PHONE NUMBER<br>412-443-0244 | ADDRESS<br>621 Mainstream Dr Suite 270 |
| | | CARRIER/WAYBILL NUMBER<br>Fed Ex / 8731 7167 0576 | | CITY, STATE<br>Nashville, TN 37228 |

STANDARD TAT ☐X
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

| DATE YEAR: 2011 | TIME | SAMPLE ID | LOCATION ID | TOP DEPTH (FT) | BOTTOM DEPTH (INCHES) | MATRIX (GW, SO, SW, SD, QC, ETC.) | COLLECTION METHOD GRAP (G) COMP (C) | No. OF CONTAINERS | Container Type Plastic (P) or Glass (G) | G | G | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Preservative Used | 4ºC MeO H +DI | 4ºC HCL | | | | | |
| | | | | | | | | | | VOCs | Perchlorate | Metals / % Moisture | | | | |
| 8/26 | 1430 | 27SS066C0002 | 066 | 0 | 2 | SO | C | 5 | | 3 | 1 | 1 | | | | |
| 8/26 | 1735 | 27TB08261101 | QC | - | - | QC | G | 2 | | 2 | | | | | | |
| 8/26 | 1440 | 27SS064C0002 | 064 | 0 | 2 | SO | C | 5 | | 3 | 1 | 1 | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |

| 1. RELINQUISHED BY | DATE: | TIME: | 1. RECEIVED BY | DATE | TIME |
|---|---|---|---|---|---|
| 2. RELINQUISHED BY | DATE | TIME | 2. RECEIVED BY | DATE | TIME |
| 3. RELINQUISHED BY | DATE | TIME | 3. RECEIVED BY | DATE | TIME |

COMMENTS

# APPENDIX B

# FIELD NOTES

"Rite in the Rain"®
ALL-WEATHER
**JOURNAL**
No. 391

PL-223

CRANE

SWMU 27

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

TETRA TECH

James Goerdt
Environmental Scientist
Tetra Tech NUS, Inc

661 Andersen Drive, Pittsburgh, PA 15220-2745
Tel 412.921.8425 Fax 412.921.4040
james.goerdt@ttnus.com www.ttnus.com

Phone Cell: 412-443-0744

Project NSA Crane
SWMU 27
112G02126
CTO: F276

Clear Vinyl Protective Slipcovers (Item No. 30) are available for this style of notebook.
Helps protect your notebook from wear & tear. Contact your dealer or the J. L. Darling Corporation.

CONTENTS

| PAGE | REFERENCE | DATE |
|---|---|---|

Jim Goerdt (JG) - FOL
Lauren Foster (LF) - Tech
Kevin Losacamp (KL) - Tech
Ellen Berklite (EB) - Tech

DPT Drillers
Micah Group
- Ben
- Ryan

SWMU 27 4-7-11

AM: Clear Mid 50's
PM: Cloudy Low 70's

0745: JG at SWMU 27 to meet w/ Crane Utility personnel. This included Chris, Mike, & Scott. Scott (512-554-1962) & JG went around to each sample location to discuss potential utilities.

0900 - JG met w/ Tom Brent to discuss field activities.

1020 - JG/EB/KL @ SWMU 27 to begin sample collection. Begin by collecting composite samples ~~at~~ around Pits 130, 1885, and 1886. Overall, the sediment/sludge depth was deeper at the lower drainage end rather



4-7-11

than the higher intake end. Sample aliquots were placed into a one-gallon Ziploc baggie & thoroughly mixed together prior to collecting the sample for FBZ analysis.

1245: Arrived @ B-126 Pit A to collect the composite samples from all four sides of the pit. The eastern side of the pit (closest to roadway) had many large (volleyball size) rocks placed around it, assumed for soil erosion protection. Unable to collect 4 aliquots on this end so 2 aliquots were collected towards the ends. One on NE side & one on SE side. FTMR was completed.

4-7-11

1420: Arrived @ the transformer station just west of B-124, in an attempt to ~~collect~~ install temp well @ 2758055 w/ DPT rig. Refusal was met @ approx 5 feet bgs on two tries. Both cores were extremely hard-packed & dry. Plans to step out (west) approx 3 feet, but not until recieved OK from utility contact.

1445: Arrived at B-2698 Pit A. Sample aliquots collected via DPT from 3 sides of the pit. Pit was 4'3" deep. Grab sample was collected from 4-6' bgs at the NW exterior corner of the pit. Pit contained some electrical lines &



4-7-11

was for the most part dry & void of sediment.

1505: Arrived at B-133 Pit A. Pit was 7'2" deep w/ water inside. Grab sample (58039) was collected by DPT @ 7-9' bgs: at the NW exterior corner.

1530: EB/KL returned to Crane field trailer to begin processing of samples. JG utilizing GPS to mark sample locations in the vicinity of B3395. Having difficulty w/ GPS coordinates. Finally realized given coordinates for Easting & Northing were flipped around.

4-7-11

625: Sample locations for SB15 & 16 were identified in the parking lot North of B-3395. Grab samples were collected via DPT.

730- JG returned to the field trailer to assist w/ sample prep.

810- EB/KL enroute to Fed Ex in Bloomington to ship samples. ~~[illegible]~~ Two coolers shipped Empirical Labs on Airbill 8631 3888 4800.

910- LF exits Crane.

945- JG exits Crane enroute to Wal Mart for field supplies.

018- Wal Mart

4-7-11

2030 - JG arrived back at hotel.

End of Day

4-7-11

Swmu 27 4-8-11

AM: Cloudy, Low 60's
PM: P. Cloudy, Mid 70's

0730 - JG/EB @ field trailer.

0800 - LF/KL @ field trailer.

0900 - JG/EB/KL & drillers enroute to swmu 27 for sample collection.

Pit 133 A
East (~~low~~ high) end: ~~6"~~ 6" sed
West (low) end: 12-16" sed
- approx 3-4' of water w/in the pit. Sample collected by ~~attaching stainless steel 2L beaker into end of~~ using a 5' DPT sleeve & pushing down into sediment. Six aliquots collected for composite sample (SB032).



4-8-11

0915 - Collected composite sediment sample w/in Pit 1885. Pit was 4' deep, w/ ~2' of water. Less than 1-inch of sediment w/in compartments 1, 2, 3. Approx 2" of sediment in compartments 4 & 5. Approx 4" sediment in compartment 6. Majority of sample collected from compartment 6.

1885

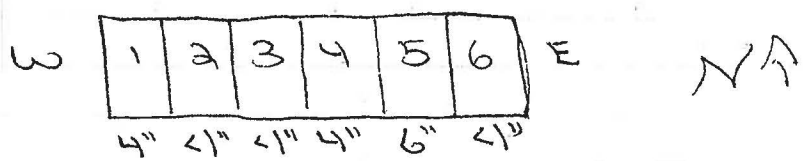
| W | 1 | 2 | 3 | 4 | 5 | 6 | E |
|---|---|---|---|---|---|---|---|
| | <1" | <1" | <1" | <2" | <2" | ~4" | |

N ↑

0920 - Collected the grab sample at Pit 130 (SB038). Sample collected just south of the pit.

4-8-11

0930 - Collected composite sample w/in Pit 1886. Pit was 4' deep, w/ approx 2' of water in it. Majority of sample aliquots were collected from compartments 1, 4, & 5. Other compartments had limited sediment available.




Pit 1885 (SB033)
- Brown-purple color w/ a sheen.

Pit 1886 (SB034)
- Black color w/ sheen.



4-8-11

1020 - Sample collection @ B-126 Pit B. Grab sample to be collected at ~~9'~~ 7-9'11" bgs (SB037) since pit depth is 8'5". Refusal encountered 3 times at approx 7'3". Sample ultimately collected at 7' bgs. Pit extends ~1'6" above ground surface. Sample collected on NW corner of the pit.

1120 - Sample collection @ B-2698 Pit. Pit depth is approx 4'. Very limited soil in pit; however, a small drainage type hole existed near center bottom & sample collected from this area (SB035). More of a grab sample rather than a composite.

45 - B-122 Pit A. (SB036).
it is ~5' deep. Utilized
PT & encountered refusal
- 4' 3" & sample collected
t this depth. Heavy
etroleum-like odor
side the pit w/ very
nick black sludge.

00 - Recieved utility
earance @ SB055 to
ep-out & re-drill for
mp well. DPT rig was
ositioned approx 5'
t from original location.
gain, refusal was encountered
~5' bgs. Soil sample was
en collected from 3-5'
oring.

00 - EB returned to field
railer to assist LF w/
mple processing. JG/KL
ont'd sample collection
/ drillers.





1430 - Moved to B-3395
for SB17/18. Samples
collected by DPT in
the asphalt parking lot
west of B-3395.
Collected SB058 in the
grass just off the parking
lot on downslope side.
Drilled SB009 in parking
lot East of B-3395 (based
on GPS coordinates). After
closer look at Figure &
table/text, appears SB009
should actually be located
just off the parking lot
at the crest of the slope
NE of B-3395. Will
revisit on Monday.

1600 - JG back at field
trailer to assist w/
sample processing. KL
& drillers collecting
SB013/014.

4-8-11

00 - KL back at field
railer.

00 - Processing samples
r shipment to FBL.
echnical difficulty w/
Data Logs, ended up
riting them out by
and.

540 - EB enroute to Fed
x in Bloomington w/
ample coolers, XRF, &
PID. KL contacted
ed Ex & they indicated
ney would remain open
ast their scheduled
losing time of 1900 until
he samples arrived.

115 - JG arrives at Fed Ex
ust as EB finished
ropping off the samples
n bill # 8631 3888 4773
samples) and

4-8-11

8631 3888 4795 (equip).

End of Day

* Drillers
demob'd from
the site at
the end of
the day.

4-8-11

4-9-11

m: PC, rain/lightning Low 50's
m: Sun Low 70's

830 - JG arrives at field
railer. EB/KL on site,
repping for cont'd soil
sampling.

900 - LF on site. Began
rocessing samples.

905 - Began mobilizing
SWMU 27; however,
in & lightning so
emained at trailer for
minimum of 30
inutes (processing
amples).

945 - Lightning still
the area. Crew cont'd
rocessing samples.

00 - Rain ending.

4-9-11

1410 - EB/KL enroute to
SWMU 22 to collect
SW/SD samples for
Tim Evans.
JG enroute to SWMU 27
to collect samples via
hand auger. LF processing
samples at field trailer.

1600 - JG at B-126 trans-
former. Gravel surrounds
the transformer pad &
is ~14" down to soil. Due
to numerous electrical
lines coming off the
transformer (underground)
& not sure exactly
where they go, samples
were collected approx
5' from slab.
- SB051 (4 aliquots)
Brown sandy soil w/ some
light brown clay. Avg
sample depth was
18-24" bgs.

4-9-11

SB052 - (4 aliquots)
Dark brown sandy soil w/ clay. Avg sample depth ~ 16" bgs.

SB050 - (4 aliquots)
Initial brown sandy soil w/ clay encountered at 8" bgs. Avg sample dept ~ 18-20" bgs.

SB049 - (3 aliquots)
- Large utility line in this area. Sample collected ~ 12" from concrete slab in gravel. ~~Avg~~ Sample depths ranged from 14-30" bgs. This is the downslope side of transformer.

45 - JG arrived at a ~~B~~ the transformer located near Hwy 5 at the entrance of the Pyro Area. (samples

4-9-11

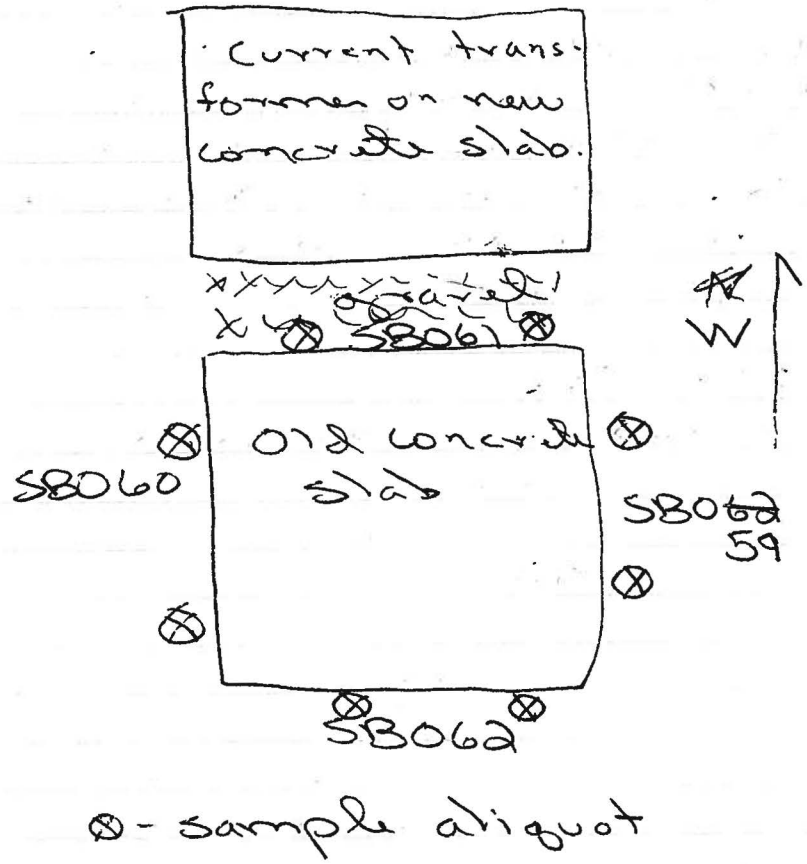
SB059-062). Sample locations had initially been placed around the entire substation area, but after looking closer at the area it appeared the current transformer was sitting on a newer concrete pad which sits next to the older slab. Approx 20" of gravel separated the two slabs. JG contacted Scott (Crane PW) to inquire about old slab vs new slab. Scott indicated the older concrete slab is where the former transformers used to sit. The current transformer & slab are new & ~~the~~ the area was formerly grass & soil. Based on this information, JG decided to sample only around

4-9-11

e former (old) transforme
ncrete slab. Also
:cided to cut the number
aliquots per sample
om 4 down to 2 based
smaller size of sample
ea. JG contacted Ralph
sinski who agreed
th this approach.

10 - SB062
- Approx 10" of gravel
- Wet clay, saturated holes
:ill w/ water as hole is dug
35 - SB059
- Approx 6" of gravel
- Damp clay (Brown/Orange)
50 - SB061
- Approx 6" of gravel
- Moist clay (Brown/Orange)
20 - SB060
- Approx 4" of gravel
- Slightly moist clay
(Brown/Orange)

4-9-11



4-9-11

950 - JG back @ field trailer.

2015 - JG leaves Crane. EB/KL already gone. JG asks LF to text him when she gets back to hotel so he knows she made it back safely.

2230 - Text from LF indicating she is back.

End of Day

J. Dow 4-9-11



4-10-11

0730 - JG at WalMart for additional field supplies.

0820 - JG arrives at field trailer. EB/KL on site. EB/KL prepping to collect sediment samples at Summ 21. JG processing samples for Summ 22.

1215 - EB/KL return from Summ 21.

1300 - JG at Summ 27 updating GPS coordinates. Other crew processing samples.

1430 - GPS battery died. Returned to field trailer. Updating paperwork.

4-10-11

510 - JG returned to sumu 27 to continue GPS updating.

630 - GPS locked up. Returned to trailer. EB exits Crane.

1700 - KL/LF working at other sumus. JG cleaning trailer.

1900 - JG exits Crane

End of Day

4-10-11



4-11-11

0730 - JG arrives at field trailer. Periods of heavy rain & lightning during the morning.

0745 - EB/KL on site. Processing samples for shipment to Fed Ex.

0800 - EB/KL collecting SB010. Return to trailer

0820 - JG collecting SB063. Updating GPS. SB063 collected to replace SB009 which was incorrectly located w/GPS.

0945 - JG back at trailer. All putting samples into coolers for shipping.

1300 - Fed Ex contacted for sample pick up at field trailer.

4-11-11

1400 - Fed Ex arrives at trailer to pick up sample coolers & equipment.

Airbills
8631 3888 4751
- APPL, Inc. (6 coolers)
8631 3888 4762
- Compuchem (4 coolers)
8631 3888 4707
- Eagle Instruments (2 boxes)
8631 3888 4718
- Empirical Labs (5 coolers)

1430 - EB exits Crane.
KL/LF @ other summus
1630 - JG at B-126 Pit A to try & collect sample. Stainless steel beaker attached to long steel pipes. After 15 attempts collected just enough material for VOC & % moisture sample.



4-11-11

1710 - KL/LF exit Crane.

1745 - JG to Fed Ex to ship sample.

8631 3888 4729
1 cooler to Empirical.

End of Shift

4-11-11

4-27-11

- in the field on another
oject & was asked to
llect sample SB065
hich would replace
3042 which was
correctly collected
rom the wrong pit
uring initial field effort.

8-26-11

JG in the field to collect
samples for another project
collected SB064 & SB066
which replaced SB035 and
SB023, respectively. The
sample within the pit
had a distinct odor to
it. Very black in color.

# APPENDIX C

# PHOTOGRAPHS

# Appendix C - NSA Crane (SWMU 27)

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>J. Goerdt<br>**VIEW:** North | **DESCRIPTION:** Sample location SB001. | 1<br>4/5/2011 |

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>J. Goerdt<br>**VIEW:** North | **DESCRIPTION:** Northern end of Building 126 Pit B. Due to rocks in this location, two aliquots were collected for composite sample SB027 instead of the 4 proposed. | 2<br>4/5/2011 |

# Appendix C - NSA Crane (SWMU 27)

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>J. Goerdt<br>**VIEW:** Southwest | **DESCRIPTION:** Concrete pad of former transformer location (Sample locations SB059, 060, 061, 062). | 3<br>4/5/2011 |

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>J. Goerdt<br>**VIEW:** North | **DESCRIPTION:** Concrete pad of new transformer. Samples SB059, 060, 061, 062 collected just east of this pad around former transformer pad. | 4<br>4/5/2011 |

# Appendix C - NSA Crane (SWMU 27)

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** West | **DESCRIPTION:** Electric substation (Sample locations SB043 through 048). | 5<br>9/17/2009 |

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** North | **DESCRIPTION:** Sump at sample location SB065. | 6<br>9/17/2009 |

# Appendix C - NSA Crane (SWMU 27)

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** North | **DESCRIPTION:** Interior of sump at sample location SB065. | 7<br>9/17/2009 |

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** West | **DESCRIPTION:** Building 126 Pit A (Sample SB030). | 8<br>9/18/2009 |

# Appendix C - NSA Crane (SWMU 27)

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** North | **DESCRIPTION:** Photo of typical compartmented basin (SB019). | 9<br>9/18/2009 |

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** Southeast | **DESCRIPTION:** View of Building 1885 (foreground) Pit A and Pit B (background). | 10<br>9/18/2009 |

# Appendix C - NSA Crane (SWMU 27)

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** Northwest | **DESCRIPTION:** Small pit south of Building 1886 (Sample SB057). | 11<br>9/18/2009 |

| | | | |
|---|---|---|---|
| **SITE:**<br>SWMU 27<br>Illuminant<br>Building 126 | **PHOTOGRAPHER:**<br>R. Barringer<br>**VIEW:** Northwest | **DESCRIPTION:** Backside view of Building 1885 Pit A showing interior compartments. | 12<br>9/18/2009 |

# APPENDIX D

# ANALYTICAL DATA

| LOCATION | 27SB001 | 27SB002 | 27SB002 | 27SB003 | 27SB004 | 27SB005 | 27SB006 | 27SB007 |
|---|---|---|---|---|---|---|---|---|
| AREA | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | 27SS001G0001 | 27SS002G0001 | 27SS002G0001-D | 27SS003G0001 | 27SS004G0001 | 27SS005G0001 | 27SS006G0001 | 27SS007G0001 |
| SAMPLE DATE | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 |
| SAMPLE CODE | NORMAL | NORMAL | DUP | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **METALS (MG/KG)** | | | | | | | | |
| ALUMINUM | 21400 | 7490 | 7980 | 6890 | 13800 | 7720 | 12700 | 10900 |
| BARIUM | 192 J | 105 | 93.7 | 80.9 J | 80.4 | 99.8 | 139 | 299 |
| CADMIUM | 1.26 U | 8.41 | 6.9 | 0.783 | 0.0786 J | 0.583 | 1.64 | 2.28 |
| CHROMIUM | 32.2 | 12.6 J | 18.3 J | 24.4 | 20.8 J | 12.7 J | 17.3 J | 21.4 J |
| COPPER | 15.2 | 17.8 | 16.5 | 18.3 | 13.6 | 17.7 | 67 | 59.9 |
| LEAD | 32 J | 41.1 J | 38.3 J | 25.7 J | 14.6 J | 38 J | 31.2 J | 72.5 J |
| MAGNESIUM | 715 J | 853 | 818 | 4190 J | 1820 | 1280 | 1590 | 2440 |
| MANGANESE | 5550 J | 1200 J | 851 J | 374 J | 271 J | 331 J | 256 J | 949 J |
| POTASSIUM | 693 J | 494 J | 508 J | 535 J | 701 J | 984 J | 851 J | 725 J |
| SODIUM | 189 U | 184 U | 181 U | 216 J | 81.2 J | 126 J | 132 J | 90.7 J |
| STRONTIUM | 7.1 J | 6.76 | 6.84 | 12.3 J | 10.5 | 10.6 | 14.2 | 33.6 |
| ZINC | 53.8 J | 81.8 | 73.3 | 60 J | 46.8 | 77.5 | 125 | 387 |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | | | |
| CYANIDE | -- | 1.37 | 0.19 J | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | | | |
| PERCHLORATE | 2.46 U | 2.49 U | 2.45 U | 2.67 U | 2.43 U | 2.86 U | 4.1 U | 3.18 U |
| **PCBS (UG/KG)** | | | | | | | | |
| AROCLOR-1016 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1221 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1232 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1242 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1248 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1254 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1260 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1262 | -- | -- | -- | -- | -- | -- | -- | -- |
| AROCLOR-1268 | -- | -- | -- | -- | -- | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,1,2,2-TETRACHLOROETHANE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,1,2-TRICHLOROETHANE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| 1,1-DICHLOROETHANE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,1-DICHLOROETHENE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,2,4-TRICHLOROBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00484 U | 0.00518 UJ | 0.00513 UJ | 0.00542 U | 0.00518 UJ | 0.00784 UJ | 0.0104 UJ | 0.0105 UJ |
| 1,2-DIBROMOETHANE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,2-DICHLOROBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,2-DICHLOROETHANE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,2-DICHLOROPROPANE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,3-DICHLOROBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 1,4-DICHLOROBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| 2-BUTANONE | 0.00484 U | 0.00518 UJ | 0.00513 UJ | 0.00542 U | 0.00518 UJ | 0.00784 UJ | 0.0104 UJ | 0.0222 J |
| 2-HEXANONE | 0.00242 U | 0.00259 UJ | 0.00256 UJ | 0.00271 U | 0.00259 UJ | 0.00392 UJ | 0.00521 UJ | 0.00525 UJ |
| 4-METHYL-2-PENTANONE | 0.00242 U | 0.00259 UJ | 0.00256 UJ | 0.00271 U | 0.00259 UJ | 0.00392 UJ | 0.00521 UJ | 0.00525 UJ |
| ACETONE | 0.00969 U | 0.0104 UJ | 0.0103 UJ | 0.0108 U | 0.0104 UJ | 0.0157 UJ | 0.0208 UJ | 0.122 J |
| BENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| BROMODICHLOROMETHANE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| BROMOFORM | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| BROMOMETHANE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| CARBON DISULFIDE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CARBON TETRACHLORIDE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CHLOROBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CHLORODIBROMOMETHANE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CHLOROETHANE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| CHLOROFORM | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CHLOROMETHANE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| CIS-1,2-DICHLOROETHENE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00179 J | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CIS-1,3-DICHLOROPROPENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| CYCLOHEXANE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| DICHLORODIFLUOROMETHANE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| ETHYLBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| ISOPROPYLBENZENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| METHYL ACETATE | 0.00484 UJ | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| METHYL CYCLOHEXANE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| METHYL TERT-BUTYL ETHER | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| METHYLENE CHLORIDE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| STYRENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| TETRACHLOROETHENE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| TOLUENE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| TOTAL XYLENES | 0.00726 UJ | 0.00778 U | 0.00769 U | 0.00813 U | 0.00776 U | 0.0118 U | 0.0156 U | 0.0158 U |
| TRANS-1,2-DICHLOROETHENE | 0.00242 U | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| TRANS-1,3-DICHLOROPROPENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| TRICHLOROETHENE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00429 J | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |
| TRICHLOROFLUOROMETHANE | 0.00484 U | 0.00518 U | 0.00513 U | 0.00542 U | 0.00518 U | 0.00784 U | 0.0104 U | 0.0105 U |
| VINYL CHLORIDE | 0.00242 UJ | 0.00259 U | 0.00256 U | 0.00271 U | 0.00259 U | 0.00392 U | 0.00521 U | 0.00525 U |

| LOCATION | 27SB008 | 27SB010 | 27SB011 | 27SB012 | 27SB019 | 27SB020 |
|---|---|---|---|---|---|---|
| AREA | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | 27SS008G0001 | 27SS010C0002 | 27SS011G0002 | 27SS012G0002 | 27SS019C0002 | 27SS020C0002 |
| SAMPLE DATE | 20110407 | 20110411 | 20110409 | 20110409 | 20110407 | 20110407 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 1 | 2 | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 12600 | 9960 | 12600 | 10400 | -- | 6960 |
| BARIUM | 124 J | 398 | 99.6 | 77.5 | -- | 238 |
| CADMIUM | 0.312 J | 0.126 U | 0.304 J | 0.137 U | -- | 0.289 |
| CHROMIUM | 17.2 | 13.1 J | 19.3 J | 14.4 J | -- | 13.4 J |
| COPPER | 15.5 | 12 | 28.9 | 17 | -- | 13.2 |
| LEAD | 20.8 J | 11 | 31.5 | 14.7 | -- | 13.9 J |
| MAGNESIUM | 1560 J | 1500 J | 1780 J | 1410 J | -- | 2920 |
| MANGANESE | 449 J | 346 | 374 | 373 | -- | 264 J |
| POTASSIUM | 755 J | 608 J | 616 J | 575 J | -- | 747 J |
| SODIUM | 191 U | 71.7 J | 197 U | 206 U | -- | 168 U |
| STRONTIUM | 10 J | 22.2 | 14.9 | 12.2 | -- | 53.6 |
| ZINC | 73.7 J | 30.2 J | 153 J | 41.5 J | -- | 62.4 |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | -- | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 2.61 U | 2.55 U | 2.7 U | 2.76 U | 2.32 U | 2.33 U |
| **PCBS (UG/KG)** | | | | | | |
| AROCLOR-1016 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1221 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1232 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1242 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1248 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1254 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1260 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1262 | -- | -- | -- | -- | -- | -- |
| AROCLOR-1268 | -- | -- | -- | -- | -- | -- |
| **VOLATILES (MG/KG)** | | | | | | |
| 1,1,1-TRICHLOROETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,1,2,2-TETRACHLOROETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,1,2-TRICHLOROETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| 1,1-DICHLOROETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,1-DICHLOROETHENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,2,4-TRICHLOROBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00603 U | -- | -- | -- | 0.00559 UJ | 0.00444 UJ |
| 1,2-DIBROMOETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,2-DICHLOROBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,2-DICHLOROETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,2-DICHLOROPROPANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,3-DICHLOROBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 1,4-DICHLOROBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| 2-BUTANONE | 0.00603 U | -- | -- | -- | 0.00559 UJ | 0.00444 UJ |
| 2-HEXANONE | 0.00302 U | -- | -- | -- | 0.0028 UJ | 0.00222 UJ |
| 4-METHYL-2-PENTANONE | 0.00302 U | -- | -- | -- | 0.0028 UJ | 0.00222 UJ |
| ACETONE | 0.0121 U | -- | -- | -- | 0.0112 UJ | 0.00888 UJ |
| BENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| BROMODICHLOROMETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| BROMOFORM | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| BROMOMETHANE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| CARBON DISULFIDE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CARBON TETRACHLORIDE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CHLOROBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CHLORODIBROMOMETHANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CHLOROETHANE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| CHLOROFORM | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CHLOROMETHANE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| CIS-1,2-DICHLOROETHENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CIS-1,3-DICHLOROPROPENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| CYCLOHEXANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| DICHLORODIFLUOROMETHANE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| ETHYLBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| ISOPROPYLBENZENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| METHYL ACETATE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| METHYL CYCLOHEXANE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| METHYL TERT-BUTYL ETHER | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| METHYLENE CHLORIDE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| STYRENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| TETRACHLOROETHENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| TOLUENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| TOTAL XYLENES | 0.00905 U | -- | -- | -- | 0.00839 U | 0.00666 U |
| TRANS-1,2-DICHLOROETHENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| TRANS-1,3-DICHLOROPROPENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| TRICHLOROETHENE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |
| TRICHLOROFLUOROMETHANE | 0.00603 U | -- | -- | -- | 0.00559 U | 0.00444 U |
| VINYL CHLORIDE | 0.00302 U | -- | -- | -- | 0.0028 U | 0.00222 U |

| LOCATION | 27SB021 | 27SB022 | 27SB023 | 27SB024 | 27SB025 | 27SB026 | 27SB027 | 27SB028 | 27SB043 | 27SB044 |
|---|---|---|---|---|---|---|---|---|---|---|
| AREA | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | 27SS021C0002 | 27SS022C0002 | 27SS023C0002 | 27SS024C0002 | 27SS025C0002 | 27SS026C0002 | 27SS027C0002 | 27SS028C0002 | 27SS043C0002 | 27SS044C0002 |
| SAMPLE DATE | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 | 20110407 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | | | | | |
| ALUMINUM | 16500 | 18400 | 12400 | 7720 | 9910 | 9010 | 14400 | 15600 | -- | -- |
| BARIUM | 91.1 | 80.9 | 112 | 80.2 | 2300 | 608 | 586 | 2260 | -- | -- |
| CADMIUM | 0.123 J | 0.208 J | 0.919 | 0.754 | 0.554 J | 0.769 J | 1.58 | 0.55 | -- | -- |
| CHROMIUM | 20.2 J | 20.3 J | 17.9 J | 12.2 J | 12 J | 14 J | 20.2 J | 17.5 J | -- | -- |
| COPPER | 19.2 | 23.8 | 16.3 | 11.5 | 29.3 | 29.3 | 48.5 | 35 | -- | -- |
| LEAD | 20 J | 20.7 J | 23.1 J | 35.3 J | 54 J | 57.3 J | 91.6 J | 38.4 J | -- | -- |
| MAGNESIUM | 2190 | 2640 | 1590 | 718 | 4890 J | 6030 J | 3760 | 3430 | -- | -- |
| MANGANESE | 468 J | 569 J | 385 J | 617 J | 806 J | 335 J | 343 J | 531 J | -- | -- |
| POTASSIUM | 965 J | 1050 J | 641 J | 531 J | 642 J | 741 J | 1040 J | 846 J | -- | -- |
| SODIUM | 182 U | 171 J | 181 U | 174 U | 935 U | 905 U | 185 U | 186 U | -- | -- |
| STRONTIUM | 17.5 | 34.4 | 7.85 | 10 | 102 | 142 | 73.5 | 86.8 | -- | -- |
| ZINC | 81.3 | 135 | 217 | 81.2 | 120 | 114 | 162 | 67.1 | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | | | | | |
| CYANIDE | -- | -- | -- | 0.288 U | -- | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | | | | | |
| PERCHLORATE | 2.55 U | 2.47 U | 2.48 U | 2.42 U | 0.841 J | 2.46 U | 1.75 J | 0.835 J | -- | -- |
| **PCBS (UG/KG)** | | | | | | | | | | |
| AROCLOR-1016 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1221 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1232 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1242 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1248 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1254 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1260 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1262 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| AROCLOR-1268 | -- | -- | -- | -- | -- | -- | -- | -- | 9.58 U | 9.29 U |
| **VOLATILES (MG/KG)** | | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,1,2,2-TETRACHLOROETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,1,2-TRICHLOROETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| 1,1-DICHLOROETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,1-DICHLOROETHENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,2,4-TRICHLOROBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00526 UJ | 0.00531 UJ | 0.00515 UJ | 0.0051 UJ | 0.00523 UJ | 0.00477 UJ | 0.00486 UJ | 0.00534 UJ | -- | -- |
| 1,2-DIBROMOETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,2-DICHLOROBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,2-DICHLOROETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,2-DICHLOROPROPANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,3-DICHLOROBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 1,4-DICHLOROBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| 2-BUTANONE | 0.00526 UJ | 0.00531 UJ | 0.00515 UJ | 0.0051 UJ | 0.00523 UJ | 0.00477 UJ | 0.00486 UJ | 0.00534 UJ | -- | -- |
| 2-HEXANONE | 0.00263 UJ | 0.00266 UJ | 0.00257 UJ | 0.00255 UJ | 0.00262 UJ | 0.00239 UJ | 0.00243 UJ | 0.00267 UJ | -- | -- |
| 4-METHYL-2-PENTANONE | 0.00263 UJ | 0.00266 UJ | 0.00257 UJ | 0.00255 UJ | 0.00262 UJ | 0.00239 UJ | 0.00243 UJ | 0.00267 UJ | -- | -- |
| ACETONE | 0.0105 UJ | 0.0106 UJ | 0.0103 UJ | 0.0102 UJ | 0.0105 UJ | 0.00955 UJ | 0.00971 UJ | 0.0107 UJ | -- | -- |
| BENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| BROMODICHLOROMETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| BROMOFORM | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| BROMOMETHANE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| CARBON DISULFIDE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CARBON TETRACHLORIDE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CHLOROBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CHLORODIBROMOMETHANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CHLOROETHANE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| CHLOROFORM | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CHLOROMETHANE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CIS-1,3-DICHLOROPROPENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| CYCLOHEXANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| DICHLORODIFLUOROMETHANE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| ETHYLBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| ISOPROPYLBENZENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| METHYL ACETATE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| METHYL CYCLOHEXANE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| METHYL TERT-BUTYL ETHER | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| METHYLENE CHLORIDE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| STYRENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| TETRACHLOROETHENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| TOLUENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| TOTAL XYLENES | 0.00789 U | 0.00797 U | 0.00772 U | 0.00765 U | 0.00785 U | 0.00716 U | 0.00728 U | 0.00801 U | -- | -- |
| TRANS-1,2-DICHLOROETHENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| TRANS-1,3-DICHLOROPROPENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| TRICHLOROETHENE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |
| TRICHLOROFLUOROMETHANE | 0.00526 U | 0.00531 U | 0.00515 U | 0.0051 U | 0.00523 U | 0.00477 U | 0.00486 U | 0.00534 U | -- | -- |
| VINYL CHLORIDE | 0.00263 U | 0.00266 U | 0.00257 U | 0.00255 U | 0.00262 U | 0.00239 U | 0.00243 U | 0.00267 U | -- | -- |

| LOCATION | 27SB045 | 27SB046 | 27SB047 | 27SB048 | 27SB049 | 27SB050 | 27SB051 | 27SB052 | 27SB053 | 27SB053 |
|---|---|---|---|---|---|---|---|---|---|---|
| AREA | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | 27SS045C0002 | 27SS046C0002 | 27SS047C0002 | 27SS048C0002 | 27SS049C0002 | 27SS050C0002 | 27SS051C0002 | 27SS052C0002 | 27SS053G0002 | 27SS053G0002-D |
| SAMPLE DATE | 20110407 | 20110407 | 20110407 | 20110407 | 20110409 | 20110409 | 20110409 | 20110409 | 20110407 | 20110407 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | DUP |
| MATRIX | SO | SO | SO | SO | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | | | | | |
| ALUMINUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BARIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CADMIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CHROMIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| COPPER | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| LEAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MAGNESIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| MANGANESE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| POTASSIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| SODIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| STRONTIUM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ZINC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | | | | | |
| CYANIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | | | | | |
| PERCHLORATE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| **PCBS (UG/KG)** | | | | | | | | | | |
| AROCLOR-1016 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1221 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1232 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1242 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1248 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1254 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1260 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1262 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| AROCLOR-1268 | 9.53 U | 9.44 U | 9.55 U | 9.37 U | 10.3 U | 9.94 U | 9.55 U | 9.32 U | 9.75 U | 9.29 U |
| **VOLATILES (MG/KG)** | | | | | | | | | | |
| 1,1,1-TRICHLOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-TETRACHLOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2-TRICHLOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1-DICHLOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1-DICHLOROETHENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2,4-TRICHLOROBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-DIBROMO-3-CHLOROPROPANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-DIBROMOETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-DICHLOROBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-DICHLOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-DICHLOROPROPANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,3-DICHLOROBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,4-DICHLOROBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-BUTANONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-HEXANONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-METHYL-2-PENTANONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ACETONE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BROMODICHLOROMETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BROMOFORM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| BROMOMETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CARBON DISULFIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CARBON TETRACHLORIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CHLOROBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CHLORODIBROMOMETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CHLOROETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CHLOROFORM | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CHLOROMETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | -- | -- | -- | -- | -- | -- | -- | -- | 0.0029 U | 0.00253 U |
| CIS-1,3-DICHLOROPROPENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| CYCLOHEXANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| DICHLORODIFLUOROMETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ETHYLBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| ISOPROPYLBENZENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| METHYL ACETATE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| METHYL CYCLOHEXANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| METHYL TERT-BUTYL ETHER | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| METHYLENE CHLORIDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| STYRENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TETRACHLOROETHENE | -- | -- | -- | -- | -- | -- | -- | -- | 0.0029 U | 0.00253 U |
| TOLUENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TOTAL XYLENES | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TRANS-1,2-DICHLOROETHENE | -- | -- | -- | -- | -- | -- | -- | -- | 0.0029 U | 0.00253 U |
| TRANS-1,3-DICHLOROPROPENE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TRICHLOROETHENE | -- | -- | -- | -- | -- | -- | -- | -- | 0.0029 U | 0.00253 U |
| TRICHLOROFLUOROMETHANE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| VINYL CHLORIDE | -- | -- | -- | -- | -- | -- | -- | -- | 0.0029 U | 0.00253 U |

| LOCATION | 27SB054 | 27SB055 | 27SB059 | 27SB060 | 27SB061 | 27SB062 | 27SB064 |
|---|---|---|---|---|---|---|---|
| AREA | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | 27SS054G0002 | 27SS055G0002 | 27SS059C0002 | 27SS060C0002 | 27SS061C0002 | 27SS062C0002 | 27SS064C0002 |
| SAMPLE DATE | 20110407 | 20110407 | 20110409 | 20110409 | 20110409 | 20110409 | 20110826 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | | |
| ALUMINUM | -- | -- | -- | -- | -- | -- | 7290 |
| BARIUM | -- | -- | -- | -- | -- | -- | 104 |
| CADMIUM | -- | -- | -- | -- | -- | -- | 0.574 U |
| CHROMIUM | -- | -- | -- | -- | -- | -- | 16.8 |
| COPPER | -- | -- | -- | -- | -- | -- | 10.4 |
| LEAD | -- | -- | -- | -- | -- | -- | 26.1 |
| MAGNESIUM | -- | -- | -- | -- | -- | -- | 947 J |
| MANGANESE | -- | -- | -- | -- | -- | -- | 396 |
| POTASSIUM | -- | -- | -- | -- | -- | -- | 455 J |
| SODIUM | -- | -- | -- | -- | -- | -- | 861 U |
| STRONTIUM | -- | -- | -- | -- | -- | -- | 4.72 |
| ZINC | -- | -- | -- | -- | -- | -- | 35.8 |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | | |
| CYANIDE | -- | -- | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | | |
| PERCHLORATE | -- | -- | -- | -- | -- | -- | 2.38 U |
| **PCBS (UG/KG)** | | | | | | | |
| AROCLOR-1016 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1221 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1232 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1242 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1248 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1254 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1260 | 129 | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1262 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| AROCLOR-1268 | 11.3 U | 8.63 U | 9.95 U | 10.2 U | 10.5 U | 10.3 U | -- |
| **VOLATILES (MG/KG)** | | | | | | | |
| 1,1,1-TRICHLOROETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,1,2,2-TETRACHLOROETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,1,2-TRICHLOROETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| 1,1-DICHLOROETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,1-DICHLOROETHENE | -- | -- | -- | -- | -- | -- | 0.00234 UJ |
| 1,2,4-TRICHLOROBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,2-DIBROMO-3-CHLOROPROPANE | -- | -- | -- | -- | -- | -- | 0.00468 UJ |
| 1,2-DIBROMOETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,2-DICHLOROBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,2-DICHLOROETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,2-DICHLOROPROPANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,3-DICHLOROBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 1,4-DICHLOROBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| 2-BUTANONE | -- | -- | -- | -- | -- | -- | 0.0125 J |
| 2-HEXANONE | -- | -- | -- | -- | -- | -- | 0.00234 UJ |
| 4-METHYL-2-PENTANONE | -- | -- | -- | -- | -- | -- | 0.00408 J |
| ACETONE | -- | -- | -- | -- | -- | -- | 0.112 J |
| BENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| BROMODICHLOROMETHANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| BROMOFORM | -- | -- | -- | -- | -- | -- | 0.00234 UJ |
| BROMOMETHANE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| CARBON DISULFIDE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| CARBON TETRACHLORIDE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| CHLOROBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| CHLORODIBROMOMETHANE | -- | -- | -- | -- | -- | -- | 0.00234 UJ |
| CHLOROETHANE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| CHLOROFORM | -- | -- | -- | -- | -- | -- | 0.00234 U |
| CHLOROMETHANE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| CIS-1,2-DICHLOROETHENE | 0.00296 U | 0.00211 U | -- | -- | -- | -- | 0.00234 U |
| CIS-1,3-DICHLOROPROPENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| CYCLOHEXANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| DICHLORODIFLUOROMETHANE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| ETHYLBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| ISOPROPYLBENZENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| METHYL ACETATE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| METHYL CYCLOHEXANE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| METHYL TERT-BUTYL ETHER | -- | -- | -- | -- | -- | -- | 0.00234 U |
| METHYLENE CHLORIDE | -- | -- | -- | -- | -- | -- | 0.0267 |
| STYRENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| TETRACHLOROETHENE | 0.00296 U | 0.00211 U | -- | -- | -- | -- | 0.00234 U |
| TOLUENE | -- | -- | -- | -- | -- | -- | 0.00234 U |
| TOTAL XYLENES | -- | -- | -- | -- | -- | -- | 0.00703 U |
| TRANS-1,2-DICHLOROETHENE | 0.00296 U | 0.00211 U | -- | -- | -- | -- | 0.00234 U |
| TRANS-1,3-DICHLOROPROPENE | -- | -- | -- | -- | -- | -- | 0.00234 UJ |
| TRICHLOROETHENE | 0.00296 U | 0.00211 U | -- | -- | -- | -- | 0.00439 J |
| TRICHLOROFLUOROMETHANE | -- | -- | -- | -- | -- | -- | 0.00468 U |
| VINYL CHLORIDE | 0.00296 U | 0.00211 U | -- | -- | -- | -- | 0.00234 U |

INVESTIGATION AREA2 SURFACE SOIL
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | 27SB009 | 27SB013 | 27SB014 | 27SB015 | 27SB016 | 27SB017 |
|---|---|---|---|---|---|---|
| AREA | IA 2 | IA 2 | IA 2 | IA 2 | IA 2 | IA 2 |
| SAMPLE ID | 27SS009G0001 | 27SS013G0002 | 27SS014G0002 | 27SS015G0002 | 27SS016G0002 | 27SS017G0002 |
| SAMPLE DATE | 20110408 | 20110408 | 20110408 | 20110407 | 20110407 | 20110408 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 1 | 2 | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 1510 | 7310 | 9090 | 13800 | 12300 | 17900 |
| BARIUM | 29.5 J | 80.6 J | 48.2 | 87.6 J | 37 J | 90.5 |
| CADMIUM | 2.59 U | 2.74 U | 0.0689 J | 0.324 | 0.0598 J | 0.131 J |
| CHROMIUM | 5.74 J | 14.5 J | 13 J | 16.2 | 16.3 | 20.4 J |
| COPPER | 10.3 U | 8.31 J | 7.53 | 14.7 | 7.23 | 19.5 |
| LEAD | 4.84 | 14.9 | 8.52 | 11 J | 7.95 J | 18.2 |
| MAGNESIUM | 10800 J | 8830 J | 1120 J | 3950 J | 1220 J | 2730 J |
| MANGANESE | 123 | 849 | 77.2 | 297 J | 53.1 J | 298 |
| POTASSIUM | 338 J | 777 J | 416 J | 847 J | 322 J | 1170 J |
| SODIUM | 135 J | 258 J | 175 U | 103 J | 92.8 J | 85.1 J |
| STRONTIUM | 152 | 100 | 7.96 | 65.4 J | 9.31 J | 23.4 |
| ZINC | 20.5 U | 48.4 U | 32 J | 38.1 J | 15.8 J | 55.7 J |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 2.15 U | 2.28 U | 2.31 U | 2.38 U | 2.33 U | 2.49 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 1,1,1-TRICHLOROETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,1,2,2-TETRACHLOROETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,1,2-TRICHLOROETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00467 U | -- | -- | -- | -- | -- |
| 1,1-DICHLOROETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,1-DICHLOROETHENE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,2,4-TRICHLOROBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00467 U | -- | -- | -- | -- | -- |
| 1,2-DIBROMOETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,2-DICHLOROBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,2-DICHLOROETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,2-DICHLOROPROPANE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,3-DICHLOROBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| 1,4-DICHLOROBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| 2-BUTANONE | 0.00467 U | -- | -- | -- | -- | -- |
| 2-HEXANONE | 0.00233 U | -- | -- | -- | -- | -- |
| 4-METHYL-2-PENTANONE | 0.00233 U | -- | -- | -- | -- | -- |
| ACETONE | 0.00933 U | -- | -- | -- | -- | -- |
| BENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| BROMODICHLOROMETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| BROMOFORM | 0.00233 U | -- | -- | -- | -- | -- |
| BROMOMETHANE | 0.00467 U | -- | -- | -- | -- | -- |
| CARBON DISULFIDE | 0.00233 U | -- | -- | -- | -- | -- |
| CARBON TETRACHLORIDE | 0.00233 U | -- | -- | -- | -- | -- |
| CHLOROBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| CHLORODIBROMOMETHANE | 0.00233 U | -- | -- | -- | -- | -- |
| CHLOROETHANE | 0.00467 U | -- | -- | -- | -- | -- |
| CHLOROFORM | 0.00233 U | -- | -- | -- | -- | -- |
| CHLOROMETHANE | 0.00467 U | -- | -- | -- | -- | -- |
| CIS-1,2-DICHLOROETHENE | 0.00233 U | -- | -- | -- | -- | -- |
| CIS-1,3-DICHLOROPROPENE | 0.00233 U | -- | -- | -- | -- | -- |
| CYCLOHEXANE | 0.00233 U | -- | -- | -- | -- | -- |
| DICHLORODIFLUOROMETHANE | 0.00467 U | -- | -- | -- | -- | -- |
| ETHYLBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| ISOPROPYLBENZENE | 0.00233 U | -- | -- | -- | -- | -- |
| METHYL ACETATE | 0.00467 U | -- | -- | -- | -- | -- |
| METHYL CYCLOHEXANE | 0.00233 U | -- | -- | -- | -- | -- |
| METHYL TERT-BUTYL ETHER | 0.00233 U | -- | -- | -- | -- | -- |
| METHYLENE CHLORIDE | 0.00467 U | -- | -- | -- | -- | -- |
| STYRENE | 0.00233 U | -- | -- | -- | -- | -- |
| TETRACHLOROETHENE | 0.00233 U | -- | -- | -- | -- | -- |
| TOLUENE | 0.00233 U | -- | -- | -- | -- | -- |
| TOTAL XYLENES | 0.007 U | -- | -- | -- | -- | -- |
| TRANS-1,2-DICHLOROETHENE | 0.00233 U | -- | -- | -- | -- | -- |
| TRANS-1,3-DICHLOROPROPENE | 0.00233 U | -- | -- | -- | -- | -- |
| TRICHLOROETHENE | 0.00233 U | -- | -- | -- | -- | -- |
| TRICHLOROFLUOROMETHANE | 0.00467 U | -- | -- | -- | -- | -- |
| VINYL CHLORIDE | 0.00233 U | -- | -- | -- | -- | -- |

| LOCATION | **27SB018** | **27SB058** | **27SB063** |
|---|---|---|---|
| AREA | **IA 2** | **IA 2** | **IA 2** |
| SAMPLE ID | **27SS018G0002** | **27SS058G0001** | **27SS063G0002** |
| SAMPLE DATE | **20110408** | **20110408** | **20110411** |
| SAMPLE CODE | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | **SO** | **SO** | **SO** |
| SUBMATRIX | **SS** | **SS** | **SS** |
| TOP DEPTH | **0** | **0** | **0** |
| BOTTOM DEPTH | **2** | **1** | **2** |
| **METALS (MG/KG)** | | | |
| ALUMINUM | 16800 | 17800 | 7740 |
| BARIUM | 95 | 88.8 | 132 |
| CADMIUM | 0.12 UJ | 0.124 UJ | 0.798 J |
| CHROMIUM | 19.4 J | 19.7 J | 11.3 J |
| COPPER | 17.6 | 18.2 | 9.71 |
| LEAD | 14.1 | 13.6 | 15.8 |
| MAGNESIUM | 2540 J | 3520 J | 11000 J |
| MANGANESE | 304 | 231 | 426 |
| POTASSIUM | 989 J | 878 J | 695 J |
| SODIUM | 208 J | 186 U | 773 J |
| STRONTIUM | 44 | 28.3 | 234 |
| ZINC | 49.4 J | 51.6 J | 60.2 J |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | |
| PERCHLORATE | 2.49 U | 2.46 U | 2.41 U |
| **VOLATILES (MG/KG)** | | | |
| 1,1,1-TRICHLOROETHANE | -- | 0.00287 U | 0.00213 UJ |
| 1.1.2.2-TETRACHLOROETHANE | -- | 0.00287 U | 0.00213 U |
| 1.1.2-TRICHLOROETHANE | -- | 0.00287 U | 0.00213 U |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | -- | 0.00574 U | 0.00427 U |
| 1,1-DICHLOROETHANE | -- | 0.00287 U | 0.00213 U |
| 1,1-DICHLOROETHENE | -- | 0.00287 U | 0.00213 U |
| 1,2,4-TRICHLOROBENZENE | -- | 0.00287 U | 0.00213 U |
| 1,2-DIBROMO-3-CHLOROPROPANE | -- | 0.00574 U | 0.00427 UJ |
| 1,2-DIBROMOETHANE | -- | 0.00287 U | 0.00213 U |
| 1,2-DICHLOROBENZENE | -- | 0.00287 U | 0.00213 U |
| 1,2-DICHLOROETHANE | -- | 0.00287 U | 0.00213 U |
| 1,2-DICHLOROPROPANE | -- | 0.00287 U | 0.00213 U |
| 1,3-DICHLOROBENZENE | -- | 0.00287 U | 0.00213 U |
| 1,4-DICHLOROBENZENE | -- | 0.00287 U | 0.00213 U |
| 2-BUTANONE | -- | 0.00574 U | 0.00427 UJ |
| 2-HEXANONE | -- | 0.00287 U | 0.00213 U |
| 4-METHYL-2-PENTANONE | -- | 0.00287 U | 0.00213 UJ |
| ACETONE | -- | 0.0115 U | 0.00853 UJ |
| BENZENE | -- | 0.00287 U | 0.00213 U |
| BROMODICHLOROMETHANE | -- | 0.00287 U | 0.00213 U |
| BROMOFORM | -- | 0.00287 U | 0.00213 UJ |
| BROMOMETHANE | -- | 0.00574 U | 0.00427 UJ |
| CARBON DISULFIDE | -- | 0.00287 U | 0.00213 U |
| CARBON TETRACHLORIDE | -- | 0.00287 U | 0.00213 UJ |
| CHLOROBENZENE | -- | 0.00287 U | 0.00213 U |
| CHLORODIBROMOMETHANE | -- | 0.00287 U | 0.00213 UJ |
| CHLOROETHANE | -- | 0.00574 U | 0.00427 UJ |
| CHLOROFORM | -- | 0.00287 U | 0.00213 U |
| CHLOROMETHANE | -- | 0.00574 U | 0.00427 U |
| CIS-1,2-DICHLOROETHENE | -- | 0.00287 U | 0.00213 U |
| CIS-1,3-DICHLOROPROPENE | -- | 0.00287 U | 0.00213 U |
| CYCLOHEXANE | -- | 0.00287 U | 0.00213 U |
| DICHLORODIFLUOROMETHANE | -- | 0.00574 U | 0.00427 UJ |
| ETHYLBENZENE | -- | 0.00287 U | 0.00213 U |
| ISOPROPYLBENZENE | -- | 0.00287 U | 0.00213 U |
| METHYL ACETATE | -- | 0.00574 U | 0.00427 UJ |
| METHYL CYCLOHEXANE | -- | 0.00287 U | 0.00213 U |
| METHYL TERT-BUTYL ETHER | -- | 0.00287 U | 0.00213 U |
| METHYLENE CHLORIDE | -- | 0.00574 U | 0.0293 U |
| STYRENE | -- | 0.00287 U | 0.00213 U |
| TETRACHLOROETHENE | -- | 0.00287 U | 0.00213 UJ |
| TOLUENE | -- | 0.00287 U | 0.00213 U |
| TOTAL XYLENES | -- | 0.00861 U | 0.0064 U |
| TRANS-1,2-DICHLOROETHENE | -- | 0.00287 U | 0.00213 U |
| TRANS-1,3-DICHLOROPROPENE | -- | 0.00287 U | 0.00213 U |
| TRICHLOROETHENE | -- | 0.00287 U | 0.00213 U |
| TRICHLOROFLUOROMETHANE | -- | 0.00574 U | 0.00427 U |
| VINYL CHLORIDE | -- | 0.00287 U | 0.00213 U |

PIT/SUMP SAMPLES
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | 27SB029 | 27SB030 | 27SB031 | 27SB032 | 27SB033 | 27SB034 |
|---|---|---|---|---|---|---|
| AREA | IA 1 - Pit | IA 1 - Pit | IA 1 - Pit | IA 1 - Pit | IA 1 - Pit | IA 1 - Pit |
| SAMPLE ID | 27SS029C0002 | 27SS030C0002 | 27SS031C0002 | 27SS032C0002 | 27SS033C0002 | 27SS034C0002 |
| SAMPLE DATE | 20110408 | 20110411 | 20110408 | 20110408 | 20110408 | 20110408 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 2 | 2 | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 3190 | 6230 | 10600 J | 1500 | 3690 | 10900 J |
| BARIUM | 76.5 J | 134 | 779 J | 102 J | 257 J | 239 J |
| CADMIUM | 11.9 | 3.49 | 14.3 J | 12.8 U | 18.1 U | 7.63 J |
| CHROMIUM | 240 J | 18.9 | 56.7 J | 63.9 U | 36.3 U | 39.5 J |
| COPPER | 277 | 498 | 1200 J | 2420 | 154 | 168 J |
| LEAD | 597 | 266 | 738 J | 1570 | 396 | 221 J |
| MAGNESIUM | 6970 J | 10600 | 13600 UJ | 45300 J | 29100 J | 11300 J |
| MANGANESE | 640 | 365 | 120000 J | 208000 | 125000 | 2400 J |
| POTASSIUM | 179 J | 191 J | 935 J | 305 J | 657 J | 1040 J |
| SODIUM | 270 U | 137 J | 1380 J | 149 J | 262 J | 921 J |
| STRONTIUM | 36.6 | 57.8 | 221 J | 18.1 | 128 | 108 J |
| ZINC | 4580 J | 2530 | 6410 J | 18900 J | 12400 J | 2120 J |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.491 J | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 3.56 U | -- | 7.48 UJ | 2.67 U | 3.65 U | 7.09 UJ |
| **VOLATILES (MG/KG)** | | | | | | |
| 1,1,1-TRICHLOROETHANE | 5.49 U | 0.00302 UJ | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1.1.2,2-TETRACHLOROETHANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 UJ | 0.0113 UJ |
| 1.1.2-TRICHLOROETHANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 11 U | 0.00605 U | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| 1,1-DICHLOROETHANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,1-DICHLOROETHENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,2,4-TRICHLOROBENZENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 UJ | 0.0113 UJ |
| 1,2-DIBROMO-3-CHLOROPROPANE | 11 U | 0.00605 UJ | 0.0246 UJ | 0.00554 UJ | 0.00924 UJ | 0.0227 UJ |
| 1,2-DIBROMOETHANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,2-DICHLOROBENZENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.0092 J | 0.00277 J | 0.0113 UJ |
| 1,2-DICHLOROETHANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,2-DICHLOROPROPANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,3-DICHLOROBENZENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 1,4-DICHLOROBENZENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.0241 J | 0.00604 J | 0.0113 UJ |
| 2-BUTANONE | 11 UJ | 0.00605 UJ | 0.153 J | 0.00554 UJ | 0.00924 U | 0.134 J |
| 2-HEXANONE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| 4-METHYL-2-PENTANONE | 5.49 UJ | 0.00302 UJ | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| ACETONE | 22 U | 0.0121 UJ | 0.399 J | 0.0111 UJ | 0.0185 U | 0.761 J |
| BENZENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00331 J | 0.00359 J | 0.0113 UJ |
| BROMODICHLOROMETHANE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| BROMOFORM | 5.49 UJ | 0.00302 UJ | 0.0123 UJ | 0.00277 UJ | 0.00462 UJ | 0.0113 UJ |
| BROMOMETHANE | 11 U | 0.00605 UJ | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| CARBON DISULFIDE | 5.49 U | 0.0055 U | 0.00888 J | 0.00277 UJ | 0.00462 U | 0.017 J |
| CARBON TETRACHLORIDE | 5.49 U | 0.00302 UJ | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| CHLOROBENZENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00779 J | 0.00876 J | 0.0113 UJ |
| CHLORODIBROMOMETHANE | 5.49 U | 0.00302 UJ | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| CHLOROETHANE | 11 U | 0.00605 UJ | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| CHLOROFORM | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| CHLOROMETHANE | 11 U | 0.00605 U | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| CIS-1,2-DICHLOROETHENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| CIS-1,3-DICHLOROPROPENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| CYCLOHEXANE | 27.9 | 0.00302 U | 0.0416 J | 0.00277 UJ | 0.00462 U | 0.891 J |
| DICHLORODIFLUOROMETHANE | 11 U | 0.00605 U | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| ETHYLBENZENE | 297 | 0.00302 U | 1.85 J | 0.00277 UJ | 0.00397 J | 0.0113 UJ |
| ISOPROPYLBENZENE | 20.1 | 0.00302 U | 0.442 J | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| METHYL ACETATE | 11 U | 0.00605 UJ | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| METHYL CYCLOHEXANE | 349 | 0.00302 U | 0.918 J | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| METHYL TERT-BUTYL ETHER | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| METHYLENE CHLORIDE | 11 U | 0.0778 | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| STYRENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| TETRACHLOROETHENE | 5.49 U | 0.00302 UJ | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| TOLUENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.0136 J | 0.0129 | 0.0113 UJ |
| TOTAL XYLENES | 829 | 0.00907 U | 3.3 J | 0.0083 UJ | 0.0171 J | 0.0171 J |
| TRANS-1,2-DICHLOROETHENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| TRANS-1,3-DICHLOROPROPENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| TRICHLOROETHENE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |
| TRICHLOROFLUOROMETHANE | 11 U | 0.00605 U | 0.0246 UJ | 0.00554 UJ | 0.00924 U | 0.0227 UJ |
| VINYL CHLORIDE | 5.49 U | 0.00302 U | 0.0123 UJ | 0.00277 UJ | 0.00462 U | 0.0113 UJ |

| LOCATION | 27SB035 | 27SB056 | 27SB057 | 27SB066 |
|---|---|---|---|---|
| AREA | IA 1 - Pit | IA 1 - Pit | IA 1 - Pit | IA 1 - Pit |
| SAMPLE ID | 27SS035C0002 | 27SS056G0002 | 27SS057G0002 | 27SS066C0002 |
| SAMPLE DATE | 20110408 | 20110407 | 20110407 | 20110826 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO |
| SUBMATRIX | SS | SS | SS | SS |
| TOP DEPTH | 0 | 0 | 0 | 0 |
| BOTTOM DEPTH | 2 | 2 | 2 | 2 |
| **METALS (MG/KG)** | | | | |
| ALUMINUM | 6830 | 7230 | 5670 | 18800 J |
| BARIUM | 62.5 | 373 J | 491 J | 1010 J |
| CADMIUM | 18.8 | 7.97 J | 10.2 J | 138 J |
| CHROMIUM | 13.8 J | 29.3 U | 94.6 U | 656 J |
| COPPER | 63.4 | 233 | 515 | 765 J |
| LEAD | 442 | 1270 J | 840 J | 6100 J |
| MAGNESIUM | 5000 J | 14500 J | 27000 J | 3280 J |
| MANGANESE | 267 | 67900 J | 279000 J | 52 J |
| POTASSIUM | 460 J | 1320 J | 921 J | 2790 UJ |
| SODIUM | 199 U | 251 J | 460 J | 2790 UJ |
| STRONTIUM | 11.7 | 223 J | 538 J | 35.9 J |
| ZINC | 824 J | 7240 J | 3250 J | 7010 J |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | |
| CYANIDE | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | |
| PERCHLORATE | 2.63 U | 2.96 U | 3.9 U | 7.62 UJ |
| **VOLATILES (MG/KG)** | | | | |
| 1,1,1-TRICHLOROETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,1,2,2-TETRACHLOROETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,1,2-TRICHLOROETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| 1,1-DICHLOROETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,1-DICHLOROETHENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,2,4-TRICHLOROBENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| 1,2-DIBROMOETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,2-DICHLOROBENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,2-DICHLOROETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,2-DICHLOROPROPANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,3-DICHLOROBENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 1,4-DICHLOROBENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 2-BUTANONE | 0.00546 U | 0.00794 U | 0.00876 U | 0.236 J |
| 2-HEXANONE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| 4-METHYL-2-PENTANONE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| ACETONE | 0.0109 U | 0.0159 U | 0.0175 U | 0.777 J |
| BENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| BROMODICHLOROMETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| BROMOFORM | 0.00273 UJ | 0.00397 U | 0.00438 U | 0.0114 UJ |
| BROMOMETHANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| CARBON DISULFIDE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0315 J |
| CARBON TETRACHLORIDE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| CHLOROBENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| CHLORODIBROMOMETHANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| CHLOROETHANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| CHLOROFORM | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| CHLOROMETHANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| CIS-1,2-DICHLOROETHENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.00799 J |
| CIS-1,3-DICHLOROPROPENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| CYCLOHEXANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0904 J |
| DICHLORODIFLUOROMETHANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| ETHYLBENZENE | 0.00181 J | 0.00397 U | 0.00438 U | 0.0114 UJ |
| ISOPROPYLBENZENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| METHYL ACETATE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| METHYL CYCLOHEXANE | 0.00273 U | 0.00397 U | 0.00438 U | 0.989 J |
| METHYL TERT-BUTYL ETHER | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| METHYLENE CHLORIDE | 0.00546 U | 0.00794 U | 0.00876 U | 0.173 J |
| STYRENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| TETRACHLOROETHENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| TOLUENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0415 J |
| TOTAL XYLENES | 0.00527 J | 0.0119 U | 0.0131 U | 0.051 J |
| TRANS-1,2-DICHLOROETHENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| TRANS-1,3-DICHLOROPROPENE | 0.00273 U | 0.00397 U | 0.00438 U | 0.0114 UJ |
| TRICHLOROETHENE | 0.00238 J | 0.00397 U | 0.00438 U | 0.0564 J |
| TRICHLOROFLUOROMETHANE | 0.00546 U | 0.00794 U | 0.00876 U | 0.0228 UJ |
| VINYL CHLORIDE | 0.00273 U | 0.00397 U | 0.00438 U | 0.00724 J |

INVESTIGATION AREA 1 SUBSURRFACE SOIL
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | 27SB036 | 27SB037 | 27SB038 | 27SB038 | 27SB039 | 27SB040 |
|---|---|---|---|---|---|---|
| AREA | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 | IA 1 |
| SAMPLE ID | 27SB036G0406 | 27SB037G0507 | 27SB038G0406 | 27SB038G0406-D | 27SB039G0709 | 27SB040G0406 |
| SAMPLE DATE | 20110408 | 20110408 | 20110408 | 20110408 | 20110407 | 20110408 |
| SAMPLE CODE | NORMAL | NORMAL | NORMAL | DUP | NORMAL | NORMAL |
| MATRIX | SO | SO | SO | SO | SO | SO |
| SUBMATRIX | SB | SB | SB | SB | SB | SB |
| TOP DEPTH | 4 | 5 | 4 | 4 | 7 | 4 |
| BOTTOM DEPTH | 6 | 7 | 6 | 6 | 9 | 6 |
| **METALS (MG/KG)** | | | | | | |
| ALUMINUM | 4460 | 2960 | 18900 | 18400 | 10600 | 12100 |
| BARIUM | 24.1 | 89.7 | 99.6 | 96.4 | 22.9 | 60.2 |
| CADMIUM | 0.106 U | 0.0621 J | 0.324 | 0.199 J | 0.501 | 0.184 J |
| CHROMIUM | 16.3 J | 7.72 | 19.3 | 17.9 | 35.6 | 17.2 |
| COPPER | 11 | 5.3 | 15.6 | 15.5 | 15.9 | 12.4 |
| LEAD | 7.4 | 4.94 | 16.7 | 16.8 | 7.5 | 10 |
| MAGNESIUM | 1010 J | 327 | 2250 | 2210 | 4910 | 1660 |
| MANGANESE | 518 | 122 J | 453 J | 507 J | 900 J | 207 J |
| POTASSIUM | 939 J | 536 J | 1050 J | 1000 J | 566 J | 624 J |
| SODIUM | 159 U | 164 U | 101 J | 107 J | 166 U | 175 U |
| STRONTIUM | 5.39 | 10.5 J | 11 J | 10.6 J | 33 J | 8.7 J |
| ZINC | 57.8 J | 27.8 J | 56.3 J | 53.5 J | 104 J | 35.3 J |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | | | | |
| CYANIDE | 0.258 U | -- | -- | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | | |
| PERCHLORATE | 2.17 U | 2.21 U | 2.51 U | 2.5 U | 2.32 U | 2.38 U |
| **VOLATILES (MG/KG)** | | | | | | |
| 1,1,1-TRICHLOROETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,1,2,2-TETRACHLOROETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,1,2-TRICHLOROETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| 1,1-DICHLOROETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,1-DICHLOROETHENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,2,4-TRICHLOROBENZENE | 0.00254 UJ | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| 1,2-DIBROMOETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,2-DICHLOROBENZENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,2-DICHLOROETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,2-DICHLOROPROPANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,3-DICHLOROBENZENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 1,4-DICHLOROBENZENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 2-BUTANONE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| 2-HEXANONE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| 4-METHYL-2-PENTANONE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| ACETONE | 0.00553 J | 0.00992 U | 0.00957 U | 0.00668 J | 0.00626 J | 0.0101 J |
| BENZENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| BROMODICHLOROMETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| BROMOFORM | 0.00254 UJ | 0.00248 UJ | 0.00239 UJ | 0.00248 U | 0.00213 U | 0.00226 U |
| BROMOMETHANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| CARBON DISULFIDE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CARBON TETRACHLORIDE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CHLOROBENZENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CHLORODIBROMOMETHANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CHLOROETHANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| CHLOROFORM | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CHLOROMETHANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| CIS-1,2-DICHLOROETHENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CIS-1,3-DICHLOROPROPENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| CYCLOHEXANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| DICHLORODIFLUOROMETHANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| ETHYLBENZENE | 0.00652 | 0.00182 J | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| ISOPROPYLBENZENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| METHYL ACETATE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| METHYL CYCLOHEXANE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| METHYL TERT-BUTYL ETHER | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| METHYLENE CHLORIDE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| STYRENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| TETRACHLOROETHENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| TOLUENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| TOTAL XYLENES | 0.0226 | 0.00462 J | 0.00717 U | 0.00745 U | 0.0064 U | 0.00679 U |
| TRANS-1,2-DICHLOROETHENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| TRANS-1,3-DICHLOROPROPENE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| TRICHLOROETHENE | 0.00521 | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |
| TRICHLOROFLUOROMETHANE | 0.00507 U | 0.00496 U | 0.00478 U | 0.00497 U | 0.00427 U | 0.00453 U |
| VINYL CHLORIDE | 0.00254 U | 0.00248 U | 0.00239 U | 0.00248 U | 0.00213 U | 0.00226 U |

INVESTIGATION AREA 1 SUBSURRFACE SOIL
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | **27SB041** | **27SB042** | **27SB065** |
|---|---|---|---|
| AREA | **IA 1** | **IA 1** | **IA 1** |
| SAMPLE ID | **27SB041G0406** | **27SB042G0406** | **27SB065G0406** |
| SAMPLE DATE | **20110408** | **20110407** | **20110427** |
| SAMPLE CODE | **NORMAL** | **NORMAL** | **NORMAL** |
| MATRIX | **SO** | **SO** | **SO** |
| SUBMATRIX | **SB** | **SB** | **SB** |
| TOP DEPTH | **4** | **4** | **4** |
| BOTTOM DEPTH | **6** | **6** | **6** |
| **METALS (MG/KG)** | | | |
| ALUMINUM | 10800 | 16700 | 13100 |
| BARIUM | 53.6 | 34.8 | 63.2 |
| CADMIUM | 0.109 J | 0.268 J | 0.248 UJ |
| CHROMIUM | 14.3 | 62.6 | 15.9 |
| COPPER | 12.9 | 16.1 | 12.9 |
| LEAD | 13 | 11.7 | 10.8 |
| MAGNESIUM | 1350 | 570 | 1900 |
| MANGANESE | 180 J | 759 J | 353 |
| POTASSIUM | 533 J | 537 J | 645 |
| SODIUM | 108 J | 177 U | 373 UJ |
| STRONTIUM | 10.9 J | 7.48 J | 12.6 |
| ZINC | 40.5 J | 90.9 J | 35.4 |
| **MISCELLANEOUS PARAMETERS (MG/KG)** | | | |
| CYANIDE | -- | -- | -- |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | |
| PERCHLORATE | 2.45 U | 2.43 U | 2.45 U |
| **VOLATILES (MG/KG)** | | | |
| 1,1,1-TRICHLOROETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,1,2,2-TETRACHLOROETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,1,2-TRICHLOROETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,1,2-TRICHLOROTRIFLUOROETHANE | 0.00476 U | 0.00456 U | 0.00629 U |
| 1,1-DICHLOROETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,1-DICHLOROETHENE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,2,4-TRICHLOROBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,2-DIBROMO-3-CHLOROPROPANE | 0.00476 U | 0.00456 U | 0.00629 U |
| 1,2-DIBROMOETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,2-DICHLOROBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,2-DICHLOROETHANE | 0.00238 U | 0.00228 U | 0.00315 UJ |
| 1,2-DICHLOROPROPANE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,3-DICHLOROBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| 1,4-DICHLOROBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| 2-BUTANONE | 0.00476 U | 0.00456 U | 0.00629 U |
| 2-HEXANONE | 0.00238 U | 0.00228 U | 0.00315 U |
| 4-METHYL-2-PENTANONE | 0.00238 U | 0.00228 U | 0.00315 U |
| ACETONE | 0.00952 U | 0.00913 U | 0.0126 UR |
| BENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| BROMODICHLOROMETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| BROMOFORM | 0.00238 U | 0.00228 U | 0.00315 UJ |
| BROMOMETHANE | 0.00476 U | 0.00456 U | 0.00629 U |
| CARBON DISULFIDE | 0.00238 U | 0.00228 U | 0.00315 U |
| CARBON TETRACHLORIDE | 0.00238 U | 0.00228 U | 0.00315 U |
| CHLOROBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| CHLORODIBROMOMETHANE | 0.00238 U | 0.00228 U | 0.00315 U |
| CHLOROETHANE | 0.00476 U | 0.00456 U | 0.00629 U |
| CHLOROFORM | 0.00238 U | 0.00228 U | 0.00315 U |
| CHLOROMETHANE | 0.00476 U | 0.00456 U | 0.00629 U |
| CIS-1,2-DICHLOROETHENE | 0.00238 U | 0.00228 U | 0.00796 |
| CIS-1,3-DICHLOROPROPENE | 0.00238 U | 0.00228 U | 0.00315 U |
| CYCLOHEXANE | 0.00238 U | 0.00228 U | 0.00315 U |
| DICHLORODIFLUOROMETHANE | 0.00476 U | 0.00456 U | 0.00629 U |
| ETHYLBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| ISOPROPYLBENZENE | 0.00238 U | 0.00228 U | 0.00315 U |
| METHYL ACETATE | 0.00476 U | 0.00456 U | 0.00373 J |
| METHYL CYCLOHEXANE | 0.00238 U | 0.00228 U | 0.00315 U |
| METHYL TERT-BUTYL ETHER | 0.00238 U | 0.00228 U | 0.00315 U |
| METHYLENE CHLORIDE | 0.00476 U | 0.00456 U | 0.0192 U |
| STYRENE | 0.00238 U | 0.00228 U | 0.00315 U |
| TETRACHLOROETHENE | 0.00238 U | 0.00228 U | 0.00315 U |
| TOLUENE | 0.00238 U | 0.00228 U | 0.00315 U |
| TOTAL XYLENES | 0.00714 U | 0.00685 U | 0.00944 U |
| TRANS-1,2-DICHLOROETHENE | 0.00238 U | 0.00228 U | 0.00315 U |
| TRANS-1,3-DICHLOROPROPENE | 0.00238 U | 0.00228 U | 0.00315 U |
| TRICHLOROETHENE | 0.00238 U | 0.00228 U | 0.0176 |
| TRICHLOROFLUOROMETHANE | 0.00476 U | 0.00456 U | 0.00629 U |
| VINYL CHLORIDE | 0.00238 U | 0.00228 U | 0.00683 |

INVESTIGATION AREA 2 SUBSURRFACE SOIL
SWMU 27 - PYROTECHNICS AREA
RCRA FACILITY INSPECTION REPORT
NSA CRANE
CRANE, INDIANA


| LOCATION | **27SB017** | **27SB017** | **27SB018** | **27SB018** | **27SB018** |
|---|---|---|---|---|---|
| AREA | **IA 2** | **IA 2** | **IA 2** | **IA 2** | **IA 2** |
| SAMPLE ID | **27SB017G0204** | **27SB017G0406** | **27SB018G0204** | **27SB018G0406** | **27SB018G0406-D** |
| SAMPLE DATE | **20110408** | **20110408** | **20110408** | **20110408** | **20110408** |
| SAMPLE CODE | **NORMAL** | **NORMAL** | **NORMAL** | **NORMAL** | **DUP** |
| MATRIX | **SO** | **SO** | **SO** | **SO** | **SO** |
| SUBMATRIX | **SB** | **SB** | **SB** | **SB** | **SB** |
| TOP DEPTH | **2** | **4** | **2** | **4** | **4** |
| BOTTOM DEPTH | **4** | **6** | **4** | **6** | **6** |
| **METALS (MG/KG)** | | | | | |
| ALUMINUM | 14300 | 15000 | 13500 | 13400 | 12600 |
| BARIUM | 116 | 83.4 | 53.9 | 88 | 88.8 |
| CADMIUM | 0.13 U | 0.113 U | 0.167 J | 0.19 J | 0.131 J |
| CHROMIUM | 16.4 | 18.1 | 20.4 | 19.5 | 14.4 |
| COPPER | 11.6 | 14.9 | 11 | 11.7 | 12.1 |
| LEAD | 13.7 | 12.6 | 9.51 | 16.8 | 16.5 |
| MAGNESIUM | 1680 | 2030 | 1840 | 1570 | 1660 |
| MANGANESE | 674 J | 286 J | 189 J | 537 J | 725 J |
| POTASSIUM | 750 J | 734 J | 538 J | 640 J | 673 J |
| SODIUM | 195 U | 169 U | 186 U | 173 U | 169 U |
| STRONTIUM | 14.5 J | 11.8 J | 30.7 J | 9.43 J | 9.49 J |
| ZINC | 42.1 J | 42 J | 22.5 J | 40.2 J | 45 J |
| **MISCELLANEOUS PARAMETERS (UG/KG)** | | | | | |
| PERCHLORATE | 2.54 U | 2.38 U | 2.43 U | 2.38 U | 2.36 U |

# APPENDIX E

# SUMMARY OF BACKGROUND COMPARISONS

**BACKGROUND COMPARISONS**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**

## 1. INTRODUCTION

SWMU 27 was divided into two investigative areas, IA1 and IA2. IA1 and IA2 surface soil were compared to Soil Group 3, Alluvial, Mississippian, and Pennsylvanian surface soil, from the Crane Basewide Background Report (Tetra Tech, 2001). IA1 and IA2 subsurface soil were compared to Soil Group 8, Pennsylvanian subsurface Clay and Silt, from the Crane Basewide Background Report (Tetra Tech, 2001). The comparative statistical method was used to compare IA1 and IA2 surface soil and IA1 subsurface soil to the appropriate background data. The comparative method utilizes several statistical techniques to compare site and background data described below. The background threshold method was used to compare IA2 subsurface soil data to Crane Group 8 soil.

## 2. STATISTICAL METHODLOGY

This section describes the graphical displays and hypothesis tests used to compare site data and background data.

The comparative statistical method of site data and background data involved a graphical evaluation and a hypothesis test comparing the central tendency (mean/median) concentrations and a hypothesis test comparing the right tails (largest values). The graphical evaluation consisted of visual inspection of boxplots, normal probability plots, and histograms. The graphical displays are presented at the end of this Appendix. One-half the detection limit was used for non-detected concentrations for the graphical displays; the full detection limit was used for non-detected concentrations for the hypothesis tests. The statistical package R version 2.13.0 was used to conduct the statistical evaluations.

The background threshold value comparison involves comparing the site maximum concentration to the background threshold value. For Crane the background threshold value presented in the Background Study is the 95 percent upper tolerance limit. A tolerance interval establishes a concentration range that is constructed to contain a specified proportion of the population with a specified confidence. The proportion of the population is referred to as the coverage and the specified confidence is referred to as the tolerance coefficient. For this analysis a coverage and specified confidence of 95 percent were used. Meaning that one can be 95 percent confident that the tolerance interval will contain 95 percent of the data. For the background comparison if the site maximum detected concentration exceeded the 95 percent upper tolerance limit than it is concluded that site concentrations exceed background concentrations, otherwise site concentrations are concluded to be consistent with background concentrations.

### 2.1 Graphical Displays

Boxplots show the central tendency, degree of symmetry, range of variation, and potential outliers of a data set. The data set is shown as a rectangular box that represents the middle 50 percent of the data. The upper value of the box represents the 75$^{th}$ percentile and the lower value of the box represents the 25$^{th}$ percentile. The median is represented by the middle line in the box. Box plots for the same analyte were plotted on the same graph. The plots were visually inspected to see which data sets look similar and which ones differed. Particular attention was paid to see if the median from one data set fell within the 75$^{th}$ and 25$^{th}$ percentile range of the other data sets.

Probability plots are a useful first step for visually comparing two data sets in a single graph. If the site and background distributions were exactly identical, the plotted values would lie on a

straight line through the origin. Deviations from this line show the differences between the two distributions. If the site and background distributions are similar the scattering of the two data sets will be mixed. If there is grouping of the two data sets then data sets are most likely different.

Histograms are a visual representation of the data collected into groups. The data range is divided into several bins or classes and the data are sorted into the bins. The x-axis displays the chemical concentration range for the bin and the y-axis shows the number of observations that fall within the bin. The histograms of the site and background datasets were plotted on top of each other to be able to compare the shapes of the two distributions, overall concentration ranges, and ranges of concentrations that have the most samples.

### 2.2 Hypothesis Tests

Two types of hypothesis tests were conducted one comparing the central tendency of the data sets and one comparing the right tails of the data sets. The Two sample T-test, Wilcoxon Rank Sum test, Gehan test, and the Two Sample Proportion Test were used to compare the central tendency of the site and background data sets. The Slippage Test and Quantile test were used to compare the right tails of the site and background datasets. All hypothesis tests were conducted using a five percent significance level meaning that if the p-value associated with the hypothesis test is less than 0.05 there is statistically significant evidence that the null hypothesis ($H_o$ or assumed hypothesis) is false. The p-value of a test can be thought of as the credibility of the null hypothesis; p-values greater than 0.05 indicate that the null hypothesis is credible whereas p-values less than 0.05 indicate otherwise.

The Two Sample T-Test tests for a difference between two populations means when it can be assumed that the data are approximately normally distributed or sample sizes are large enough (m and n at least 30) and the data are all detected. If the variances of the two data sets are not equal than the Two sample T Test with unequal variance was computed. The null and alternative hypotheses were:

$H_o$: Site Average ≥ Background Average + Background Standard Deviation
$H_A$: Site Average < Background Average + Background Standard Deviation

The Wilcoxon Rank-Sum (WRS) nonparametric test is used to test for a difference between median concentrations between two independent populations. The WRS test was used when the data were not normally distributed and there were less than three reporting limits if non-detected concentrations were present. The null and alternative hypotheses were:

$H_o$: Site Median ≥ Background Media + Background Standard Deviation
$H_A$: Site Median < Background Median + Background Standard Deviation

The Gehan nonparametric test is used to test for a difference between median concentrations between two independent populations. The Gehan test can be used when the background or site datasets contain multiple nondetects with different reporting limits. The Gehan test was used when the nondetects had more than three reporting limits. The null and alternative hypotheses are the same as the null and alternative hypothesis for the WRS test.

The two sample proportion test was used to compare site and background sodium concentrations in IA1 surface and subsurface soil. Because there is no action level (i.e., essential nutrients) for sodium the proportion of detected concentrations greater than the largest background non-detected concentration was compared. The proportion test was used when there were between 50 and 90 percent non-detects. The null and alternative hypotheses were:

$H_o$: Proportion Site = Proportion Background
$H_A$: Proportion Site ≠ Proportion Background

The Slippage Test and Quantile tests are used to test for a shift to the right in the extreme right-tail of the site versus the background concentrations. This is equivalent to asking if a set of the largest values of the site distribution are larger than the maximum value of the background distribution. If the slippage test found the extreme right tail of the site data to be larger than the background data it was concluded that the site concentrations are greater than background. The null and alternative hypotheses were:

$H_o$: Right Tail of Site Dataset ≤ Right Tail of the Background Dataset
$H_A$: Right Tail of the Site Dataset > Right Tail of the Background Dataset

## 3. STATISTICAL CONCLUSIONS

The statistical analysis of the IA1 surface soil, IA1 subsurface soil, IA2 surface soil, and IA2 subsurface soil background comparisons discussed in Sections 3.1, 3.2, 3.3, and 3.4 respectively. Tables 1, 2, 3, and 4 present the conclusions of the background comparisons.

For IA1 surface soil it can be concluded that site concentrations of cadmium, manganese, and potassium are consistent with background concentrations while site concentrations of aluminum, barium, chromium, copper, lead, magnesium, sodium, strontium, and zinc are greater than background concentrations. For IA1 subsurface soil it can be concluded that site concentrations of aluminum, cadmium, copper, lead, potassium, and strontium are consistent with background concentrations while site concentrations of barium, chromium, magnesium, manganese, sodium, and zinc are greater than background concentrations. For IA2 surface soil it can be concluded that site surface soil concentrations of barium, cadmium, chromium, lead, manganese, and potassium are consistent with background concentrations while site concentrations of aluminum, copper, magnesium, sodium, strontium, and zinc are greater than background concentrations. For IA2 subsurface soil, it can be concluded that site concentrations of aluminum, cadmium, chromium, copper, lead, magnesium, manganese, potassium, strontium, and zinc are consistent with background concentrations while concentrations of barium are greater than background concentrations.

**TABLE 1**
**IA1 SURFACE SOIL BACKGROUND COMPARISONS**


| PARAMETER | SITE FOD | BACKGROUND FOD | SITE DISTRIBUTION | BACKGROUND DISTRIBUTION | HYPOTHESIS TEST | P-VALUE | HYPOTHESIS TEST CONCLUSION | SLIPPAGE TEST STATISTIC | SLIPPAGE TEST CONCLUSION | QUANTILE TEST STATISTIC | QUANTILE CONCLUSION | FINAL CONCLUSION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALUMINUM | 21 / 21 | 15 / 15 | Normal | Normal | Equal Variance T-Test | 0.2304 | Site Greater than Background | 3 | Site Consistent with Background | 4 | Site Consistent with Background | Site Greater than Background |
| BARIUM | 21 / 21 | 15 / 15 | Nonparametric | Nonparametric | WRS | 0.8198 | Site Greater than Background | 9 | Site Greater Background | 5 | Site Greater Background | Site Greater than Background |
| CADMIUM | 18 / 21 | 10 / 15 | Nonparametric | Nonparametric | Gehan | 0.0362 | Site Consistent with Background | 2 | Site Consistent with Background | 4 | Site Consistent with Background | Site Consistent with Background |
| CHROMIUM | 21 / 21 | 15 / 15 | Nonparametric | Normal | WRS | 0.2657 | Site Greater than Background | 3 | Site Consistent with Background | 4 | Site Consistent with Background | Site Greater than Background |
| COPPER | 21 / 21 | 15 / 15 | Nonparametric | Nonparametric | WRS | 1 | Site Greater than Background | 13 | Site Greater Background | 5 | Site Greater Background | Site Greater than Background |
| LEAD | 21 / 21 | 15 / 15 | Nonparametric | Normal | WRS | 0.9976 | Site Greater than Background | 14 | Site Greater Background | 5 | Site Greater Background | Site Greater than Background |
| MAGNESIUM | 21 / 21 | 15 / 15 | Normal | Normal | Unequal Variance T-Test | 0.9865 | Site Greater than Background | 9 | Site Greater Background | 5 | Site Greater Background | Site Greater than Background |
| MANGANESE | 21 / 21 | 15 / 15 | Nonparametric | Normal | WRS | 4.09E-06 | Site Consistent with Background | 1 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| POTASSIUM | 20 / 21 | 15 / 15 | Nonparametric | Normal | WRS | 6.24E-05 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| SODIUM | 7 / 21 | 5 / 15 | Nonparametric | Nonparametric | Proportion | 1 | Site Greater than Background | NA | NA | NA | NA | Site Greater than Background |
| STRONTIUM | 21 / 21 | 14 / 14 | Nonparametric | Nonparametric | WRS | 0.1033 | Site Greater than Background | 4 | Site Consistent with Background | 4 | Site Consistent with Background | Site Greater than Background |
| ZINC | 21 / 21 | 14 / 15 | Nonparametric | Normal | WRS | 0.9999 | Site Greater than Background | 16 | Site Greater Background | 5 | Site Greater Background | Site Greater than Background |

FOD = Frequency of Detection
NA = Not Applicable
WRS = Wilcoxon Rank Sum

**TABLE 2**
**IA1 SUBSURFACE SOIL BACKGROUND COMPARISONS**


| PARAMETER | SITE FOD | BACKGROUND FOD | SITE DISTRIBUTION | BACKGROUND DISTRIBUTION | HYPOTHESIS TEST | P-VALUE | HYPOTHESIS TEST CONCLUSION | SLIPPAGE TEST STATISTIC | SLIPPAGE TEST CONCLUSION | QUANTILE TEST STATISTIC | QUANTILE CONCLUSION | FINAL CONCLUSION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALUMINUM | 8 / 8 | 9 / 9 | Normal | Normal | Equal Variance T-Test | 0.03077 | Site Consistent with Background | 2 | Site Consistent with Background | 2 | Site Consistent with Background | Site Consistent with Background |
| BARIUM | 8 / 8 | 9 / 9 | Normal | Normal | Equal Variance T-Test | 0.0552 | Site Greater than Background | 2 | Site Consistent with Background | 2 | Site Consistent with Background | Site Greater than Background |
| CADMIUM | 6 / 8 | 8 / 9 | Normal | Normal | Gehan | 0.0154 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| CHROMIUM | 8 / 8 | 9 / 9 | Nonparametric | Normal | WRS | 0.1179 | Site Greater than Background | 2 | Site Consistent with Background | 2 | Site Consistent with Background | Site Greater than Background |
| COPPER | 8 / 8 | 9 / 9 | Normal | Normal | Equal Variance T-Test | 0.004067 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| LEAD | 8 / 8 | 9 / 9 | Normal | Normal | Equal Variance T-Test | 0.01671 | Site Consistent with Background | 1 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| MAGNESIUM | 8 / 8 | 9 / 9 | Normal | Normal | Unequal Variance T-Test | 0.1115 | Site Greater than Background | 1 | Site Consistent with Background | 2 | Site Consistent with Background | Site Greater than Background |
| MANGANESE | 8 / 8 | 9 / 9 | Normal | Normal | Equal Variance T-Test | 0.563 | Site Greater than Background | 3 | Site Consistent with Background | 3 | Site Consistent with Background | Site Greater than Background |
| POTASSIUM | 8 / 8 | 9 / 9 | Nonparametric | Normal | WRS | 0.001211 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| SODIUM | 2 / 8 | 6 / 9 | Assumed Nonparametric | Normal | Proportion | 0.997 | Site Greater than Background | NA | NA | NA | NA | Site Greater than Background |
| STRONTIUM | 8 / 8 | 9 / 9 | Nonparametric | Normal | WRS | 0.0137 | Site Consistent with Background | 1 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| ZINC | 8 / 8 | 9 / 9 | Normal | Normal | Equal Variance T-Test | 0.7536 | Site Greater than Background | 2 | Site Consistent with Background | 3 | Site Consistent with Background | Site Greater than Background |

FOD = Frequency of Detection
NA = Not Applicable
WRS = Wilcoxon Rank Sum

**TABLE 3**
**IA2 SURFACE SOIL BACKGROUND COMPARISONS**


| PARAMETER | SITE FOD | BACKGROUND FOD | SITE DISTRIBUTION | BACKGROUND DISTRIBUTION | HYPOTHESIS TEST | HYPOTHESIS P-VALUE | HYPOTHESIS TEST CONCLUSION | SLIPPAGE TEST STATISTIC | SLIPPAGE TEST CONCLUSION | QUANTILE TEST STATISTIC | QUANTILE CONCLUSION | FINAL CONCLUSION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALUMINUM | 9 / 9 | 15 / 15 | Normal | Normal | T-Test | 0.2295 | Site Greater than Background | 2 | Site Consistent with Background | 2 | Site Consistent with Background | Site Greater than Background |
| BARIUM | 9 / 9 | 15 / 15 | Normal | Nonparametric | WRS | 0.0006417 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| CADMIUM | 5 / 9 | 10 / 15 | Nonparametric | Nonparametric | Gehan | 0.0032 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| CHROMIUM | 9 / 9 | 15 / 15 | Normal | Normal | T-Test | 0.03857 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| COPPER | 8 / 9 | 15 / 15 | Normal | Nonparametric | WRS | 0.3714 | Site Greater than Background | 3 | Site Consistent with Background | 3 | Site Greater Background | Site Greater than Background |
| LEAD | 9 / 9 | 15 / 15 | Normal | Normal | T-Test | 0.0004156 | Site Consistent with Background | 0 | Site Consistent with Background | 0 | Site Consistent with Background | Site Consistent with Background |
| MAGNESIUM | 9 / 9 | 15 / 15 | Nonparametric | Normal | WRS | 0.9915 | Site Greater than Background | 7 | Site Greater Background | 3 | Site Greater Background | Site Greater than Background |
| MANGANESE | 9 / 9 | 15 / 15 | Normal | Normal | T-Test | 2.49E-07 | Site Consistent with Background | 0 | Site Consistent with Background | 0 | Site Consistent with Background | Site Consistent with Background |
| POTASSIUM | 9 / 9 | 15 / 15 | Normal | Normal | T-Test | 0.001316 | Site Consistent with Background | 0 | Site Consistent with Background | 1 | Site Consistent with Background | Site Consistent with Background |
| SODIUM | 7 / 9 | 5 / 15 | Nonparametric | Nonparametric | Gehan | 0.9999 | Site Greater than Background | 7 | Site Greater Background | 3 | Site Greater Background | Site Greater than Background |
| STRONTIUM | 9 / 9 | 14 / 14 | Normal | Nonparametric | WRS | 0.9265 | Site Greater than Background | 4 | Site Greater Background | 3 | Site Greater Background | Site Greater than Background |
| ZINC | 7 / 9 | 14 / 15 | Normal | Normal | Gehan | 0.2052 | Site Greater than Background | 0 | Site Consistent with Background | 2 | Site Consistent with Background | Site Greater than Background |

FOD = Frequency of Detection
WRS = Wilcoxon Rank Sum

TABLE 4
IA2 SUBSURFACE SOIL BACKGROUND COMPARISONS

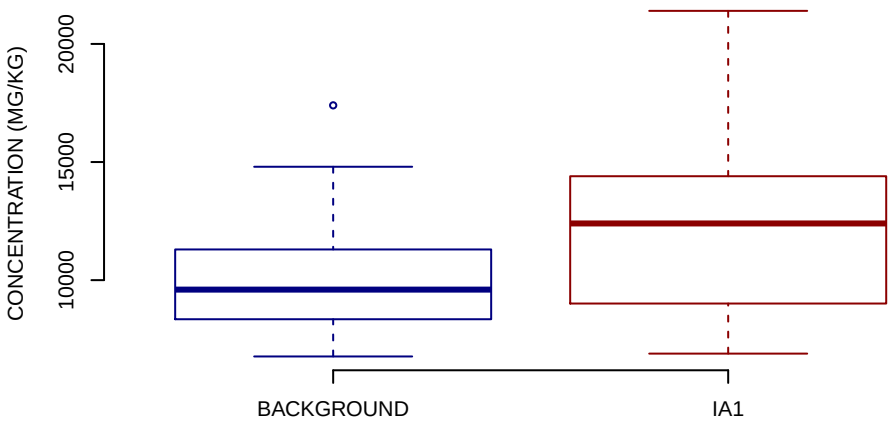

| PARAMETER | SITE FOD | BACKGROUND FOD | SITE MAXIMUM DETECTION (MG/KG) | BACKGROUND MAXIMUM DETECTION (MG/KG) | GROUP 8 95% UTL(1,2) | CONCLUSION |
|---|---|---|---|---|---|---|
| ALUMINUM | 4 / 4 | 9 / 9 | 15000 | 16200 | 20,600 | Site Consistent with Background |
| BARIUM | 4 / 4 | 9 / 9 | 116 | 83.4 | **115** | Site Greater than Background |
| CADMIUM | 2 / 4 | 8 / 9 | 0.19 | 0.64 | 0.8 | Site Consistent with Background |
| CHROMIUM | 4 / 4 | 9 / 9 | 20.4 | 27.1 | 33.0 | Site Consistent with Background |
| COPPER | 4 / 4 | 9 / 9 | 14.9 | 23.8 | 33.3 | Site Consistent with Background |
| LEAD | 4 / 4 | 9 / 9 | 16.8 | 14.6 | 19.6 | Site Consistent with Background |
| MAGNESIUM | 4 / 4 | 9 / 9 | 2030 | 2870 | 3,410 | Site Consistent with Background |
| MANGANESE | 4 / 4 | 9 / 9 | 674 | 457 | 704 | Site Consistent with Background |
| POTASSIUM | 4 / 4 | 9 / 9 | 750 | 1290 | 1,890 | Site Consistent with Background |
| STRONTIUM | 4 / 4 | 9 / 9 | 30.7 | 20.3 | 30.9 | Site Consistent with Background |
| ZINC | 4 / 4 | 9 / 9 | 42.1 | 58.2 | 83.3 | Site Consistent with Background |

FOD = Frequency of Detection
UTL = Upper Tolerance Level

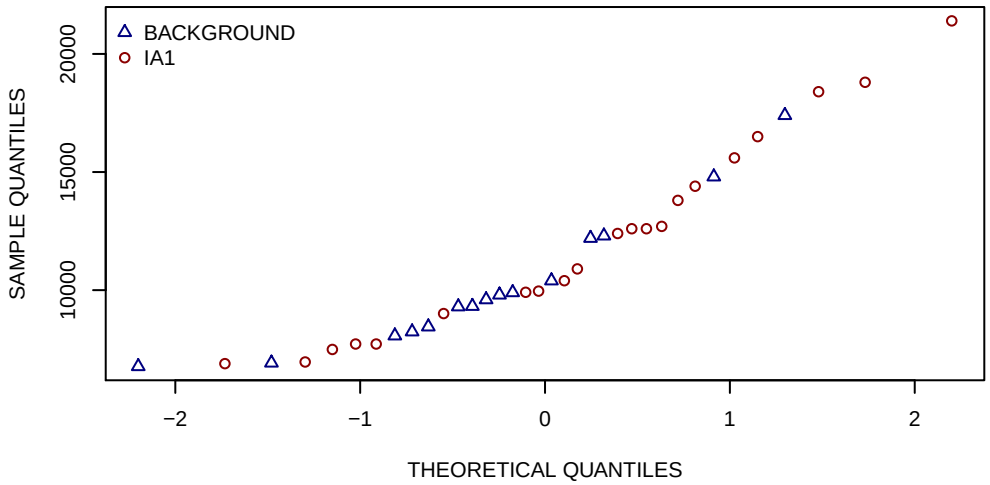
(1) Group 8 95 percent UTL from the Crane Basewide Background Report.
(2) Highlighted cells indicate that Site maximum detected concentration exceeds Background 95 percent UTL.

# ALUMINUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 1 OF 12

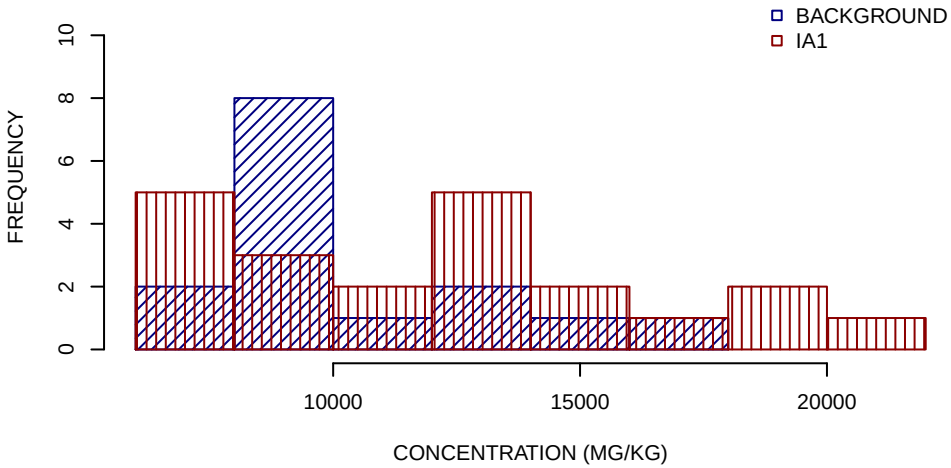
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| MINIMUM | 6800 | 6900 |
| 25TH PERCENTILE | 8300 | 9000 |
| MEDIAN | 9600 | 12000 |
| MEAN | 10000 | 12000 |
| 75TH PERCENTILE | 11000 | 14000 |
| MAXIMUM | 17000 | 21000 |

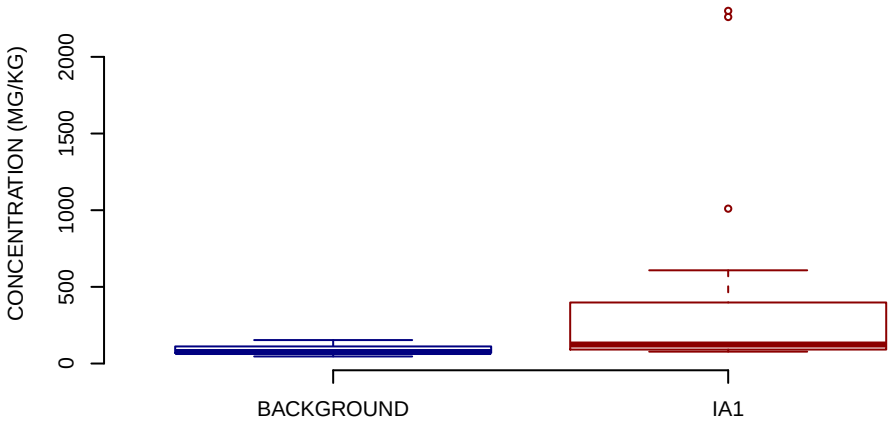
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

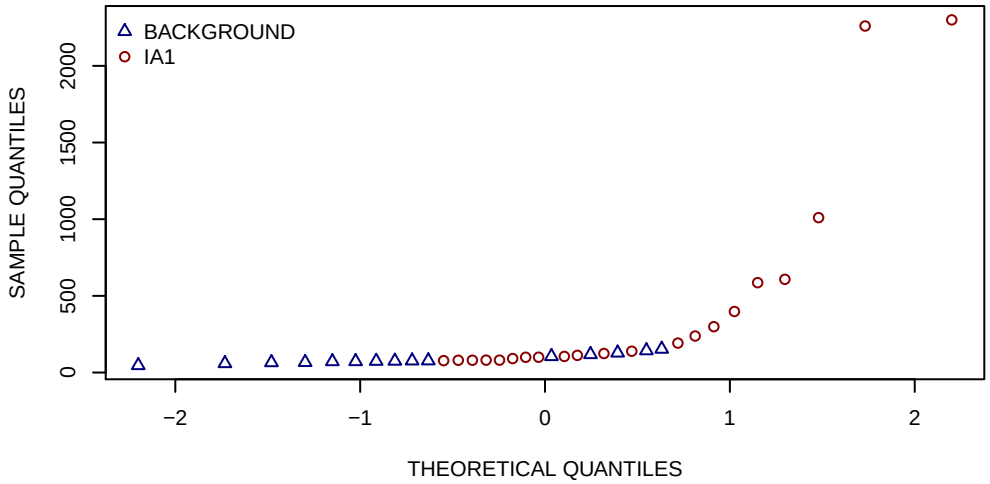
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# BARIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 2 OF 12

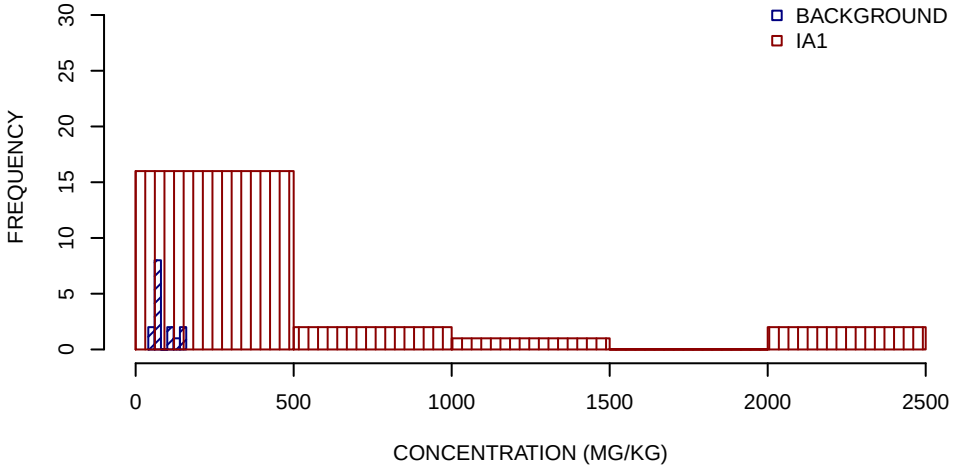
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| MINIMUM | 46 | 78 |
| 25TH PERCENTILE | 69 | 91 |
| MEDIAN | 75 | 120 |
| MEAN | 89 | 430 |
| 75TH PERCENTILE | 110 | 400 |
| MAXIMUM | 150 | 2300 |

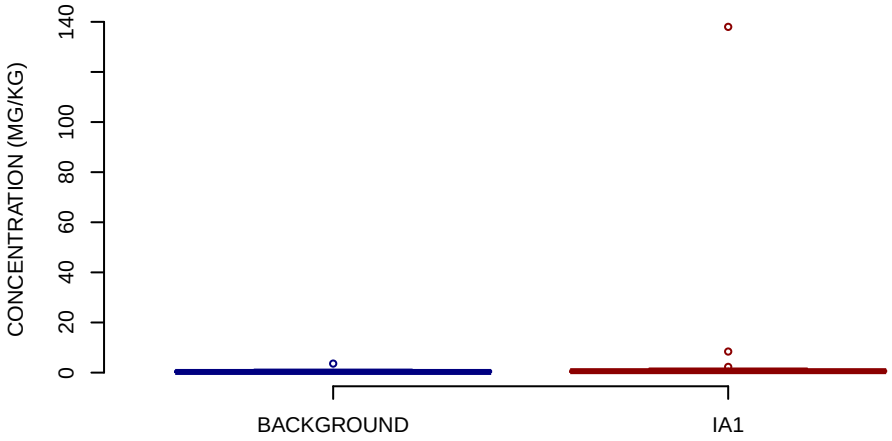
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

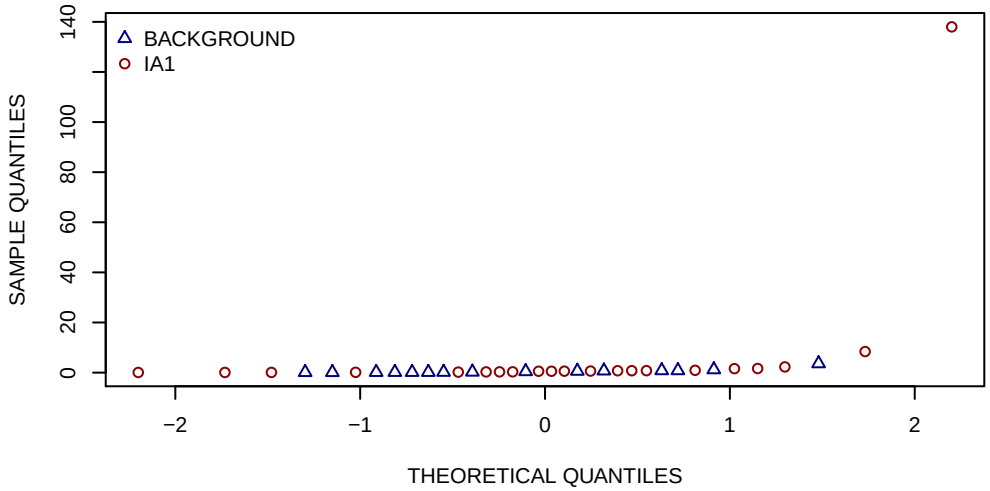
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CADMIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 3 OF 12

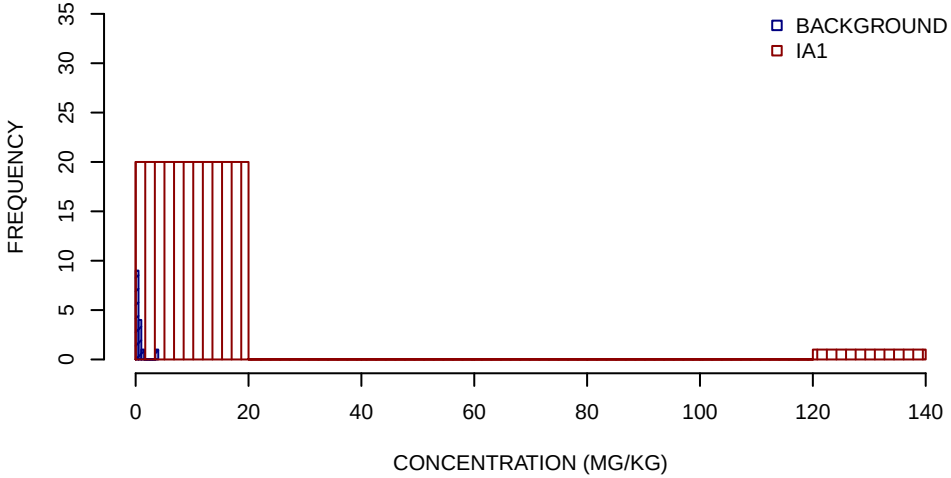
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 0.1 | 0.063 |
| **25TH PERCENTILE** | 0.14 | 0.29 |
| **MEDIAN** | 0.26 | 0.58 |
| **MEAN** | 0.63 | 7.6 |
| **75TH PERCENTILE** | 0.78 | 0.92 |
| **MAXIMUM** | 3.6 | 140 |

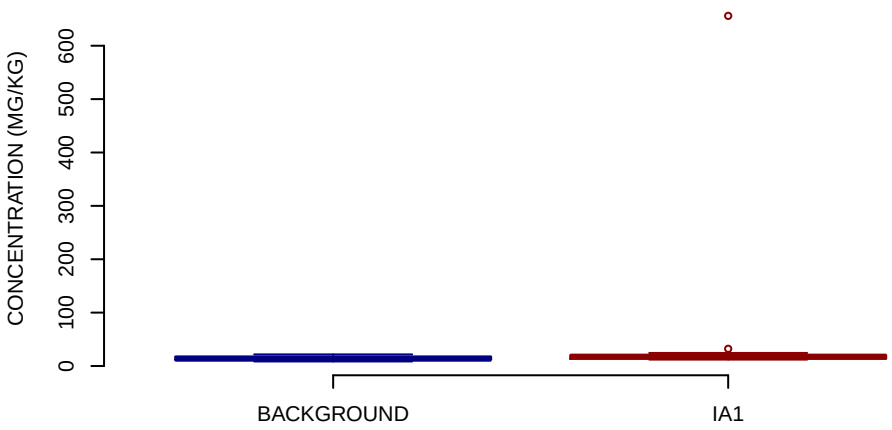
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

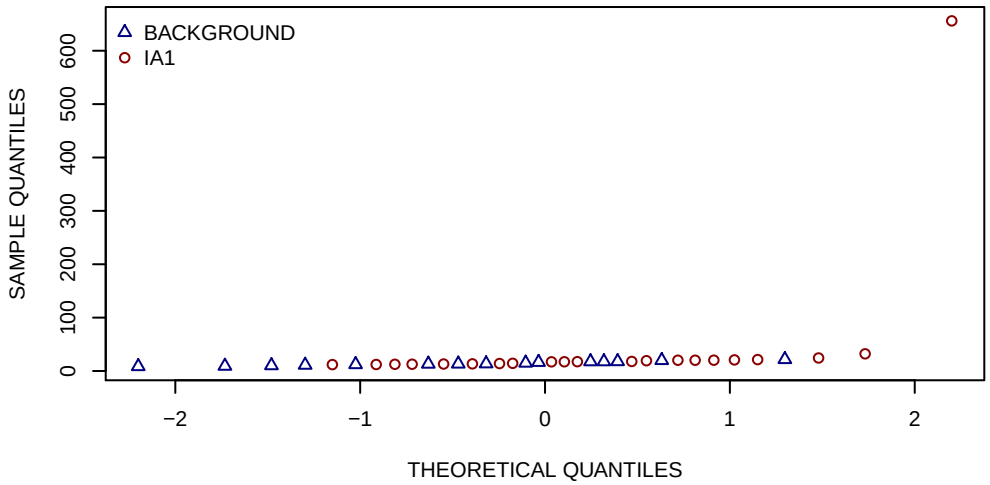
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CHROMIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 4 OF 12

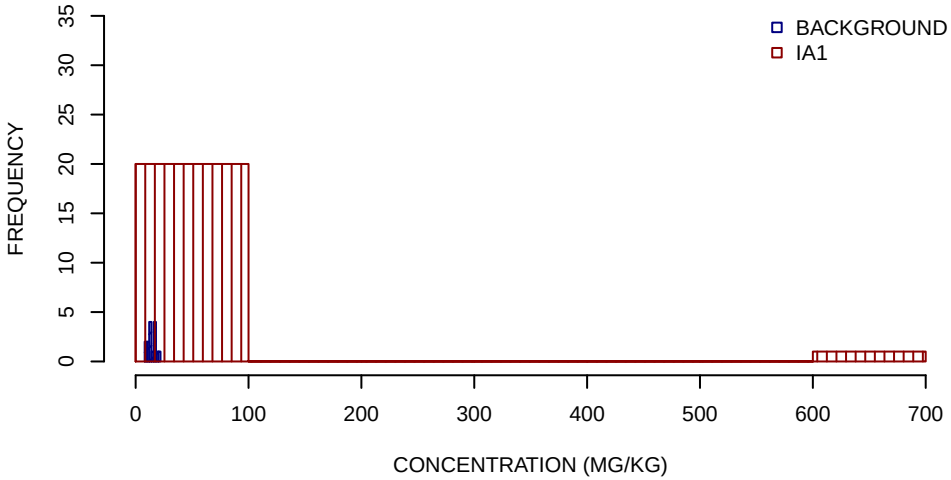
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| MINIMUM | 8.5 | 12 |
| 25TH PERCENTILE | 12 | 13 |
| MEDIAN | 14 | 18 |
| MEAN | 14 | 48 |
| 75TH PERCENTILE | 18 | 20 |
| MAXIMUM | 22 | 660 |

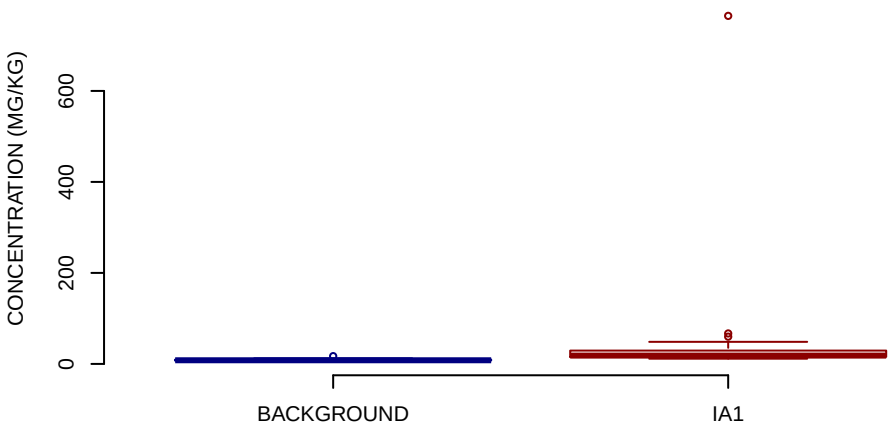
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

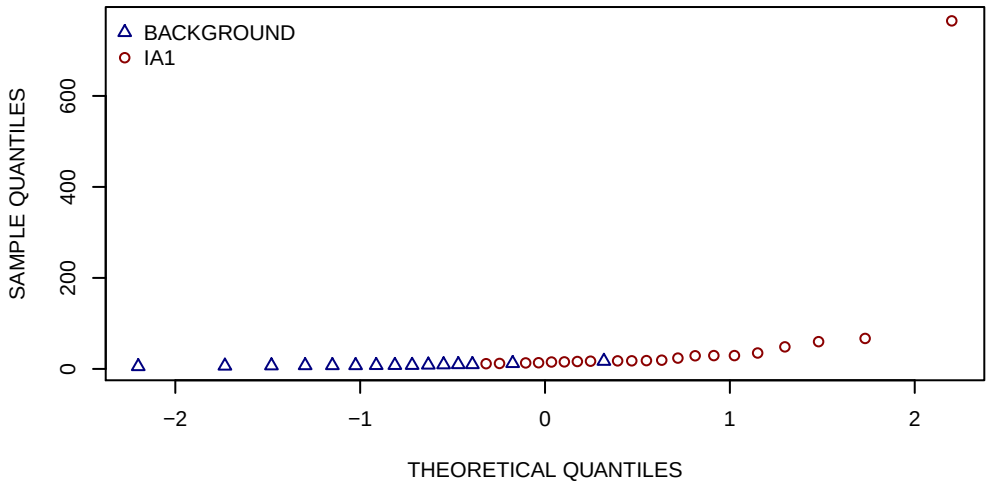
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# COPPER IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 5 OF 12

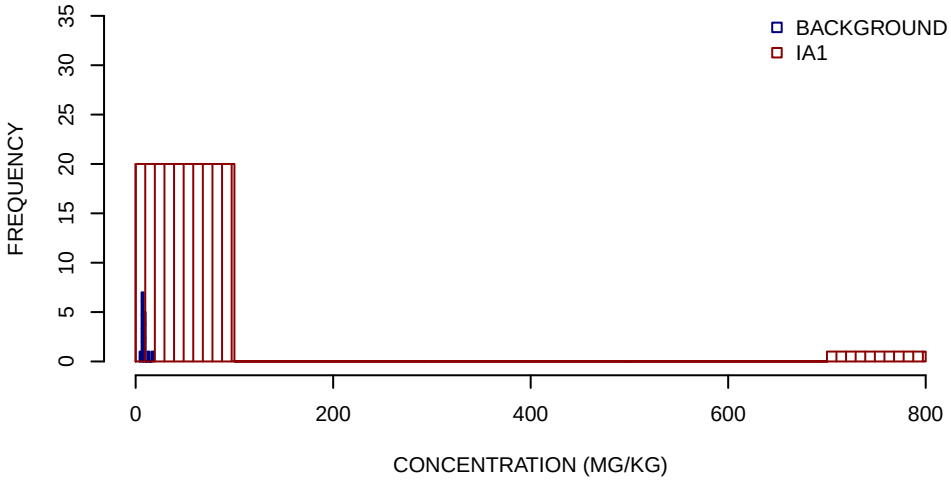
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 5.4 | 12 |
| **25TH PERCENTILE** | 7.6 | 16 |
| **MEDIAN** | 8 | 18 |
| **MEAN** | 8.9 | 61 |
| **75TH PERCENTILE** | 9.6 | 29 |
| **MAXIMUM** | 17 | 760 |

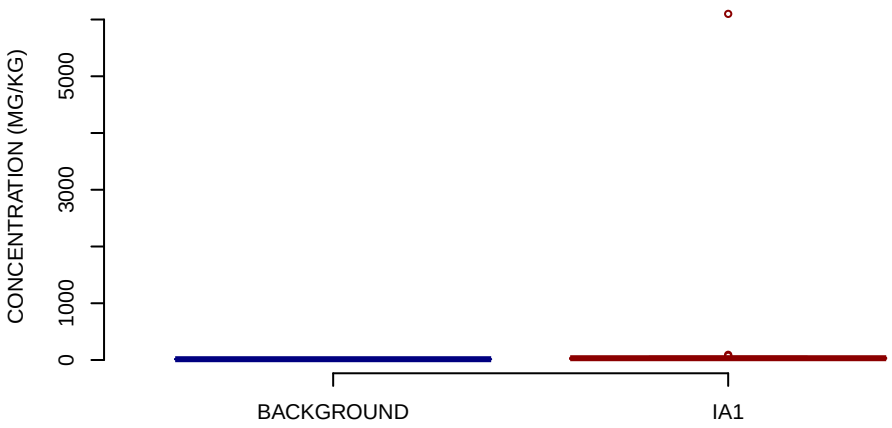
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

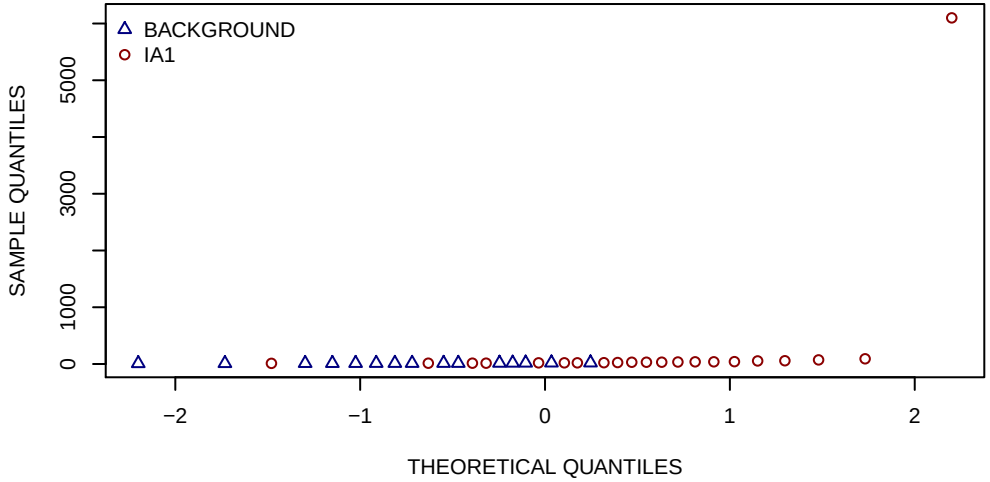
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# LEAD IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 6 OF 12

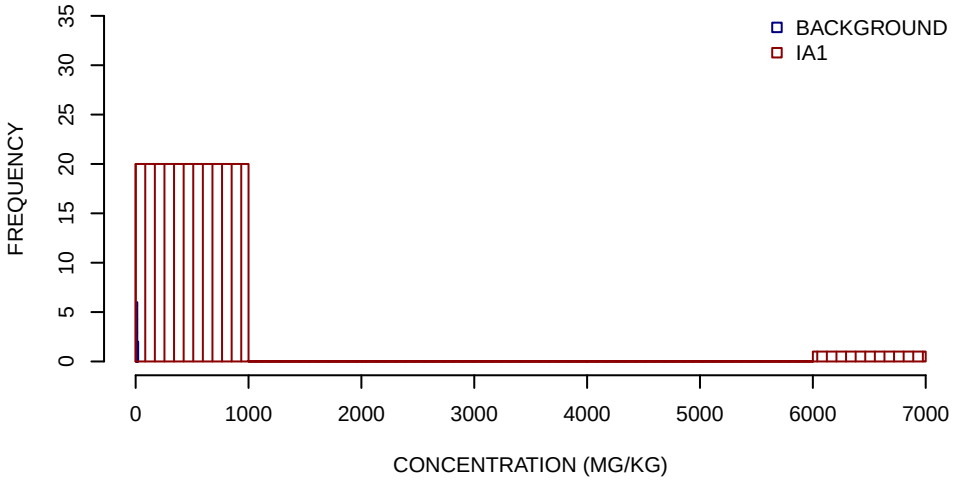
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 9.4 | 11 |
| **25TH PERCENTILE** | 13 | 21 |
| **MEDIAN** | 14 | 32 |
| **MEAN** | 15 | 320 |
| **75TH PERCENTILE** | 17 | 41 |
| **MAXIMUM** | 22 | 6100 |

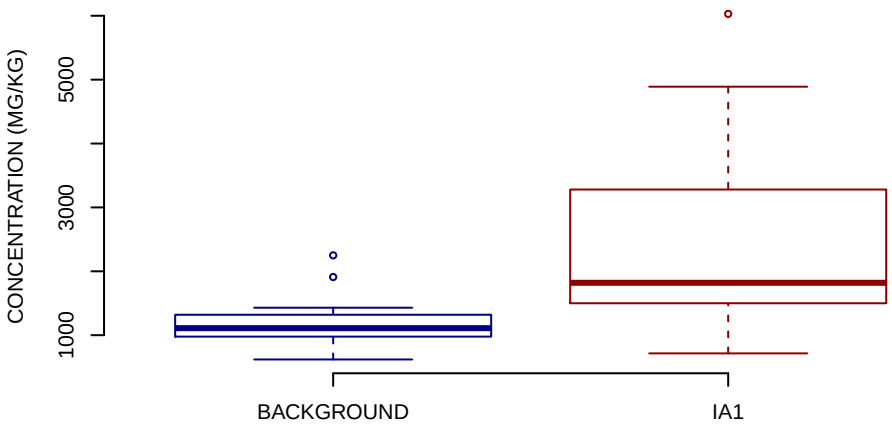
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

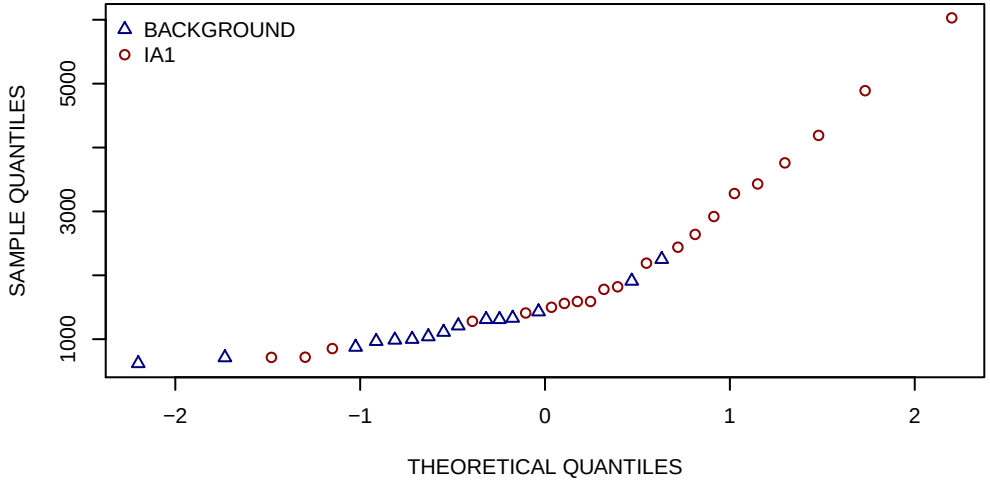
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MAGNESIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 7 OF 12

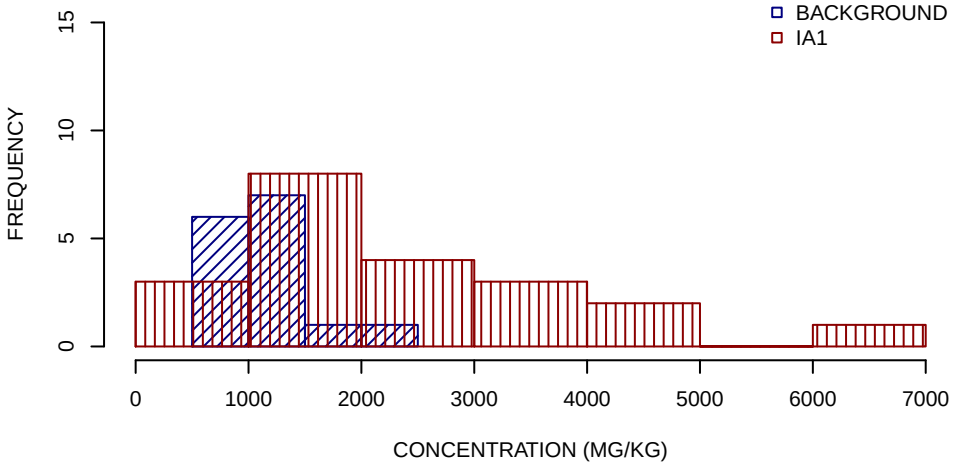
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 620 | 720 |
| **25TH PERCENTILE** | 980 | 1500 |
| **MEDIAN** | 1100 | 1800 |
| **MEAN** | 1200 | 2400 |
| **75TH PERCENTILE** | 1300 | 3300 |
| **MAXIMUM** | 2200 | 6000 |

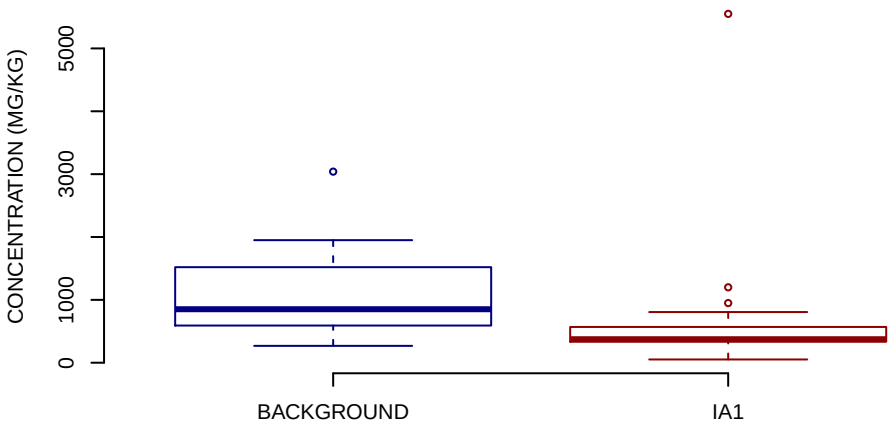
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

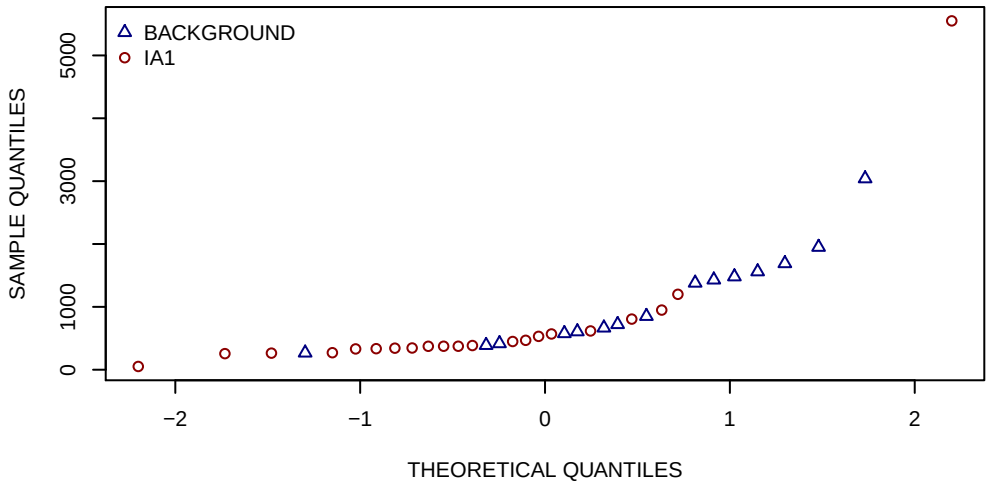
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MANGANESE IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 8 OF 12

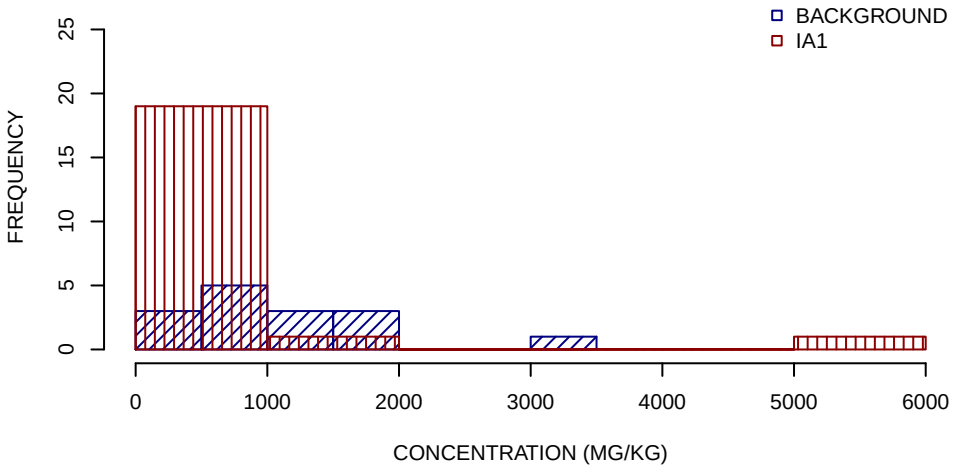
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 270 | 52 |
| **25TH PERCENTILE** | 590 | 340 |
| **MEDIAN** | 850 | 370 |
| **MEAN** | 1100 | 710 |
| **75TH PERCENTILE** | 1500 | 570 |
| **MAXIMUM** | 3000 | 5600 |

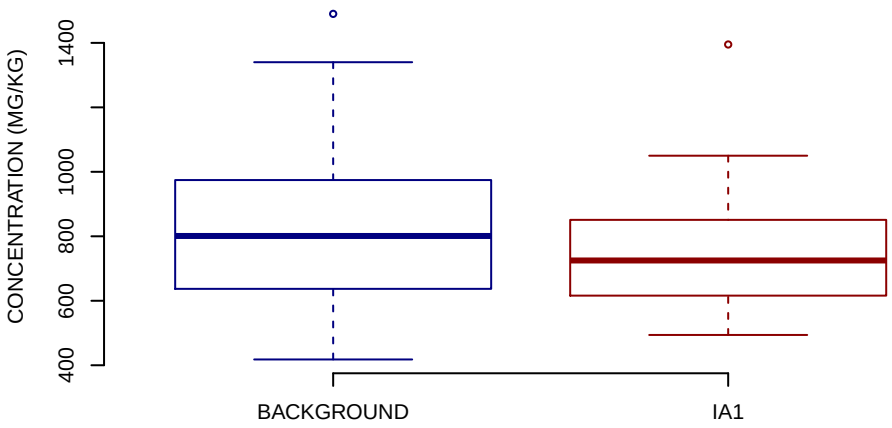
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

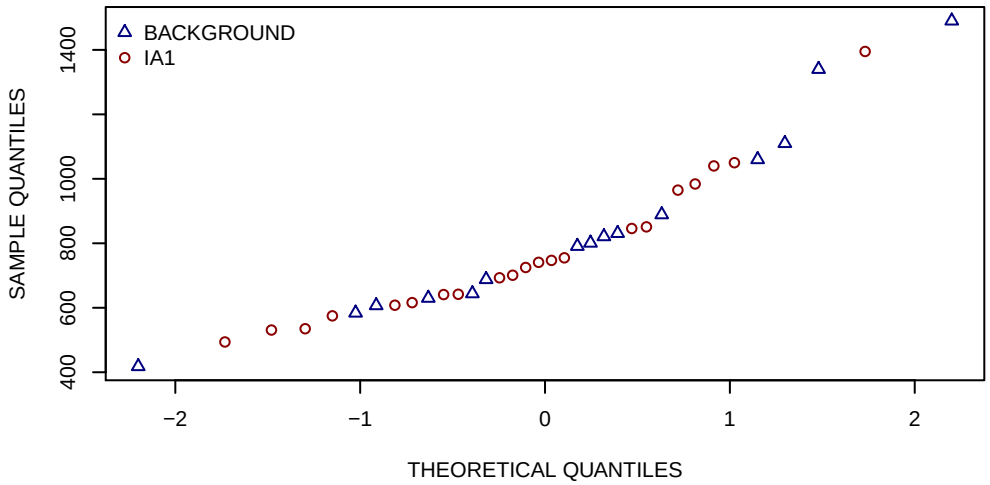
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# POTASSIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 9 OF 12

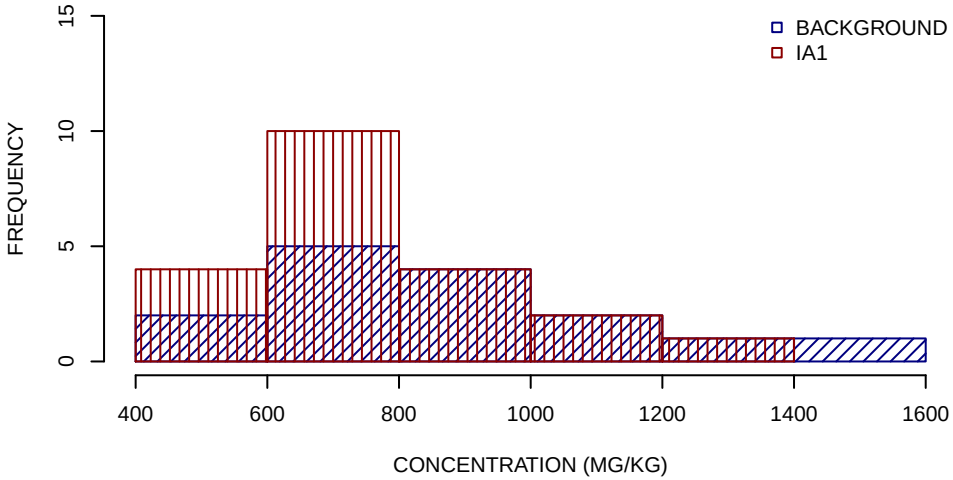
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 420 | 490 |
| **25TH PERCENTILE** | 640 | 620 |
| **MEDIAN** | 800 | 720 |
| **MEAN** | 850 | 770 |
| **75TH PERCENTILE** | 970 | 850 |
| **MAXIMUM** | 1500 | 1400 |

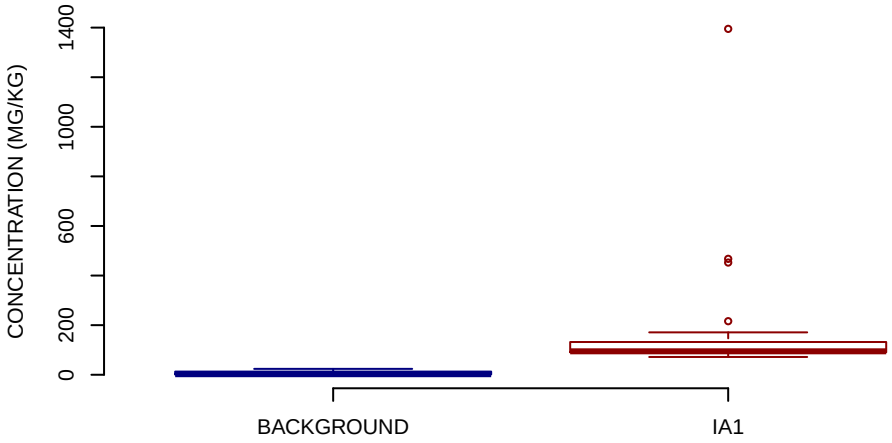
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

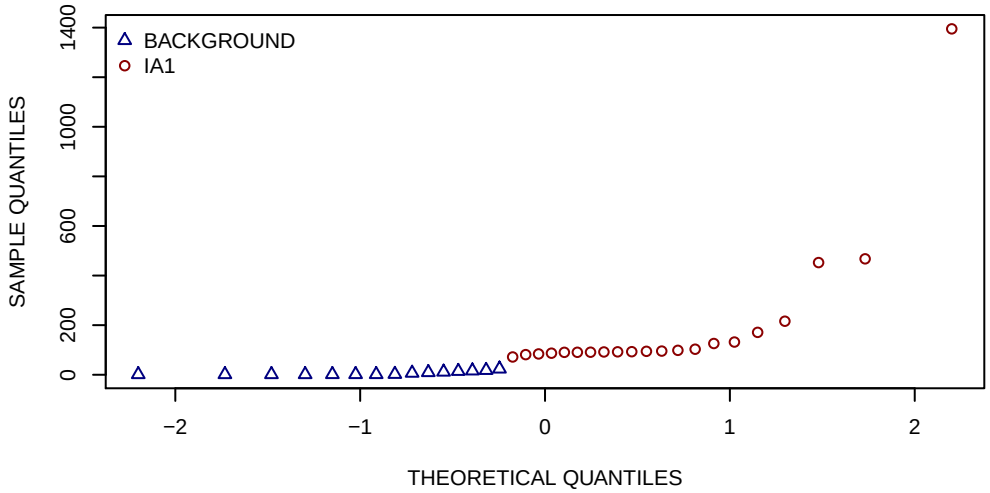
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# SODIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 10 OF 12

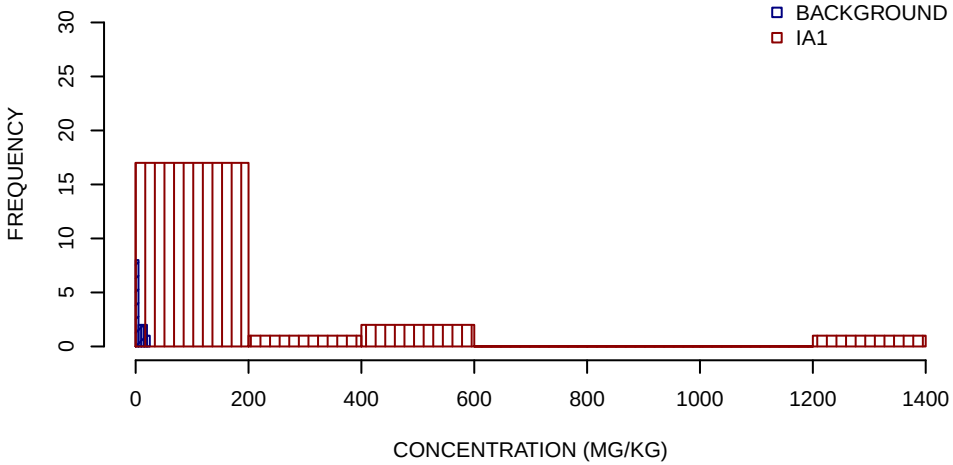
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 1.2 | 72 |
| **25TH PERCENTILE** | 1.3 | 91 |
| **MEDIAN** | 2.2 | 94 |
| **MEAN** | 7.4 | 200 |
| **75TH PERCENTILE** | 13 | 130 |
| **MAXIMUM** | 24 | 1400 |

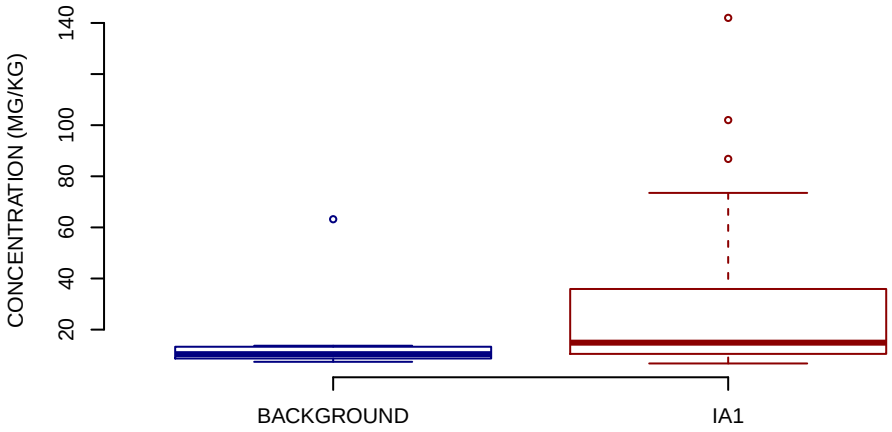
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

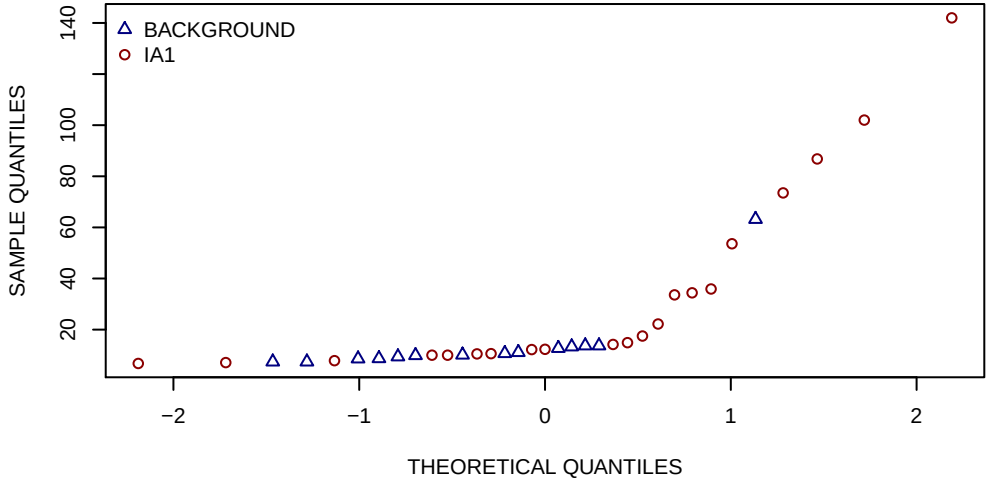
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# STRONTIUM IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 11 OF 12

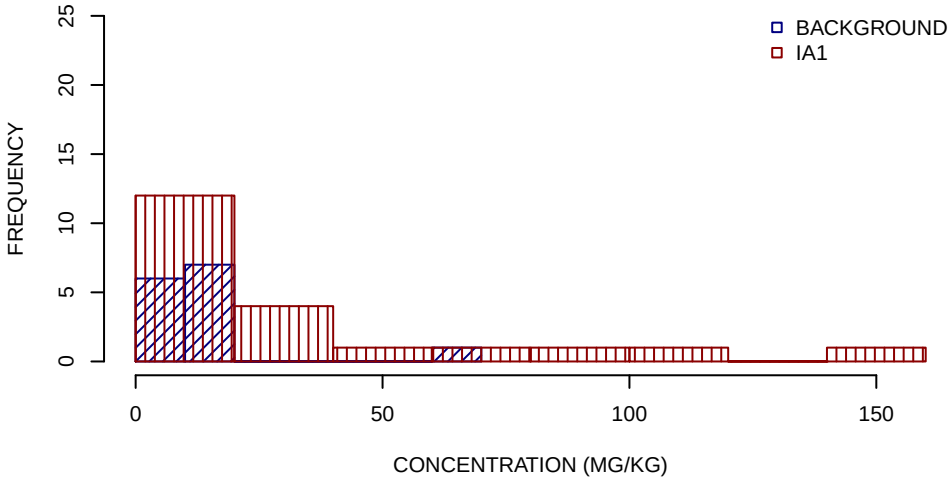
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 7.4 | 6.8 |
| **25TH PERCENTILE** | 8.9 | 10 |
| **MEDIAN** | 10 | 15 |
| **MEAN** | 14 | 34 |
| **75TH PERCENTILE** | 13 | 36 |
| **MAXIMUM** | 63 | 140 |

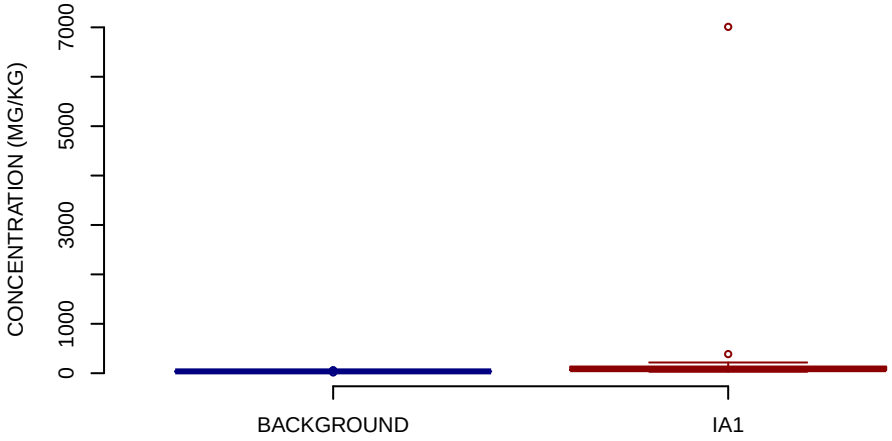
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

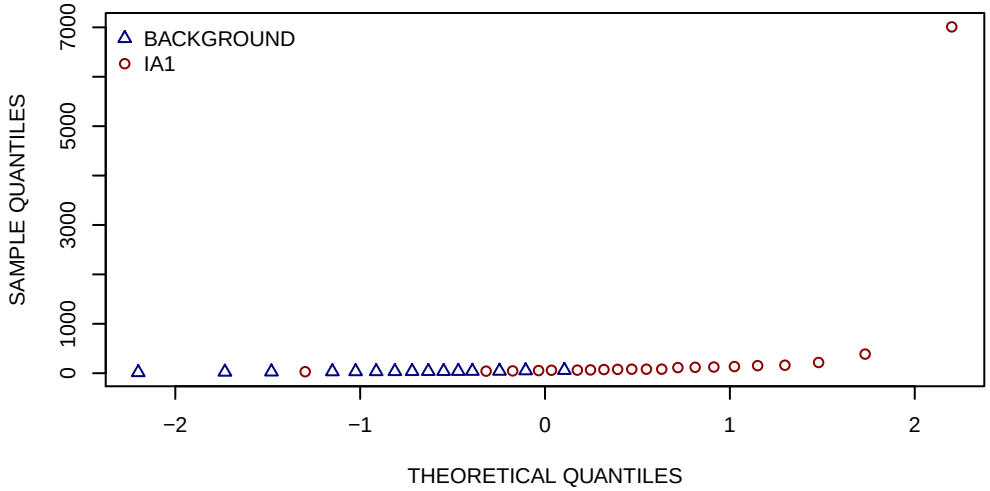
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ZINC IA1 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 12 OF 12

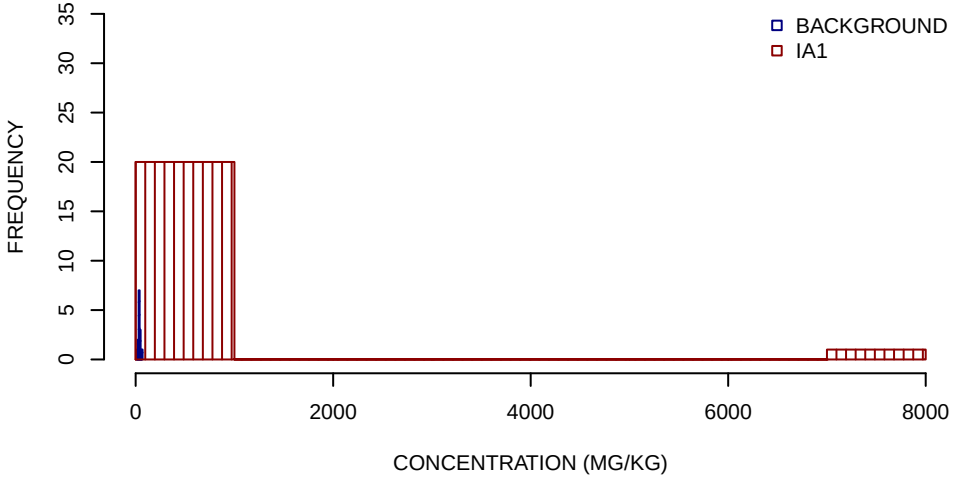
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 15 | 30 |
| **25TH PERCENTILE** | 33 | 62 |
| **MEDIAN** | 37 | 81 |
| **MEAN** | 37 | 440 |
| **75TH PERCENTILE** | 41 | 140 |
| **MAXIMUM** | 60 | 7000 |

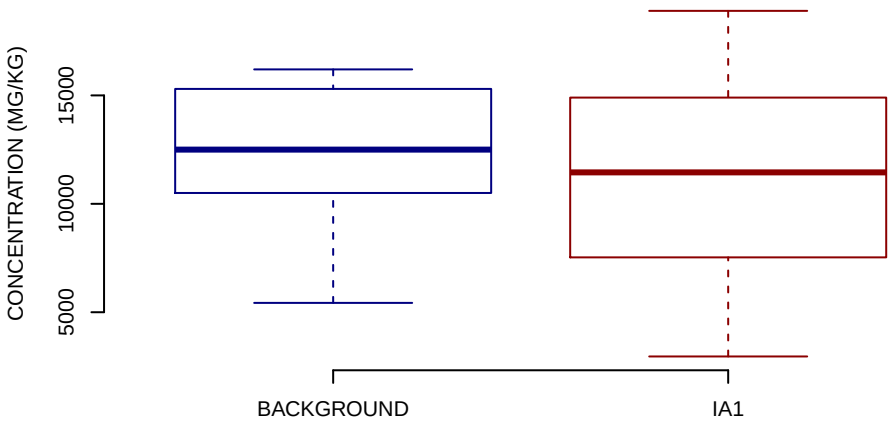
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

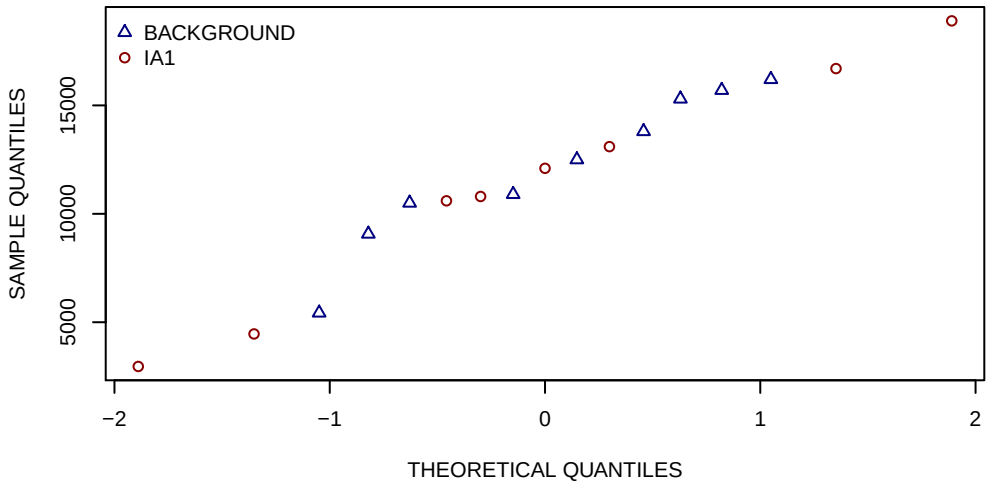
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ALUMINUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 1 OF 12

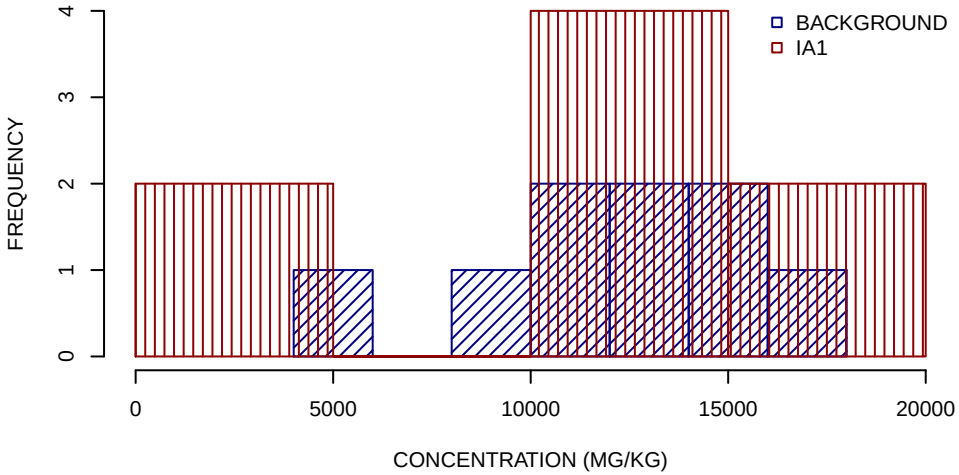
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 5400 | 3000 |
| **25TH PERCENTILE** | 10000 | 9100 |
| **MEDIAN** | 12000 | 11000 |
| **MEAN** | 12000 | 11000 |
| **75TH PERCENTILE** | 15000 | 14000 |
| **MAXIMUM** | 16000 | 19000 |

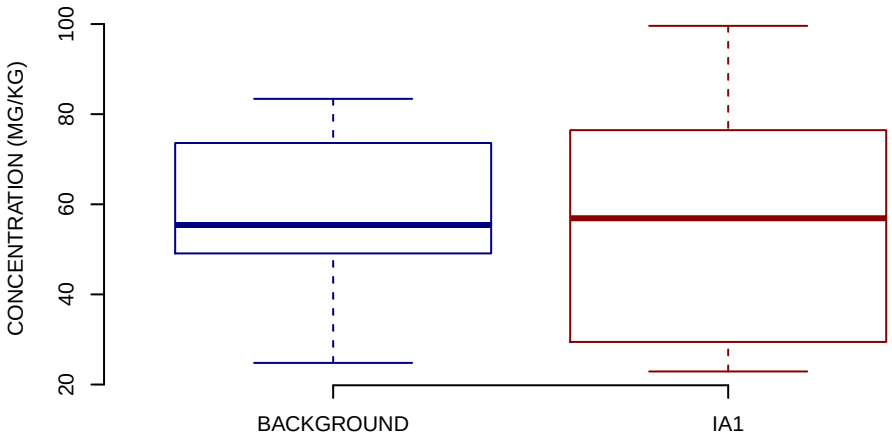
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

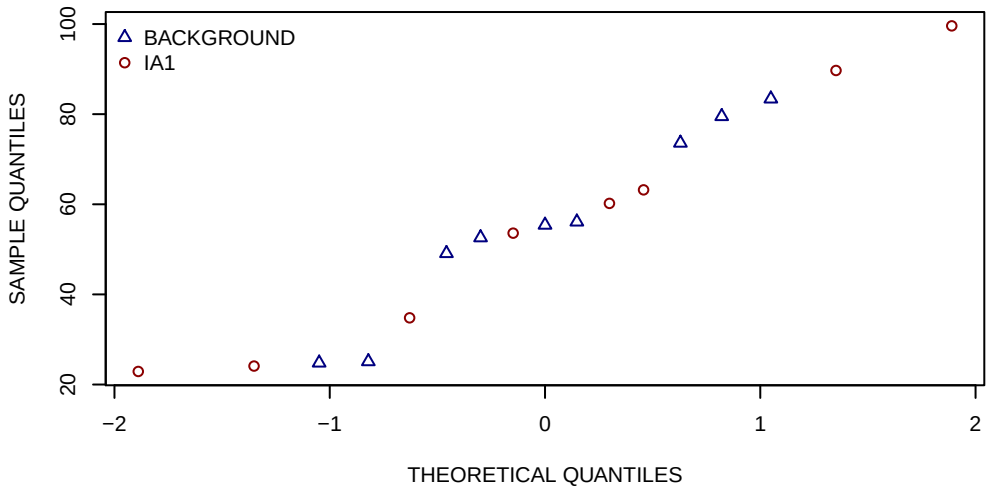
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# BARIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 2 OF 12

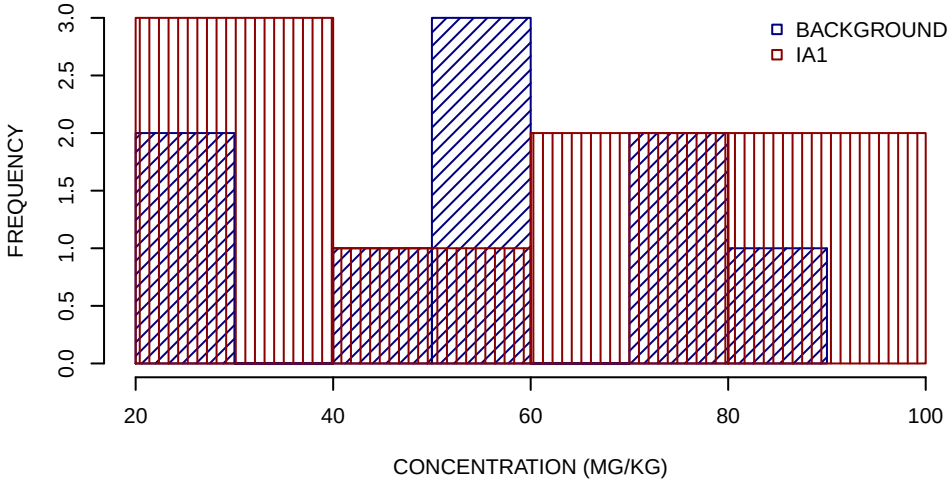
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| MINIMUM | 25 | 23 |
| 25TH PERCENTILE | 49 | 32 |
| MEDIAN | 55 | 57 |
| MEAN | 56 | 56 |
| 75TH PERCENTILE | 74 | 70 |
| MAXIMUM | 83 | 100 |

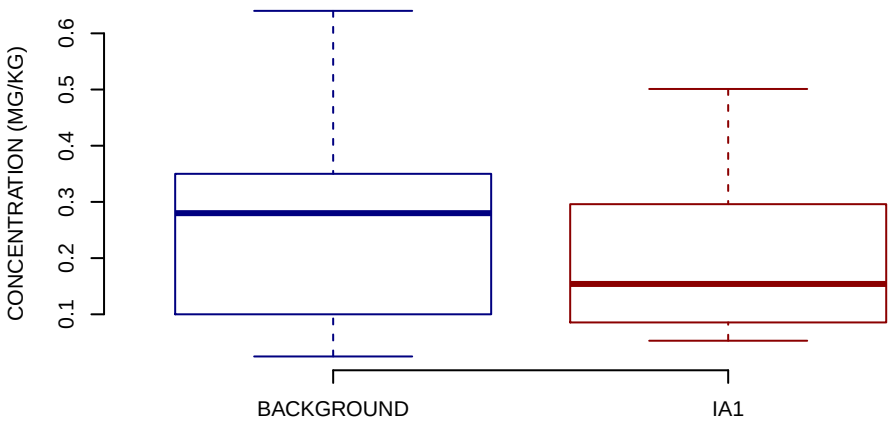
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

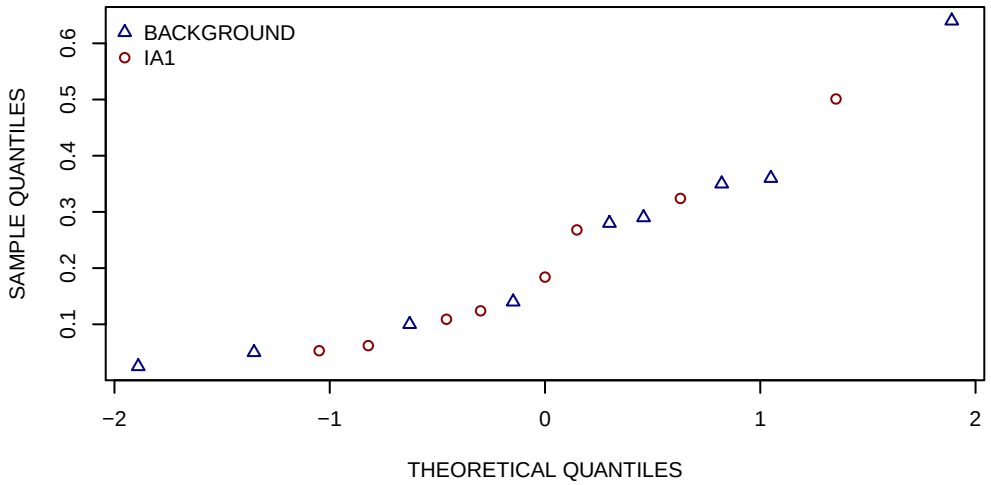
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CADMIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 3 OF 12

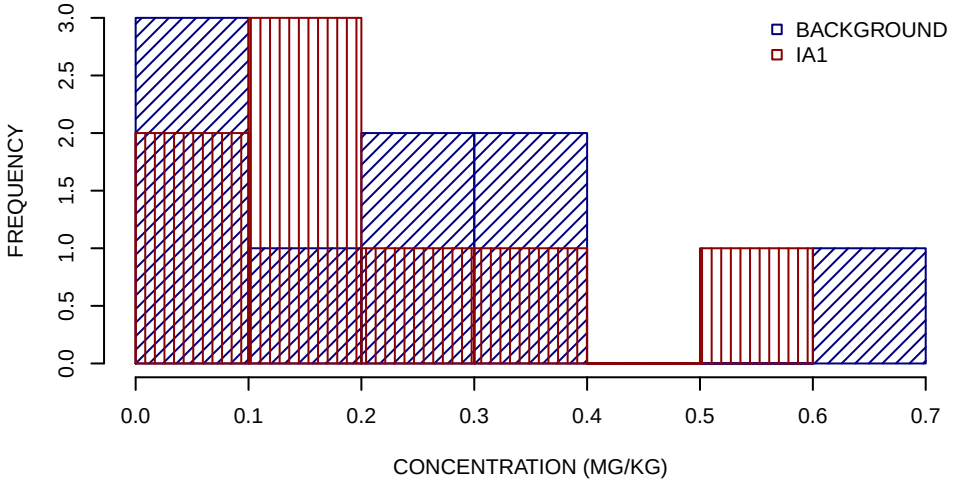
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 0.025 | 0.053 |
| **25TH PERCENTILE** | 0.1 | 0.097 |
| **MEDIAN** | 0.28 | 0.15 |
| **MEAN** | 0.25 | 0.2 |
| **75TH PERCENTILE** | 0.35 | 0.28 |
| **MAXIMUM** | 0.64 | 0.5 |

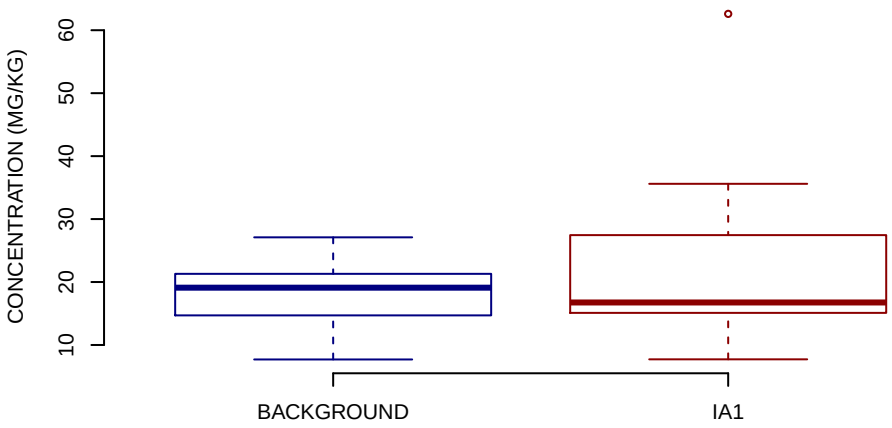
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

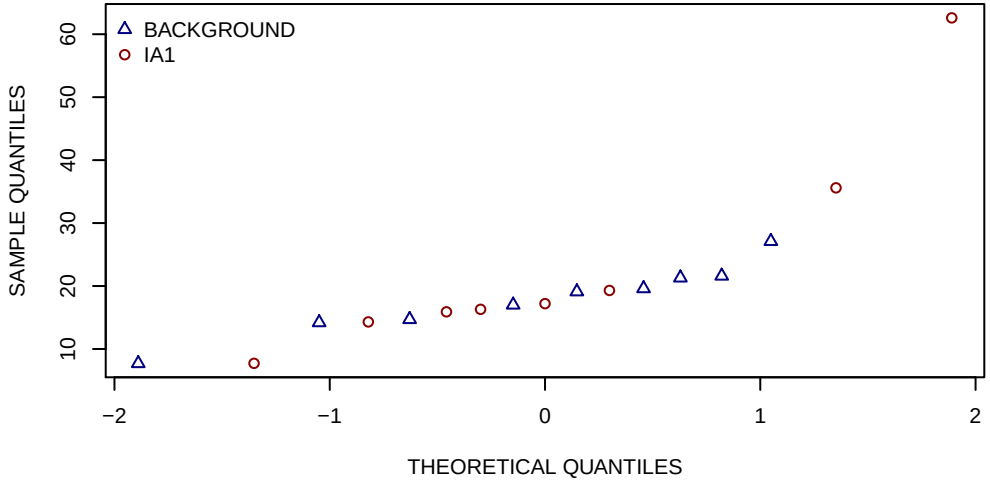
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CHROMIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 4 OF 12

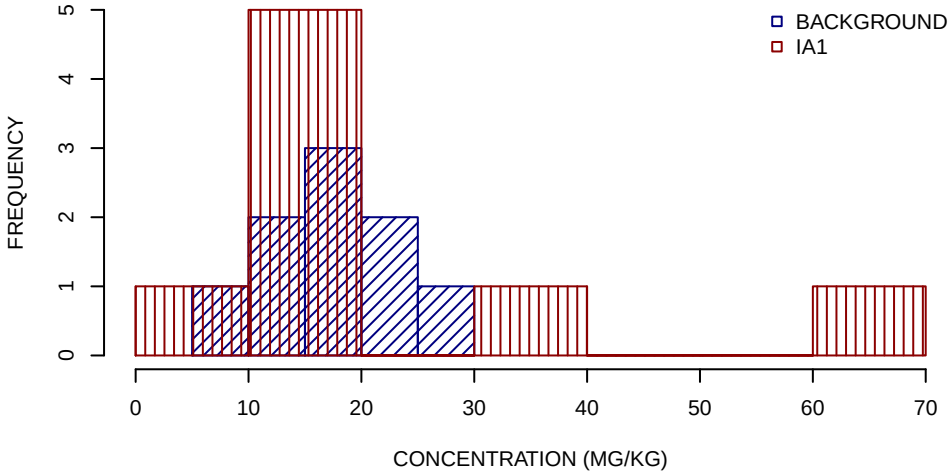
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 7.7 | 7.7 |
| **25TH PERCENTILE** | 15 | 16 |
| **MEDIAN** | 19 | 17 |
| **MEAN** | 18 | 24 |
| **75TH PERCENTILE** | 21 | 23 |
| **MAXIMUM** | 27 | 63 |

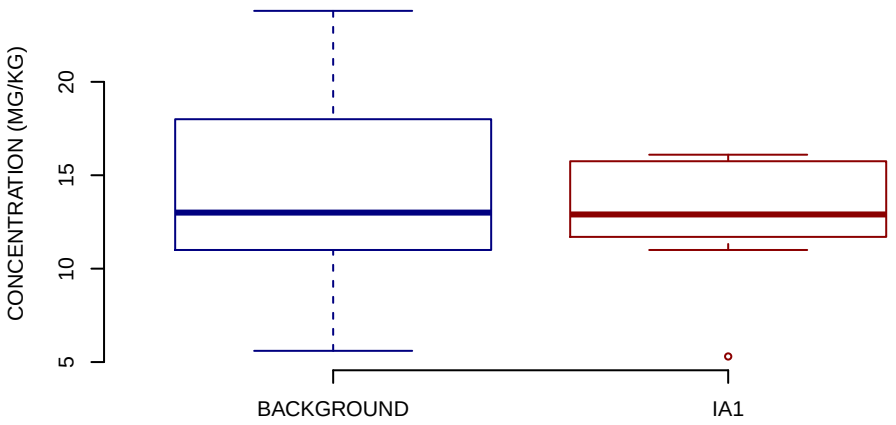
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

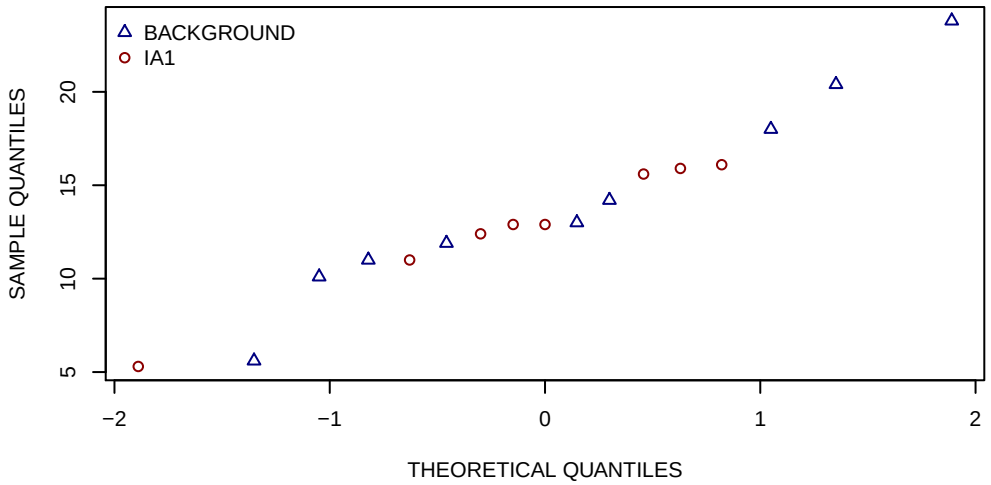
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# COPPER IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 5 OF 12

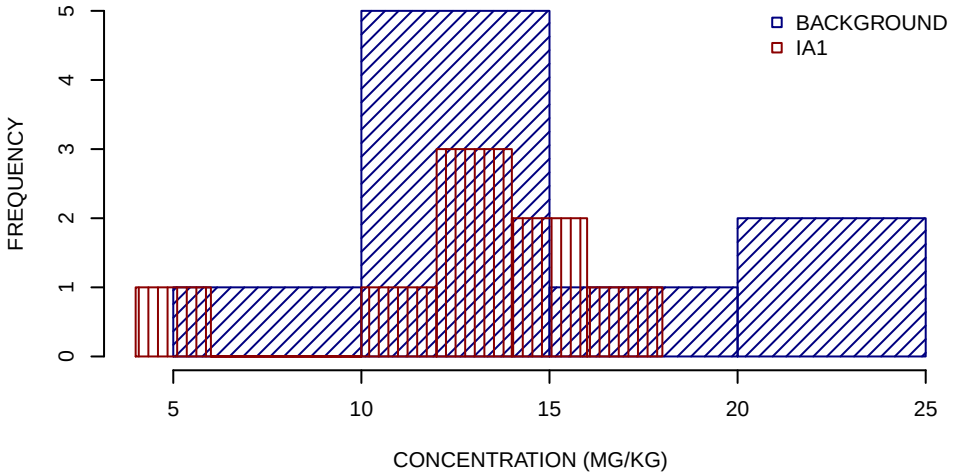
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 5.6 | 5.3 |
| **25TH PERCENTILE** | 11 | 12 |
| **MEDIAN** | 13 | 13 |
| **MEAN** | 14 | 13 |
| **75TH PERCENTILE** | 18 | 16 |
| **MAXIMUM** | 24 | 16 |

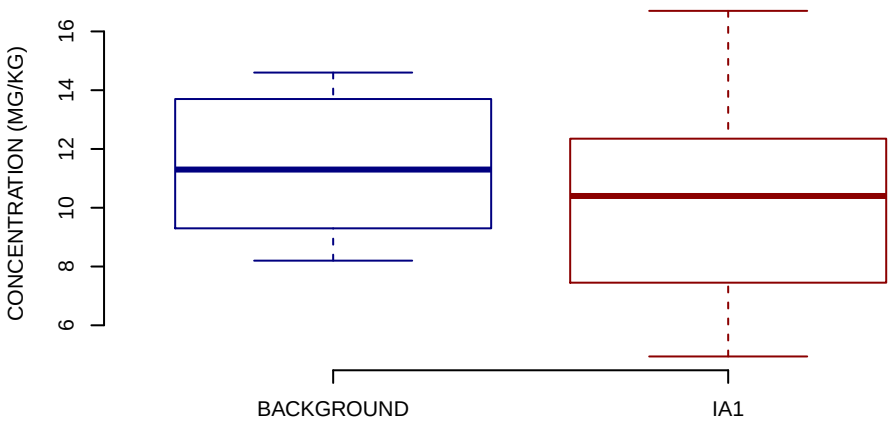
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

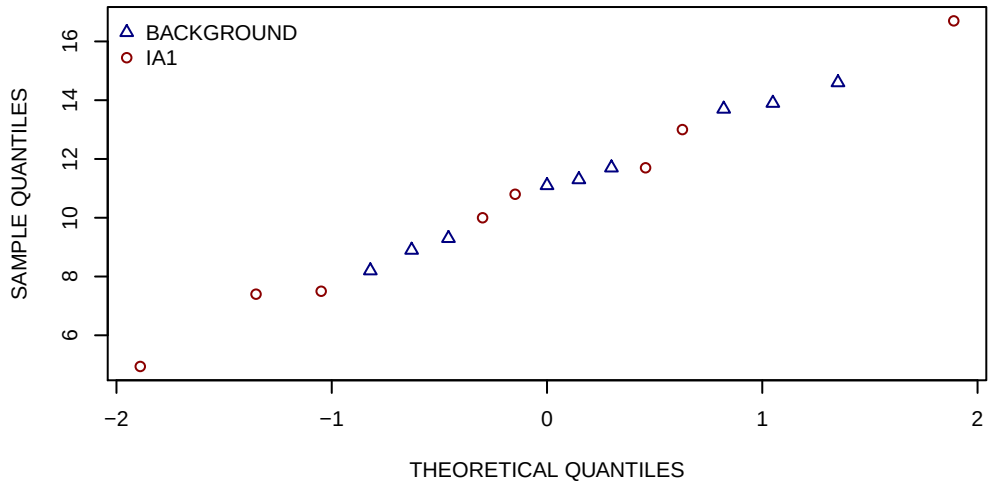
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# LEAD IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 6 OF 12

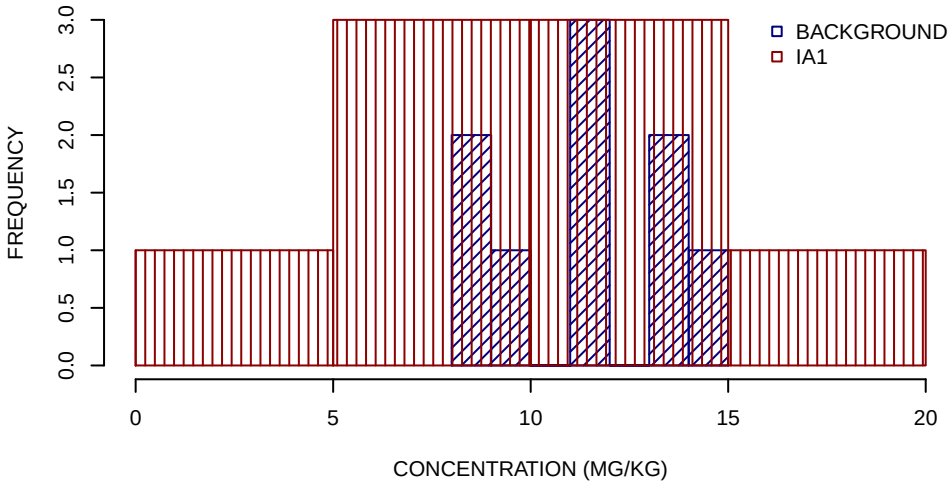
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 8.2 | 4.9 |
| **25TH PERCENTILE** | 9.3 | 7.5 |
| **MEDIAN** | 11 | 10 |
| **MEAN** | 11 | 10 |
| **75TH PERCENTILE** | 14 | 12 |
| **MAXIMUM** | 15 | 17 |

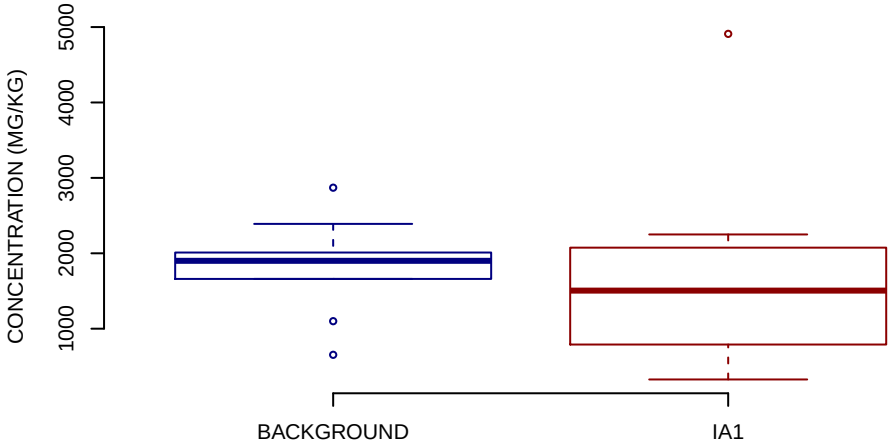
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

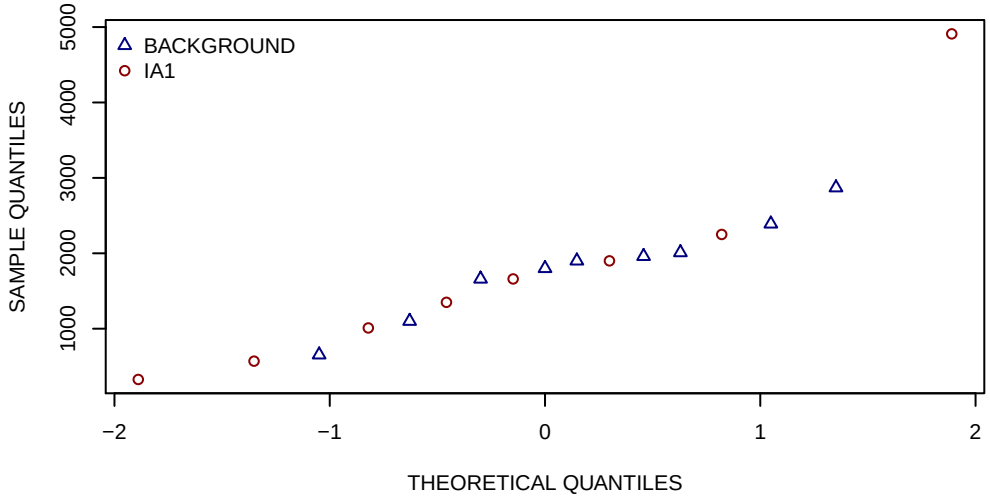
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MAGNESIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 7 OF 12

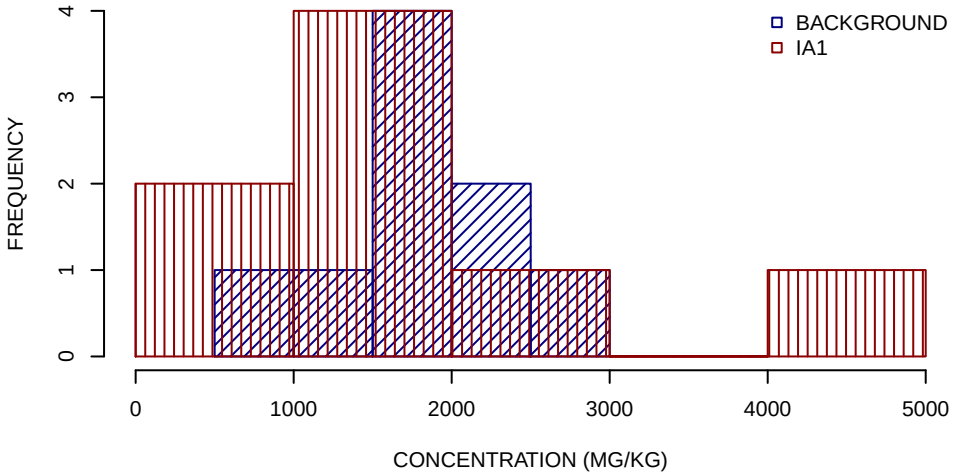
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 650 | 330 |
| **25TH PERCENTILE** | 1700 | 900 |
| **MEDIAN** | 1900 | 1500 |
| **MEAN** | 1800 | 1700 |
| **75TH PERCENTILE** | 2000 | 2000 |
| **MAXIMUM** | 2900 | 4900 |

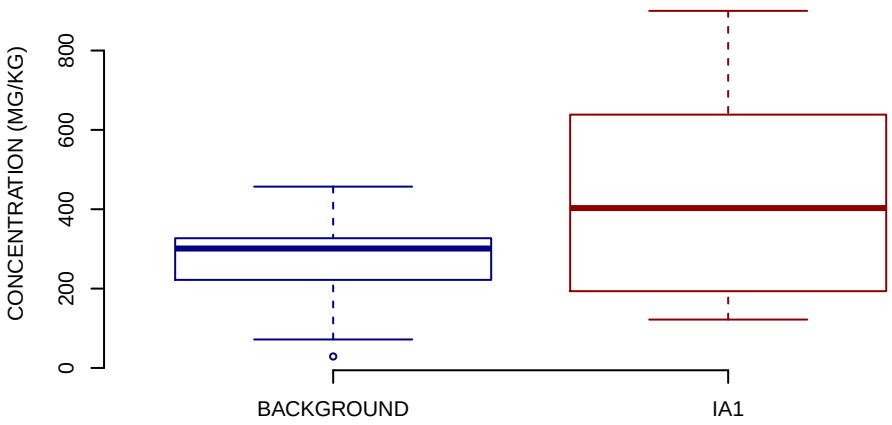
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

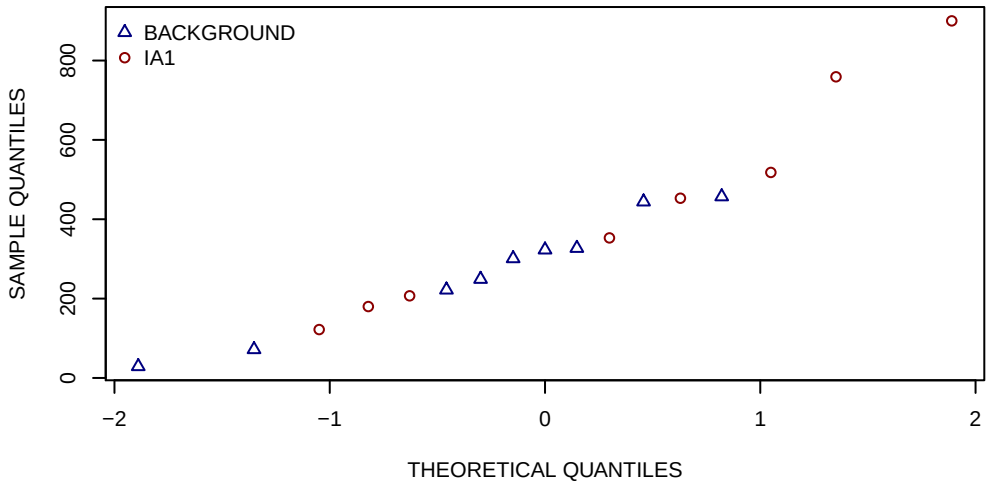
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MANGANESE IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 8 OF 12

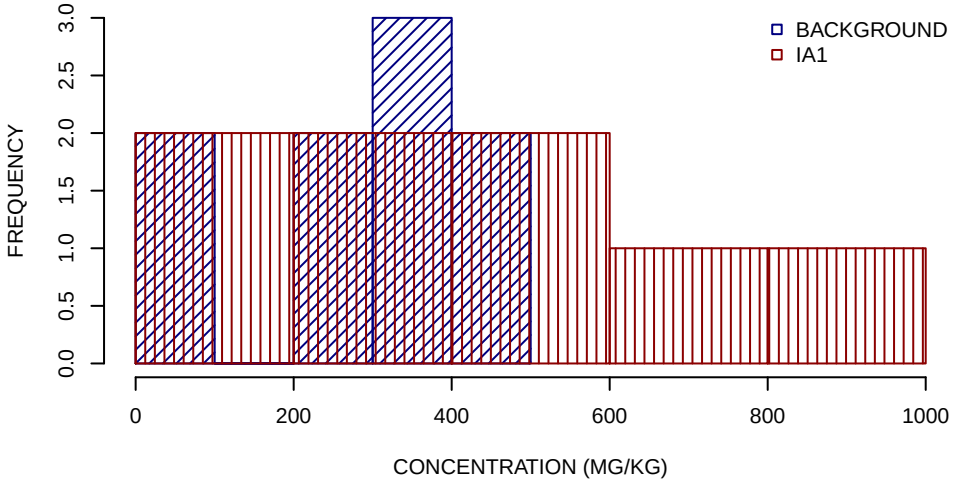
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| MINIMUM | 29 | 120 |
| 25TH PERCENTILE | 220 | 200 |
| MEDIAN | 300 | 400 |
| MEAN | 270 | 440 |
| 75TH PERCENTILE | 330 | 580 |
| MAXIMUM | 460 | 900 |

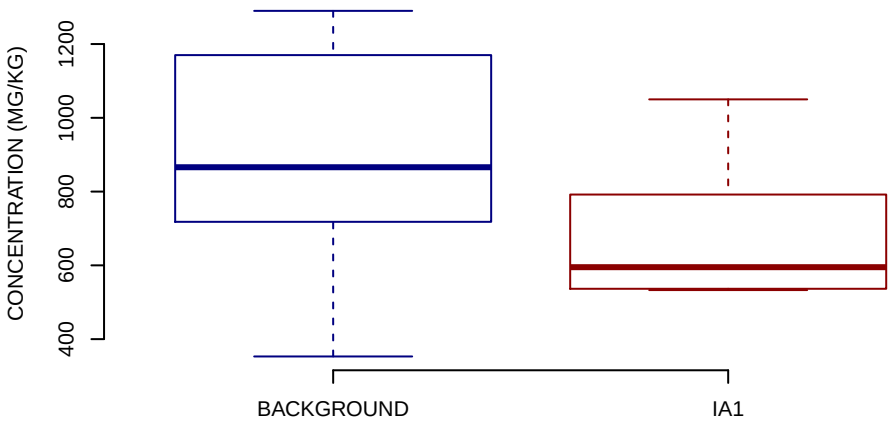
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

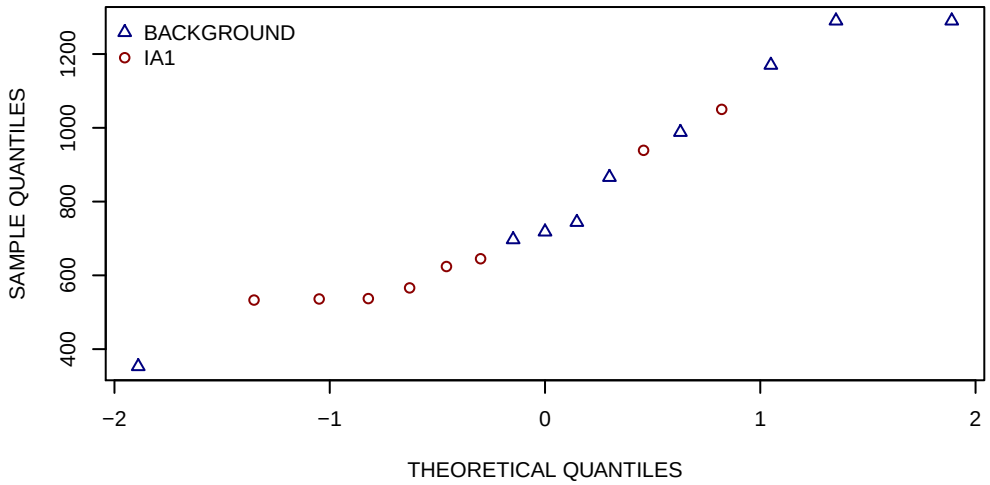
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# POTASSIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 9 OF 12

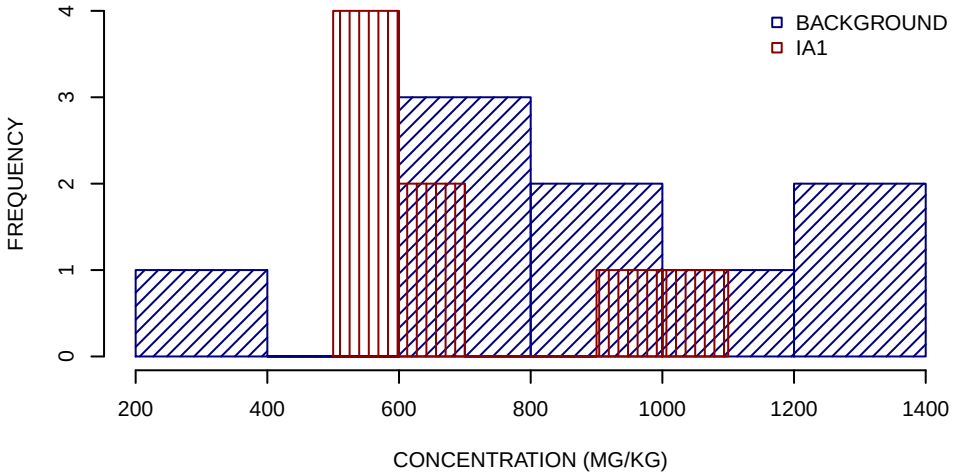
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| MINIMUM | 350 | 530 |
| 25TH PERCENTILE | 720 | 540 |
| MEDIAN | 870 | 600 |
| MEAN | 900 | 680 |
| 75TH PERCENTILE | 1200 | 720 |
| MAXIMUM | 1300 | 1000 |

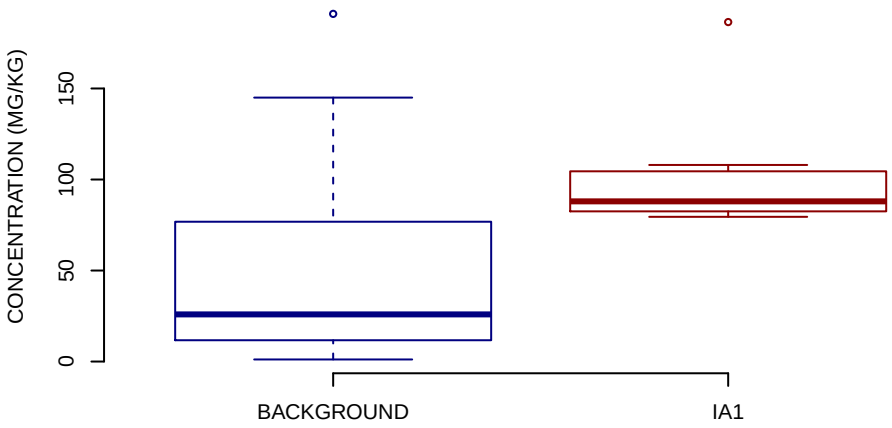
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

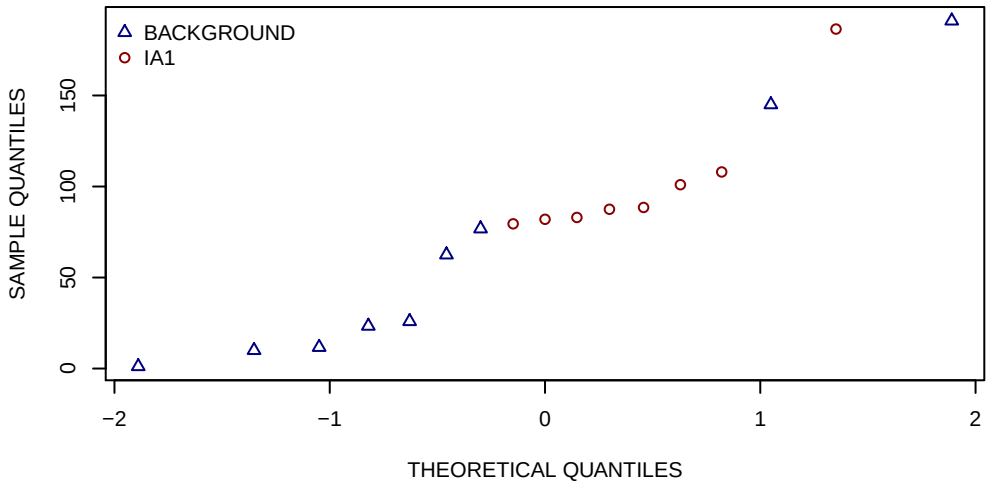
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# SODIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 10 OF 12

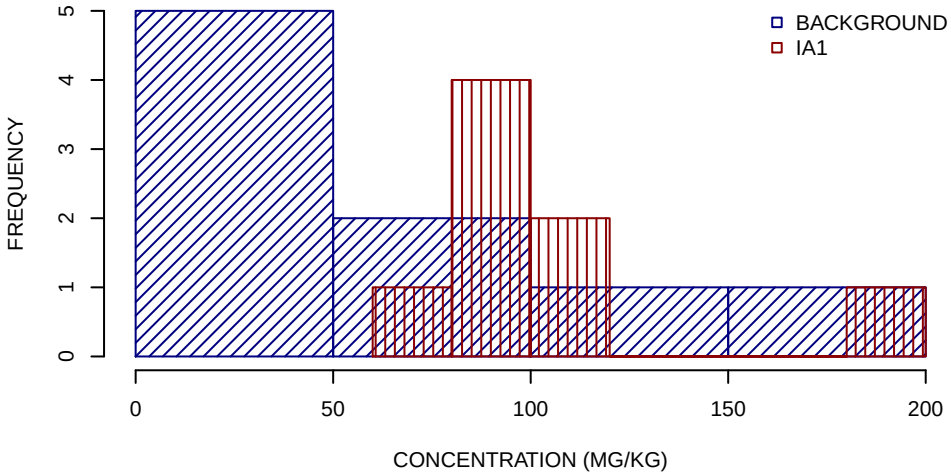
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 1.2 | 80 |
| **25TH PERCENTILE** | 12 | 83 |
| **MEDIAN** | 26 | 88 |
| **MEAN** | 61 | 100 |
| **75TH PERCENTILE** | 77 | 100 |
| **MAXIMUM** | 190 | 190 |

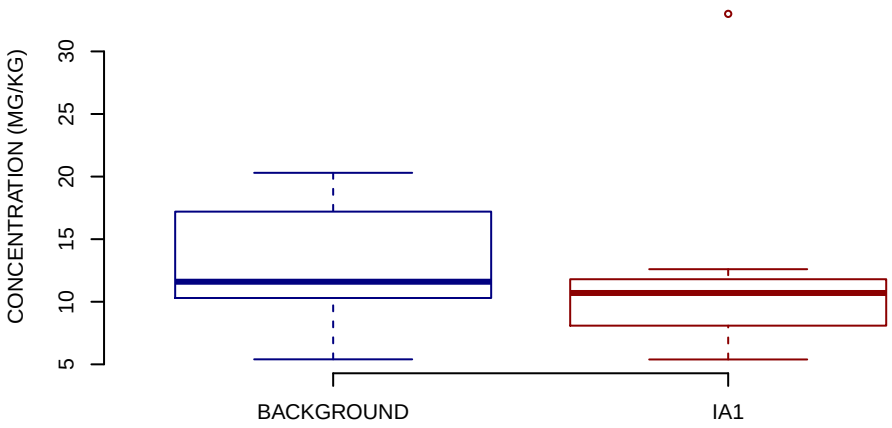
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

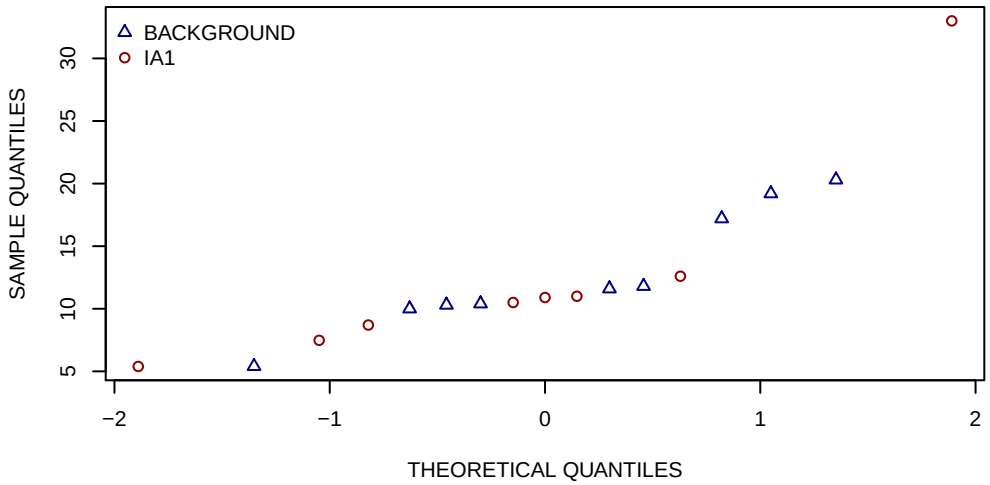
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# STRONTIUM IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 11 OF 12

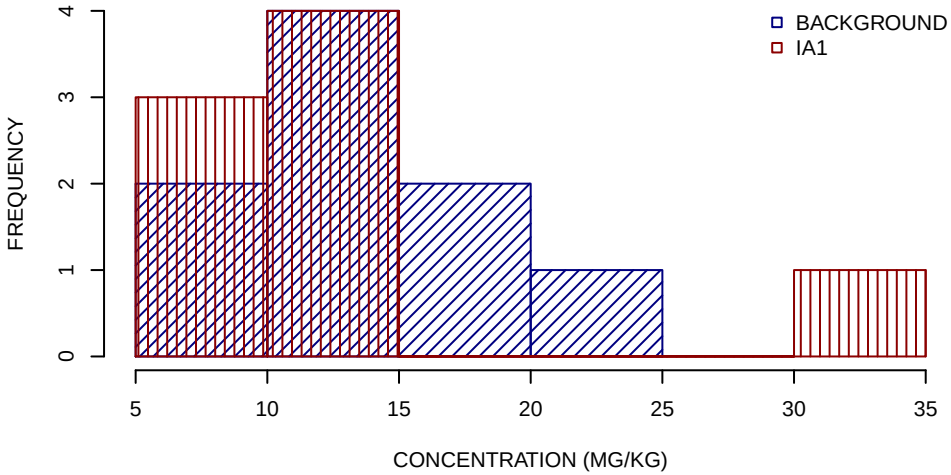
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 5.4 | 5.4 |
| **25TH PERCENTILE** | 10 | 8.4 |
| **MEDIAN** | 12 | 11 |
| **MEAN** | 13 | 12 |
| **75TH PERCENTILE** | 17 | 11 |
| **MAXIMUM** | 20 | 33 |

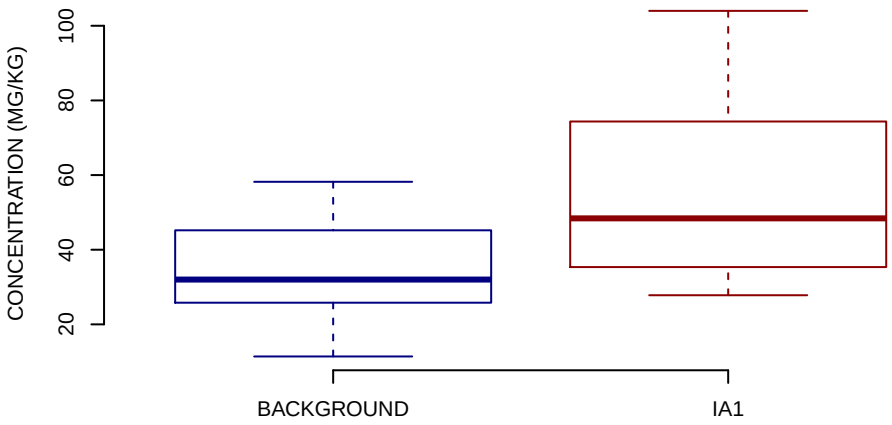
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

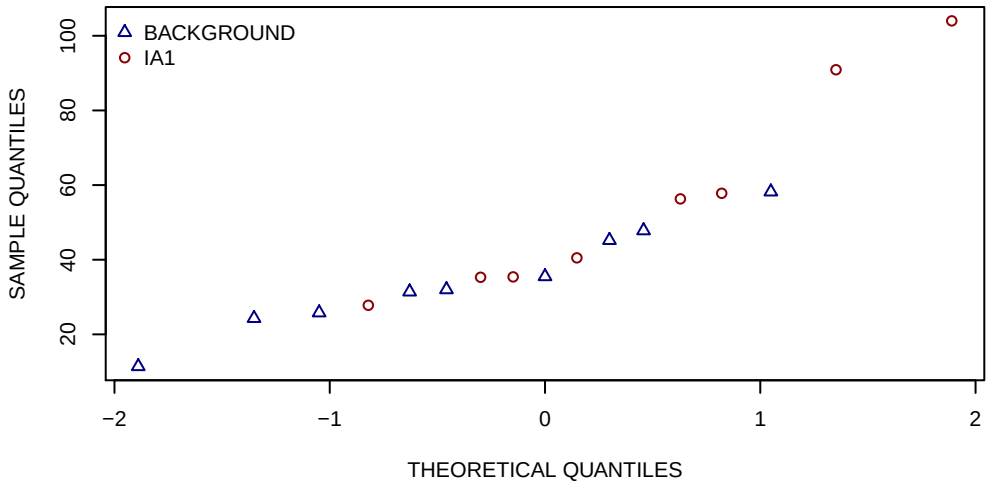
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ZINC IA1 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 12 OF 12

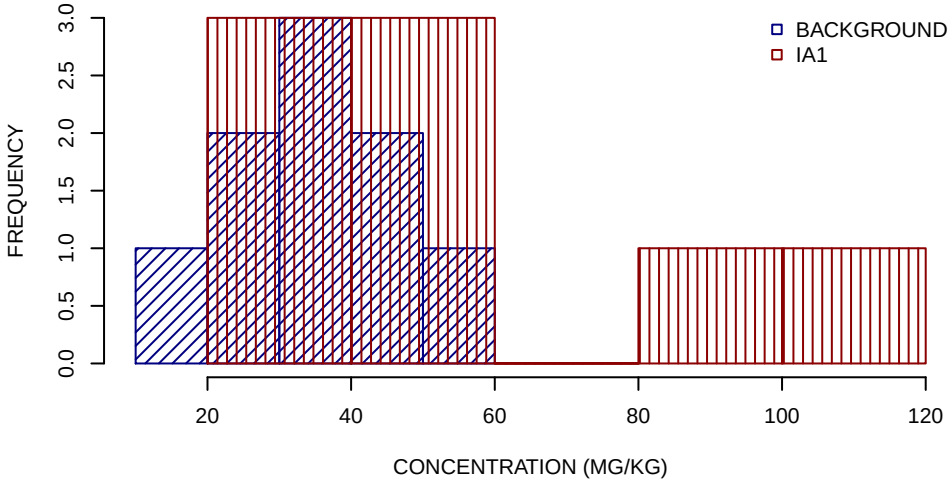
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA1 |
|---|---|---|
| **MINIMUM** | 11 | 28 |
| **25TH PERCENTILE** | 26 | 35 |
| **MEDIAN** | 32 | 48 |
| **MEAN** | 35 | 56 |
| **75TH PERCENTILE** | 45 | 66 |
| **MAXIMUM** | 58 | 100 |

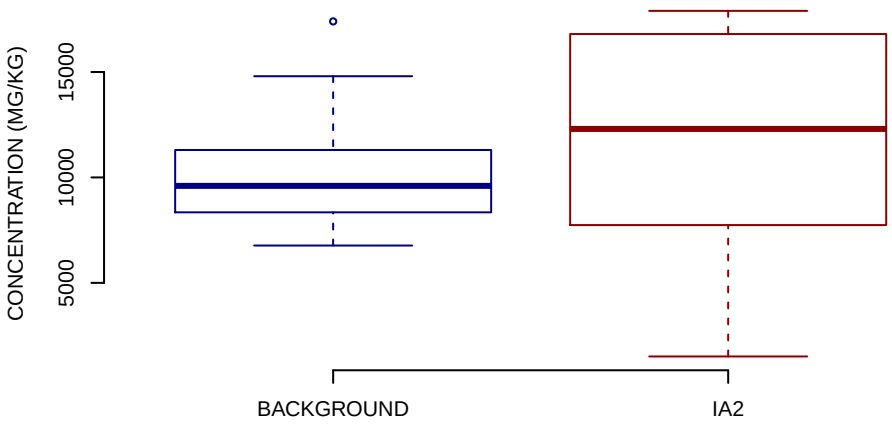
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

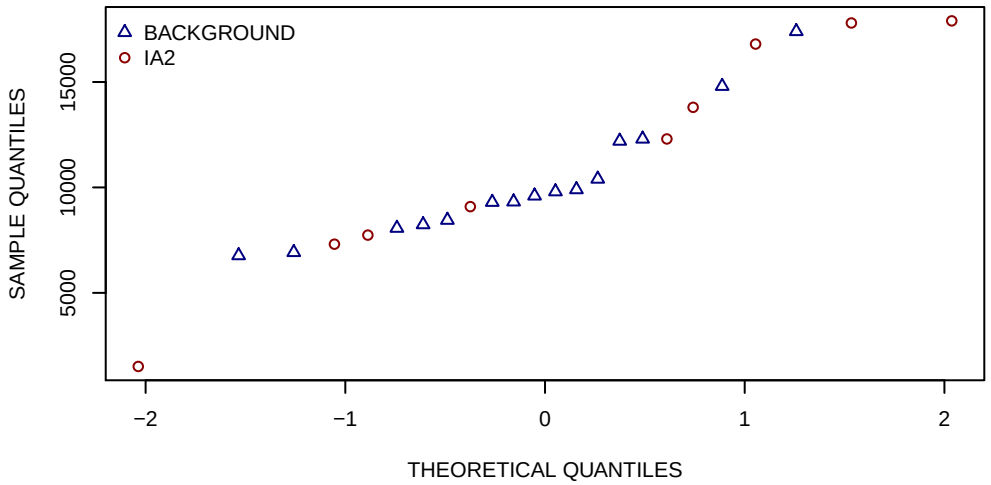
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ALUMINUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 1 OF 12

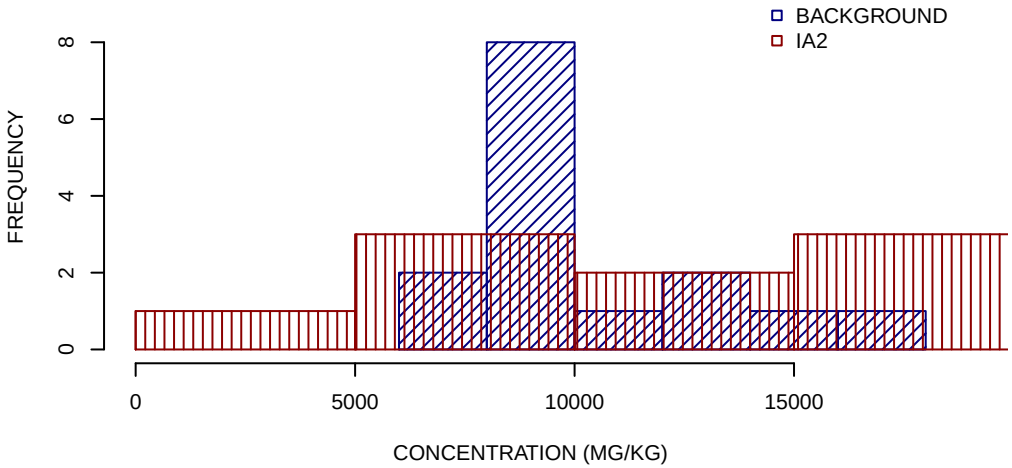
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 6800 | 1500 |
| **25TH PERCENTILE** | 8300 | 7700 |
| **MEDIAN** | 9600 | 12000 |
| **MEAN** | 10000 | 12000 |
| **75TH PERCENTILE** | 11000 | 17000 |
| **MAXIMUM** | 17000 | 18000 |

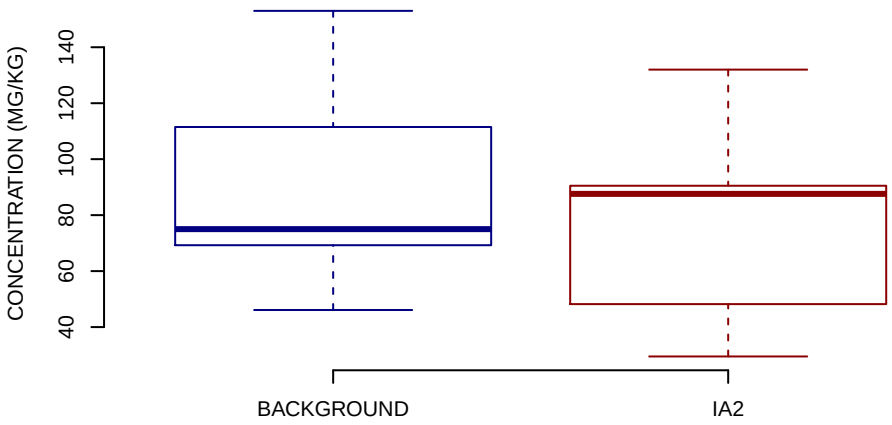
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

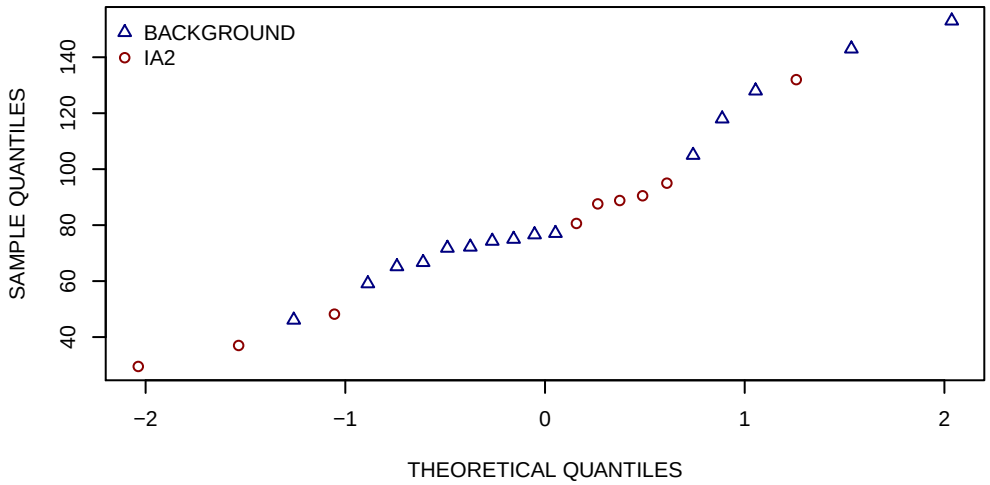
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# BARIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 2 OF 12

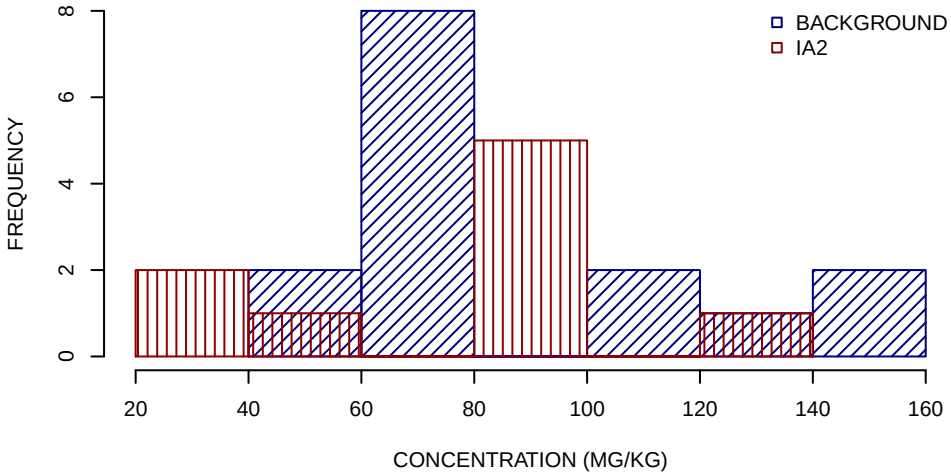
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 46 | 30 |
| **25TH PERCENTILE** | 69 | 48 |
| **MEDIAN** | 75 | 88 |
| **MEAN** | 89 | 77 |
| **75TH PERCENTILE** | 110 | 90 |
| **MAXIMUM** | 150 | 130 |

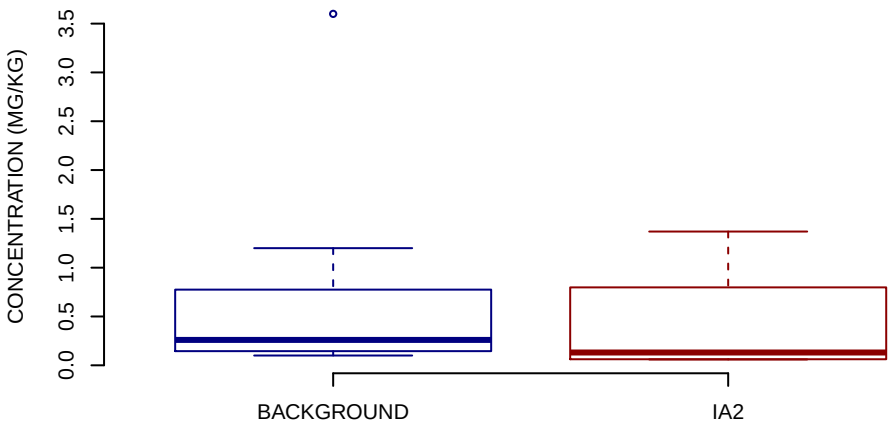
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

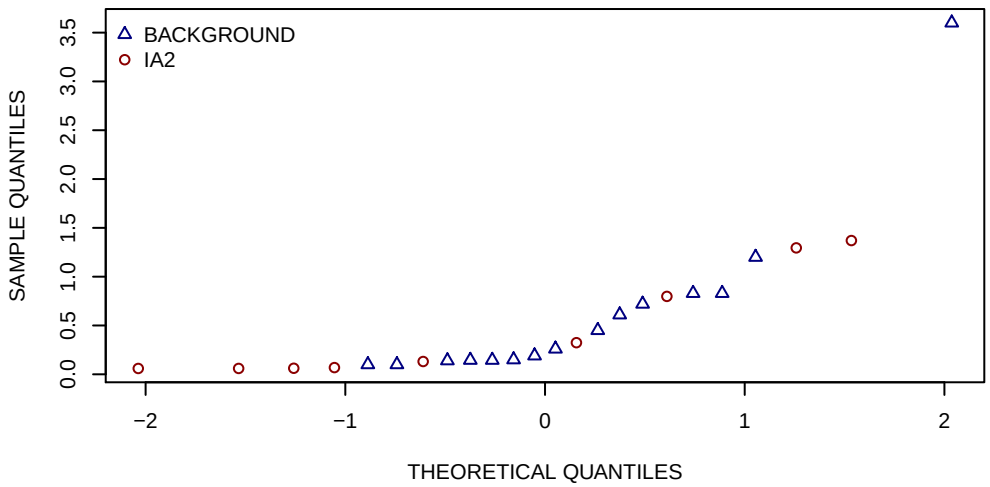
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CADMIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 3 OF 12

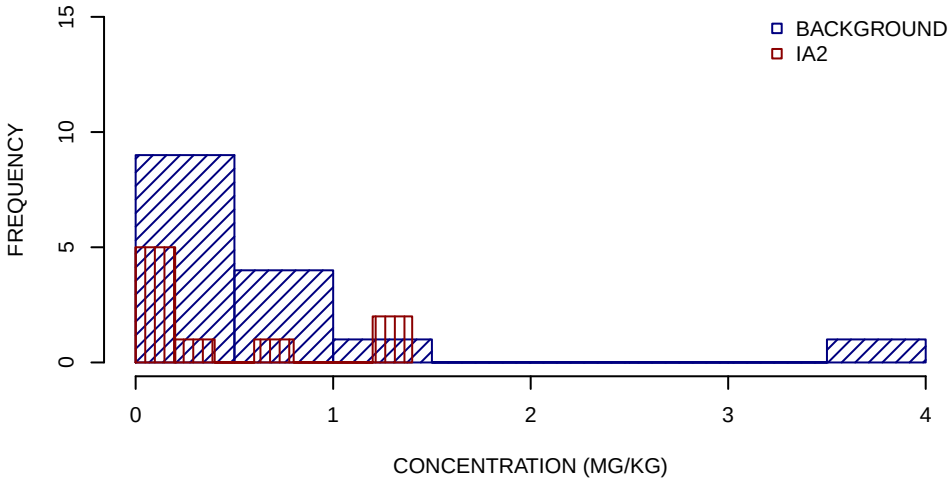
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 0.1 | 0.06 |
| **25TH PERCENTILE** | 0.14 | 0.062 |
| **MEDIAN** | 0.26 | 0.13 |
| **MEAN** | 0.63 | 0.46 |
| **75TH PERCENTILE** | 0.78 | 0.8 |
| **MAXIMUM** | 3.6 | 1.4 |

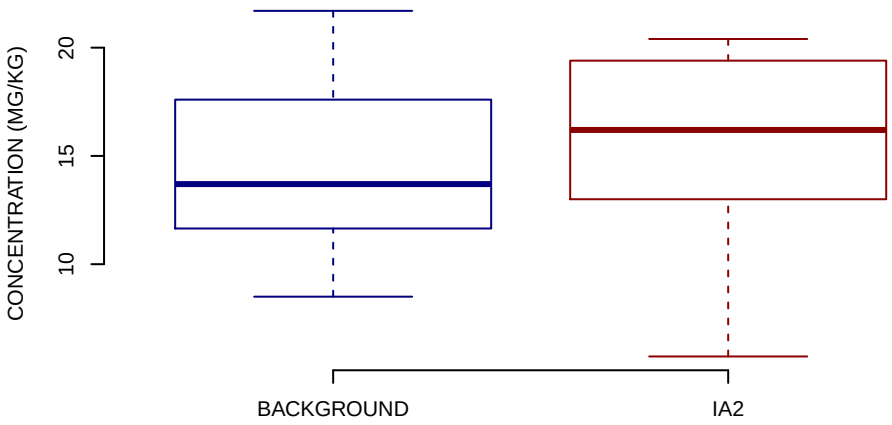
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

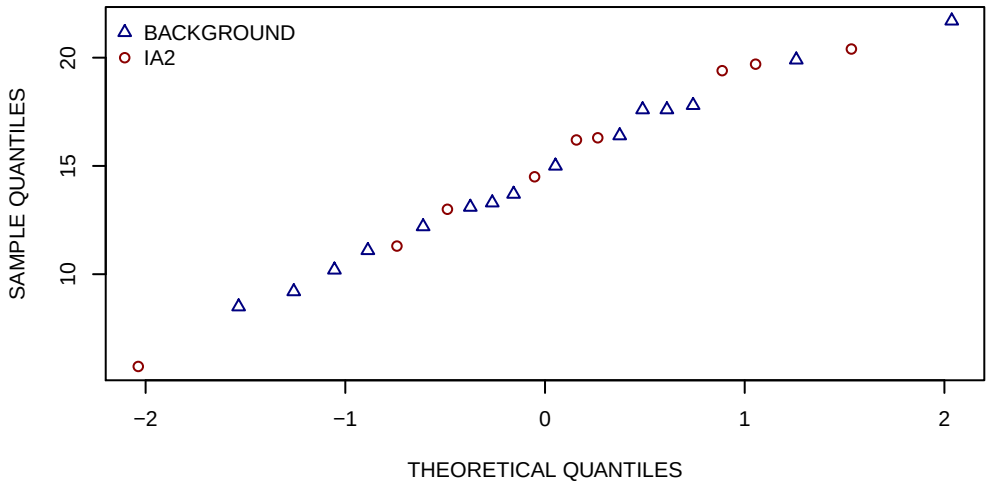
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CHROMIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 4 OF 12

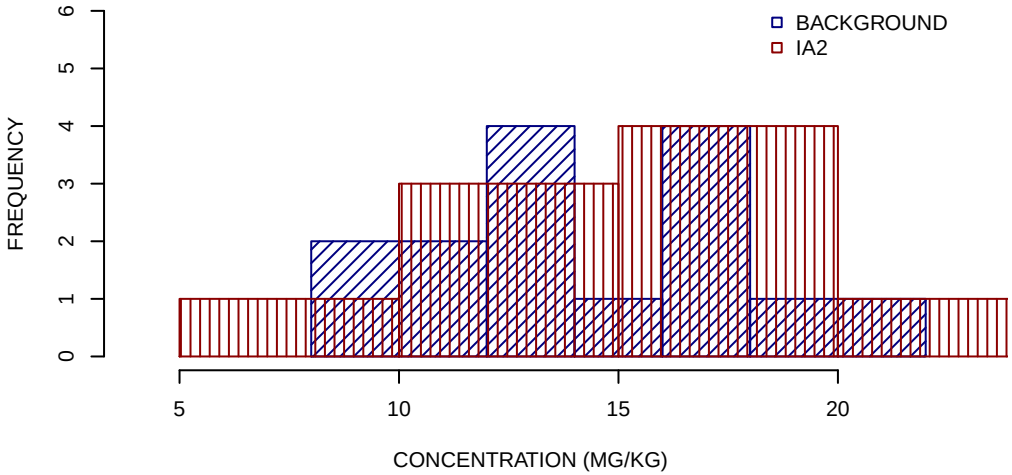
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 8.5 | 5.7 |
| **25TH PERCENTILE** | 12 | 13 |
| **MEDIAN** | 14 | 16 |
| **MEAN** | 14 | 15 |
| **75TH PERCENTILE** | 18 | 19 |
| **MAXIMUM** | 22 | 20 |

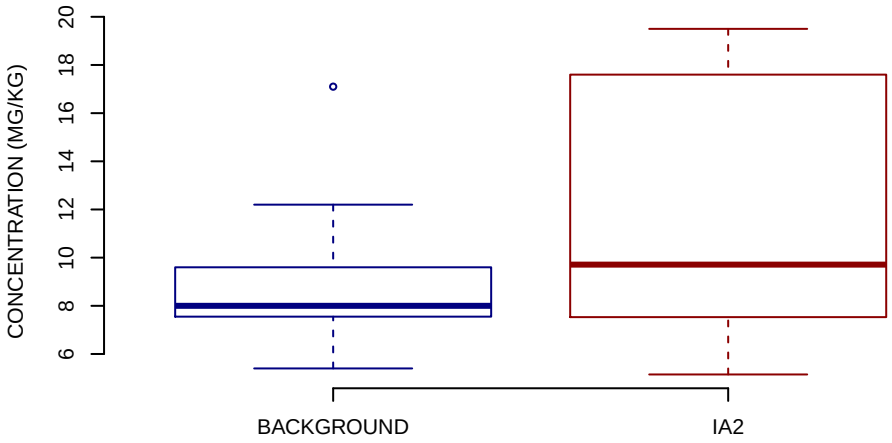
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

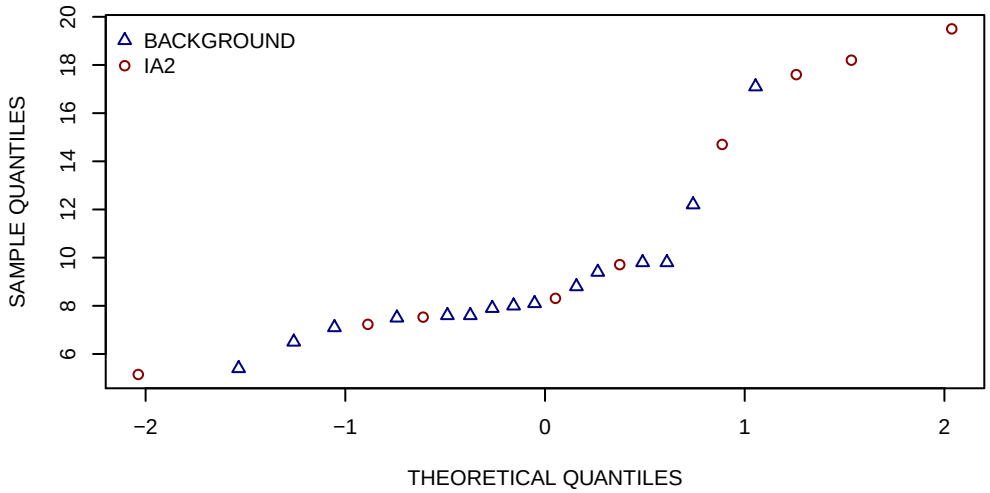
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# COPPER IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 5 OF 12

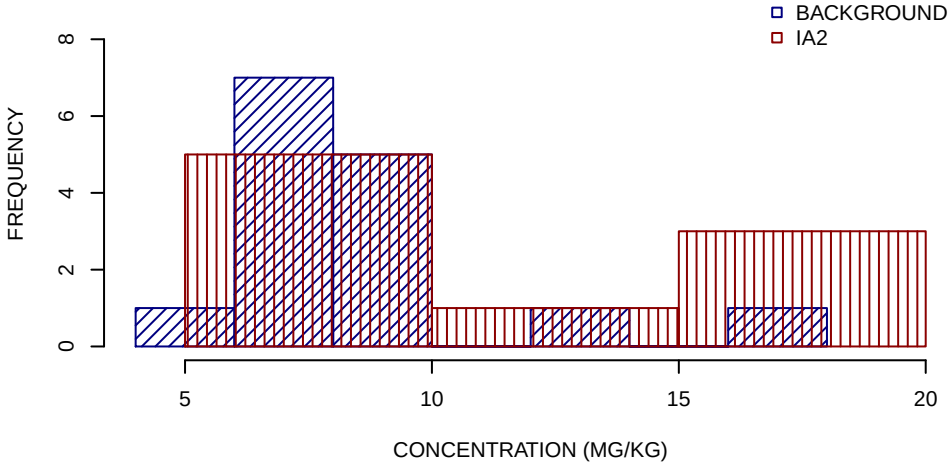
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 5.4 | 5.2 |
| **25TH PERCENTILE** | 7.6 | 7.5 |
| **MEDIAN** | 8 | 9.7 |
| **MEAN** | 8.9 | 12 |
| **75TH PERCENTILE** | 9.6 | 18 |
| **MAXIMUM** | 17 | 20 |

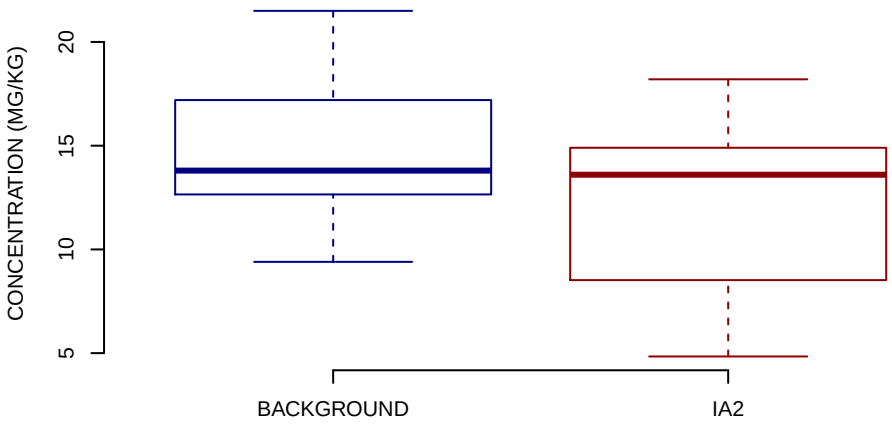
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

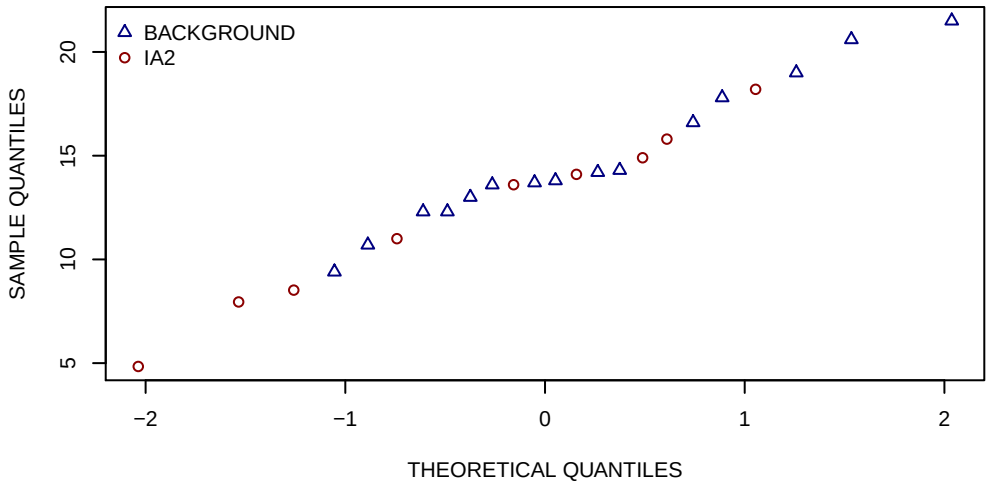
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# LEAD IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 6 OF 12

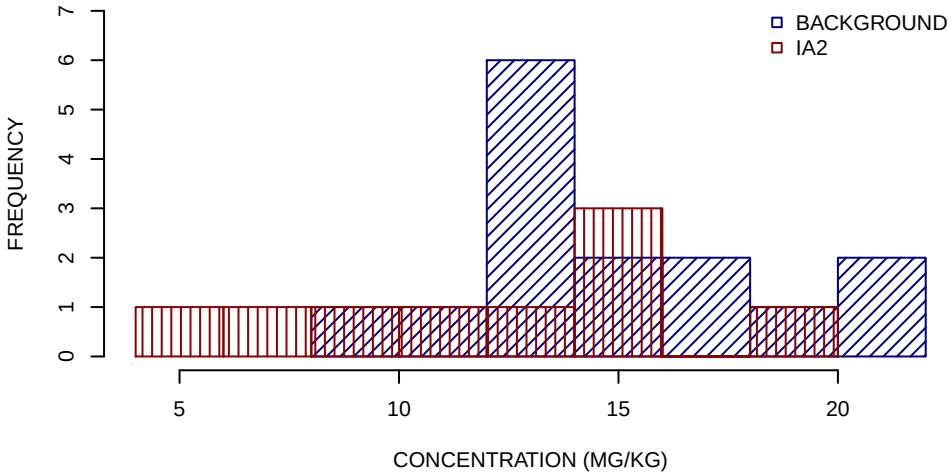
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 9.4 | 4.8 |
| **25TH PERCENTILE** | 13 | 8.5 |
| **MEDIAN** | 14 | 14 |
| **MEAN** | 15 | 12 |
| **75TH PERCENTILE** | 17 | 15 |
| **MAXIMUM** | 22 | 18 |

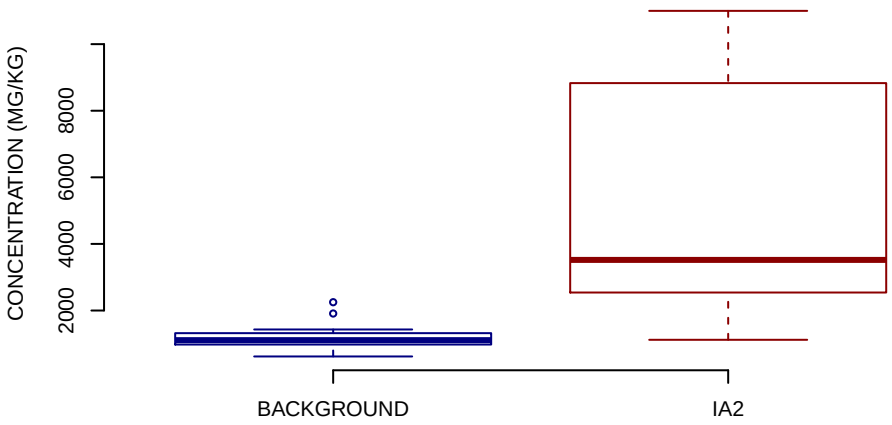
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

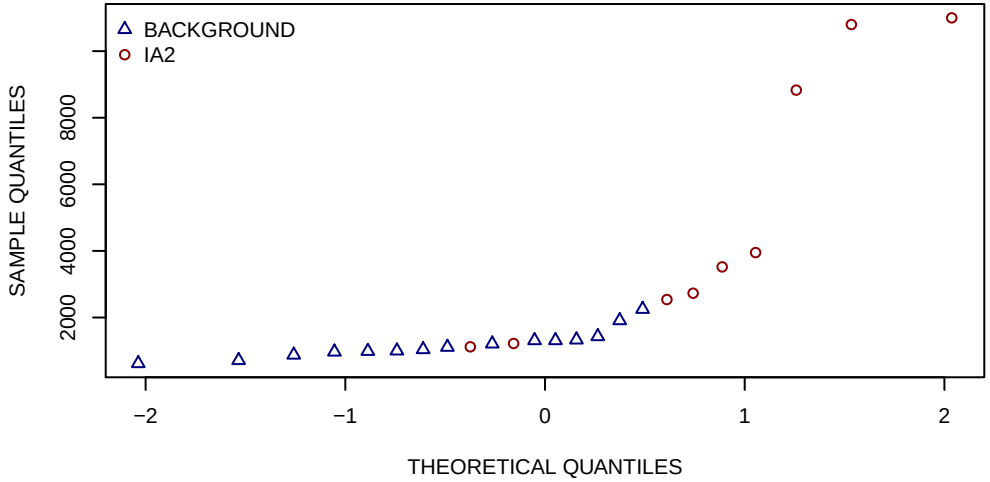
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MAGNESIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 7 OF 12

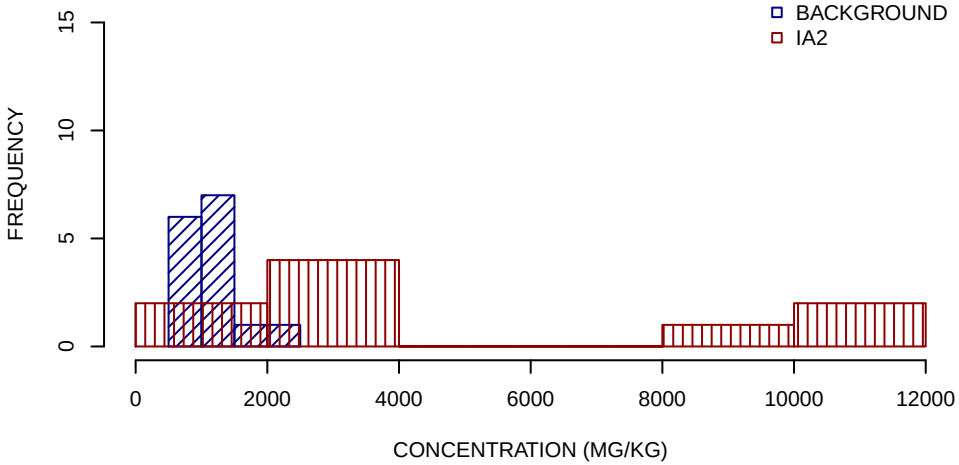
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 620 | 1100 |
| **25TH PERCENTILE** | 980 | 2500 |
| **MEDIAN** | 1100 | 3500 |
| **MEAN** | 1200 | 5100 |
| **75TH PERCENTILE** | 1300 | 8800 |
| **MAXIMUM** | 2200 | 11000 |

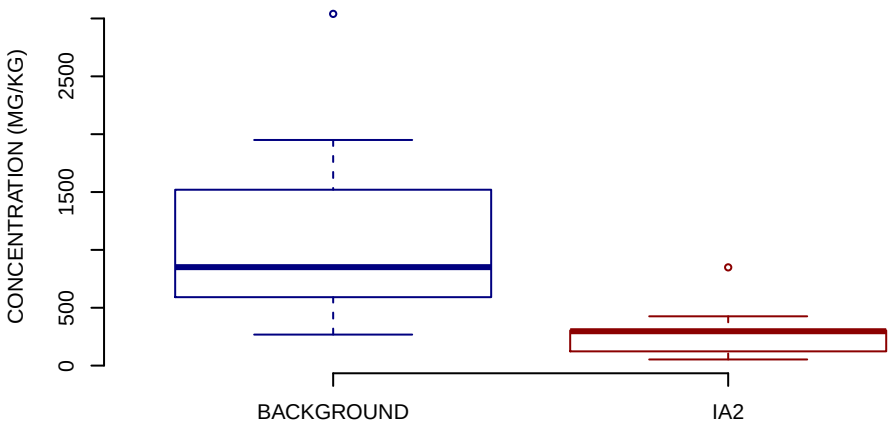
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

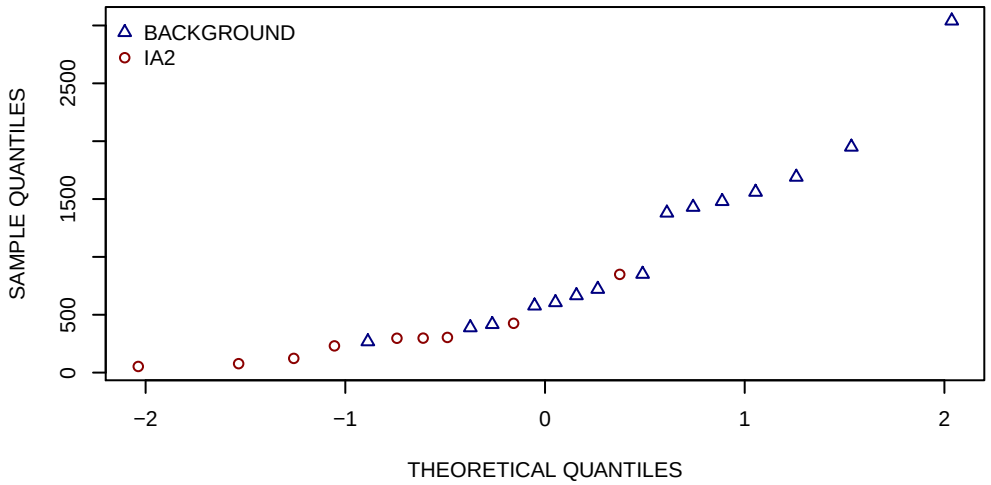
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MANGANESE IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 8 OF 12

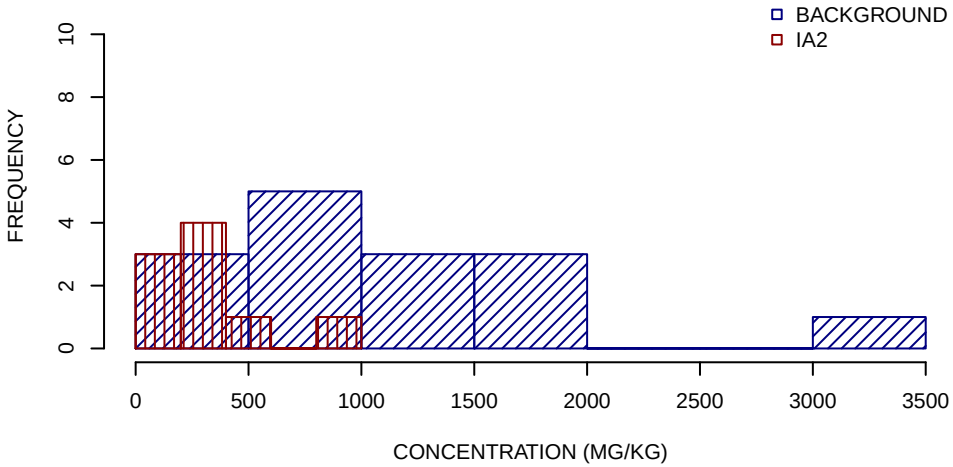
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS



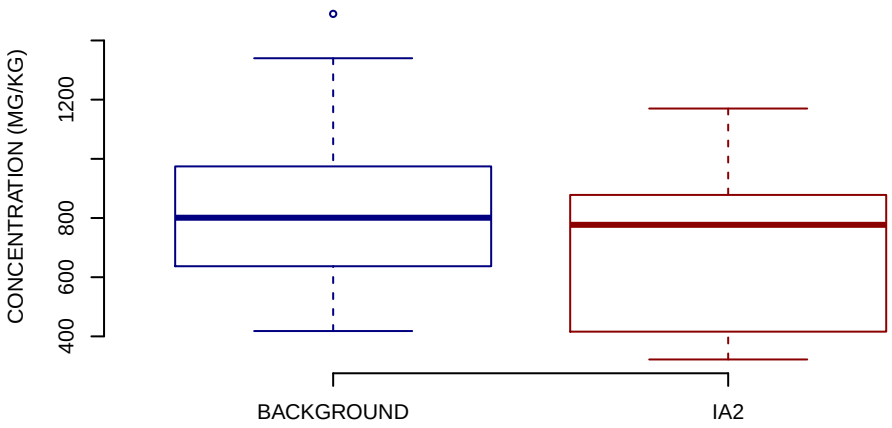

## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 270 | 53 |
| **25TH PERCENTILE** | 590 | 120 |
| **MEDIAN** | 850 | 300 |
| **MEAN** | 1100 | 300 |
| **75TH PERCENTILE** | 1500 | 300 |
| **MAXIMUM** | 3000 | 850 |

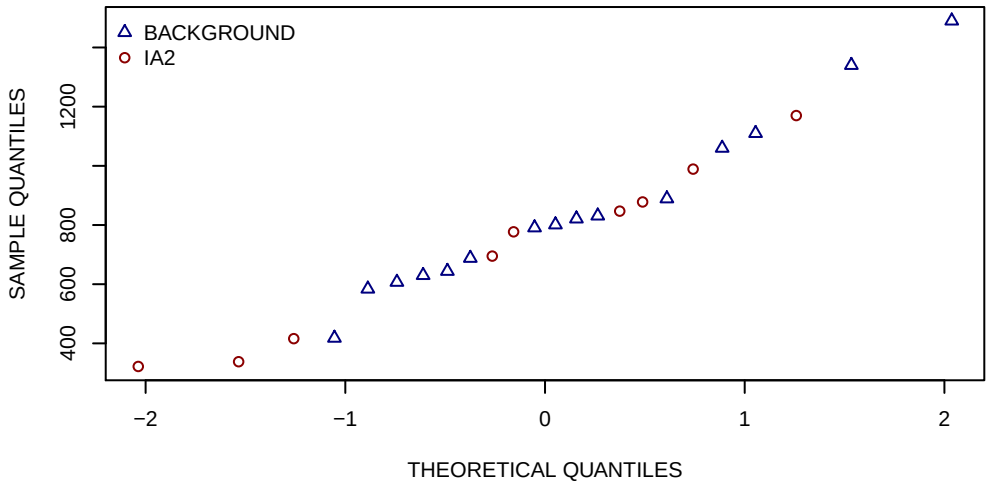
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON−DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# POTASSIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 9 OF 12

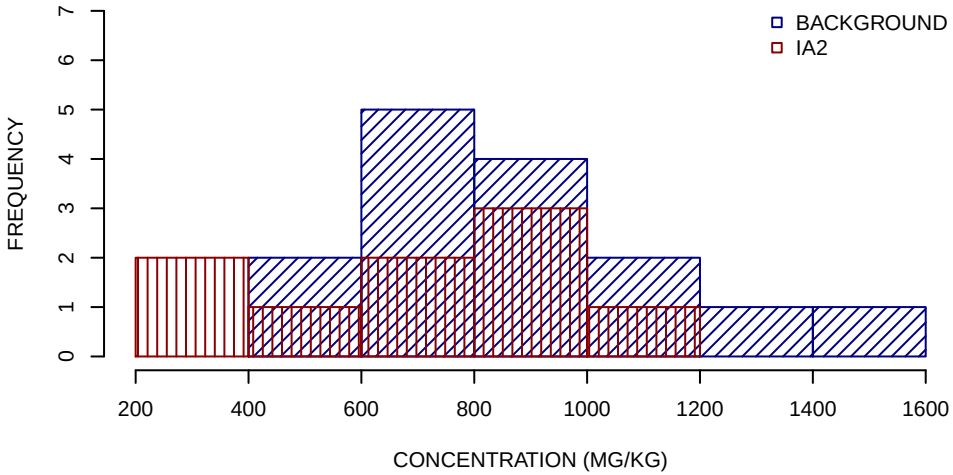
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| MINIMUM | 420 | 320 |
| 25TH PERCENTILE | 640 | 420 |
| MEDIAN | 800 | 780 |
| MEAN | 850 | 710 |
| 75TH PERCENTILE | 970 | 880 |
| MAXIMUM | 1500 | 1200 |

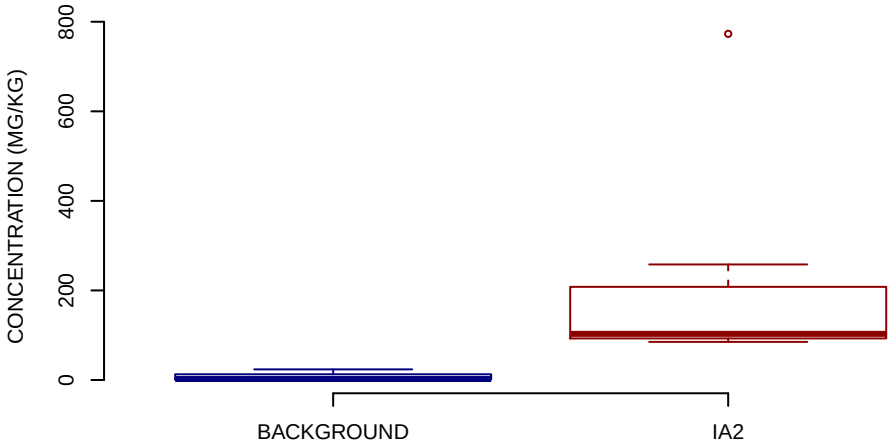
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

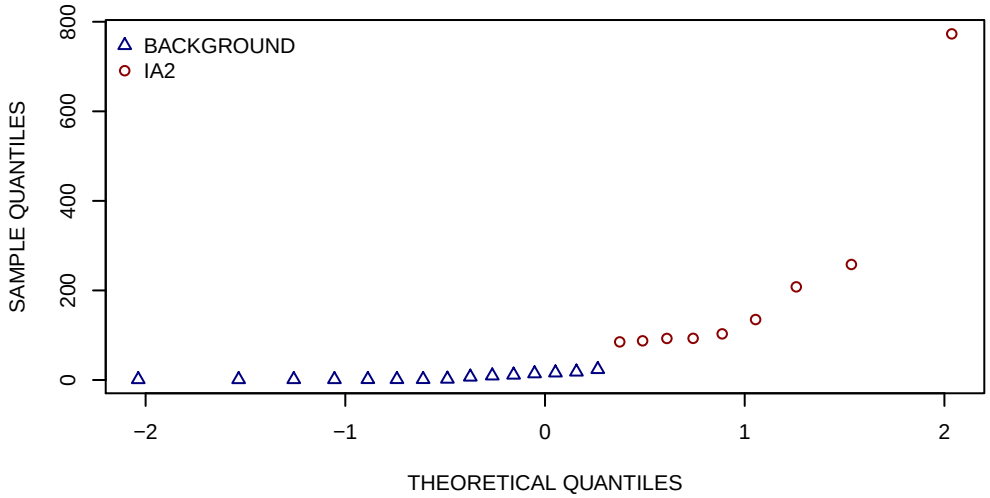
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# SODIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 10 OF 12

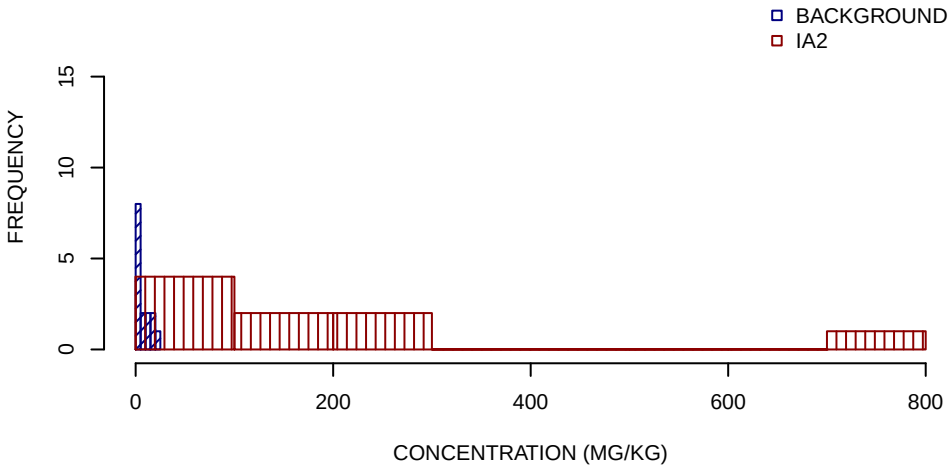
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 1.2 | 85 |
| **25TH PERCENTILE** | 1.3 | 93 |
| **MEDIAN** | 2.2 | 100 |
| **MEAN** | 7.4 | 200 |
| **75TH PERCENTILE** | 13 | 210 |
| **MAXIMUM** | 24 | 770 |

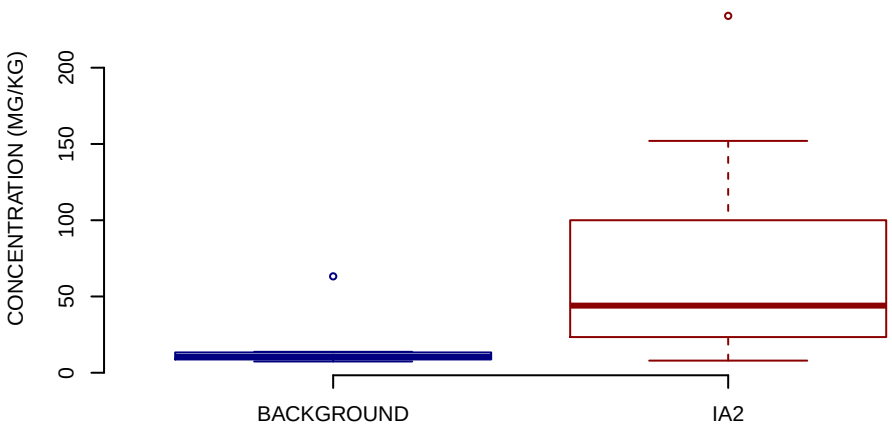
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

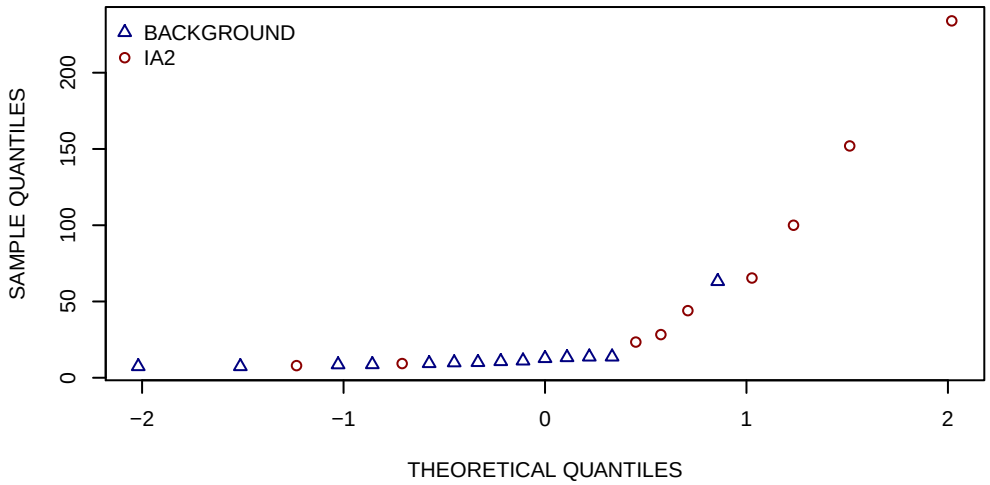
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# STRONTIUM IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 11 OF 12

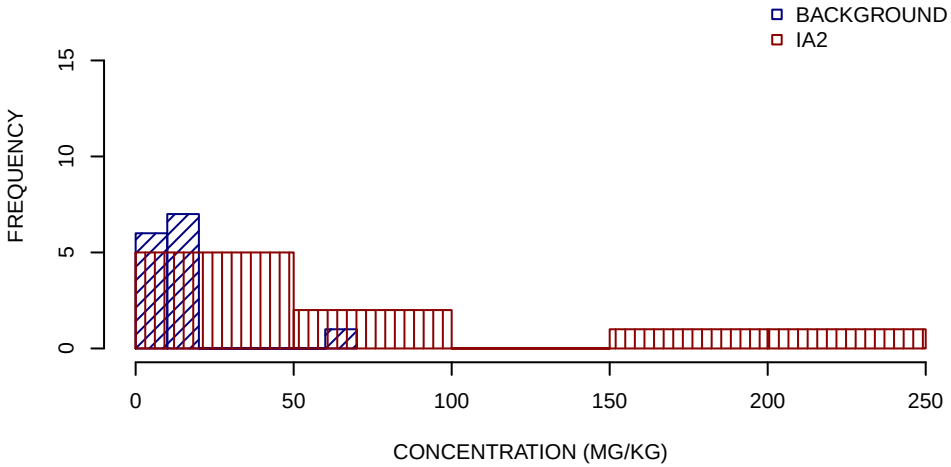
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 7.4 | 8 |
| **25TH PERCENTILE** | 8.9 | 23 |
| **MEDIAN** | 10 | 44 |
| **MEAN** | 14 | 74 |
| **75TH PERCENTILE** | 13 | 100 |
| **MAXIMUM** | 63 | 230 |

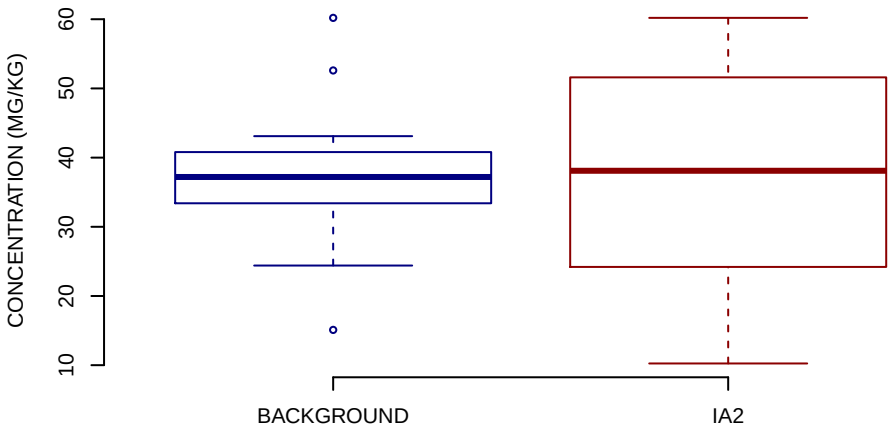
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

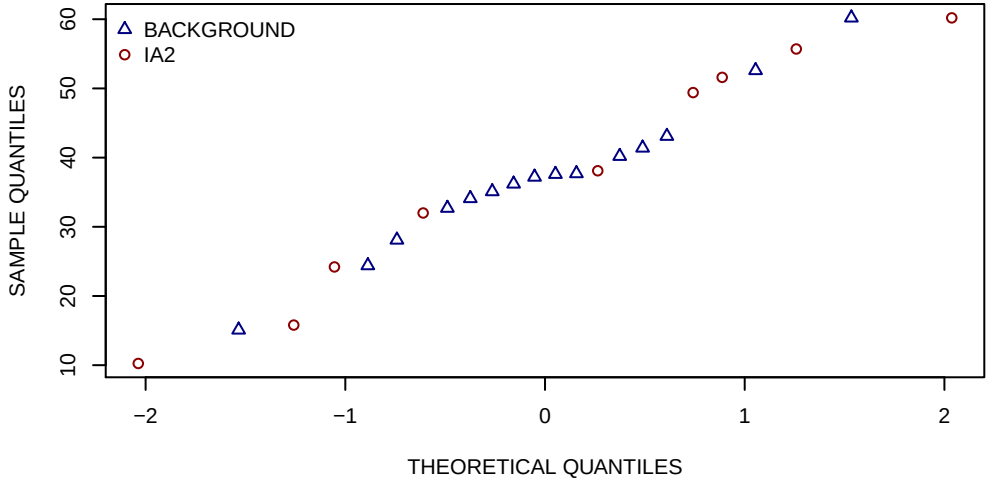
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ZINC IA2 SURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 12 OF 12

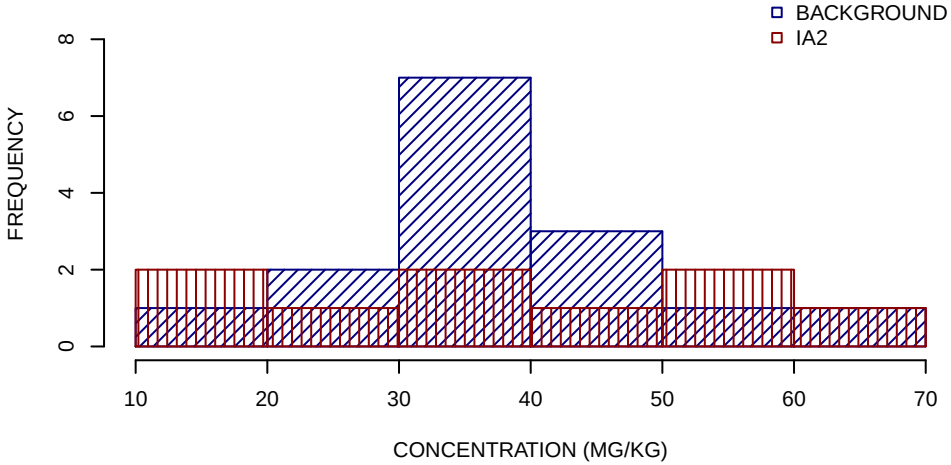
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 15 | 10 |
| **25TH PERCENTILE** | 33 | 24 |
| **MEDIAN** | 37 | 38 |
| **MEAN** | 37 | 37 |
| **75TH PERCENTILE** | 41 | 52 |
| **MAXIMUM** | 60 | 60 |

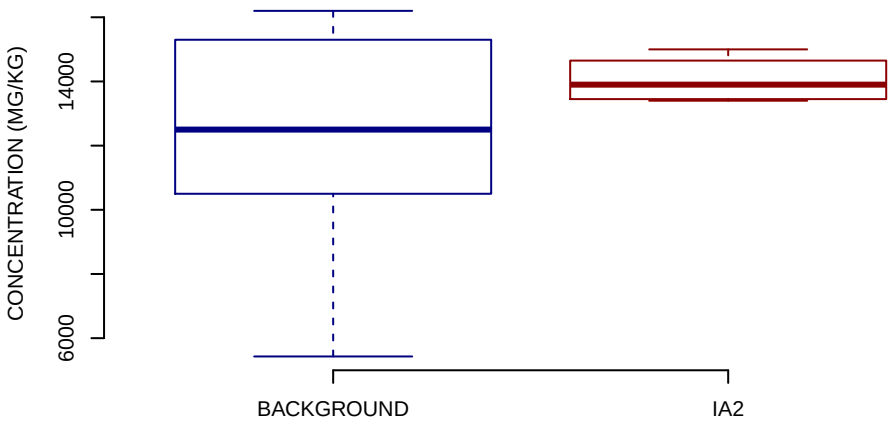
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

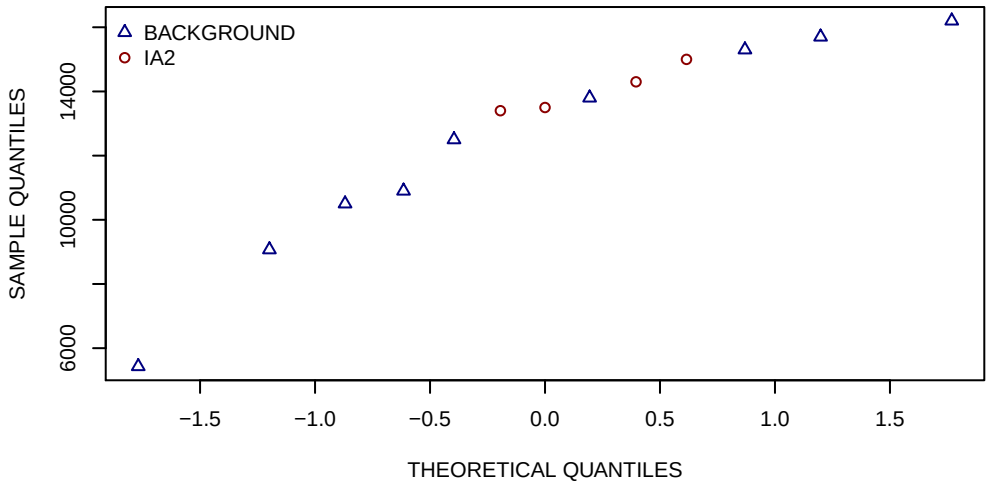
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ALUMINUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 1 OF 11

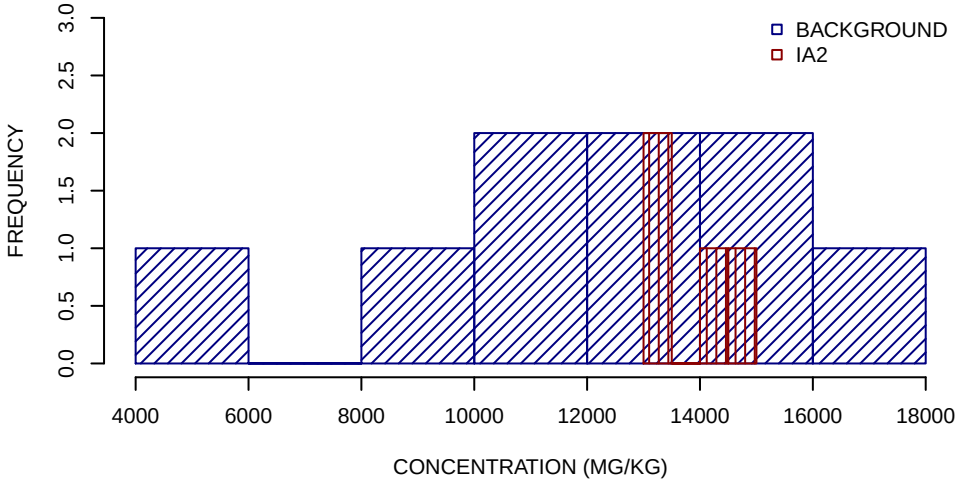
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 5400 | 13000 |
| **25TH PERCENTILE** | 10000 | 13000 |
| **MEDIAN** | 12000 | 14000 |
| **MEAN** | 12000 | 14000 |
| **75TH PERCENTILE** | 15000 | 14000 |
| **MAXIMUM** | 16000 | 15000 |

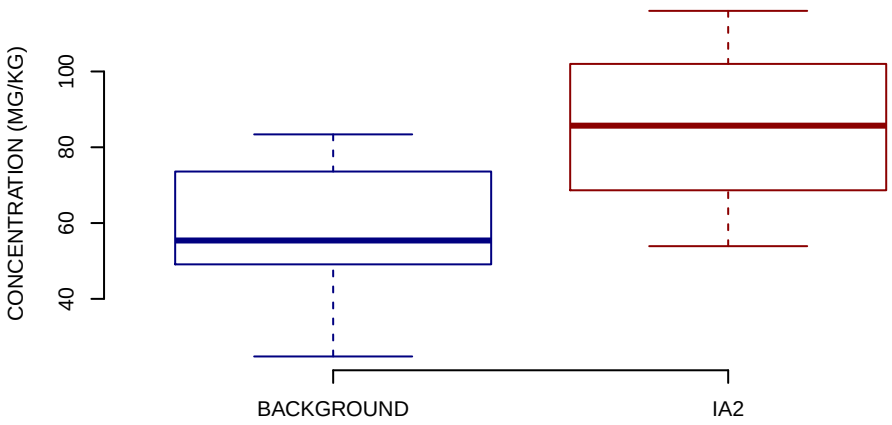
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

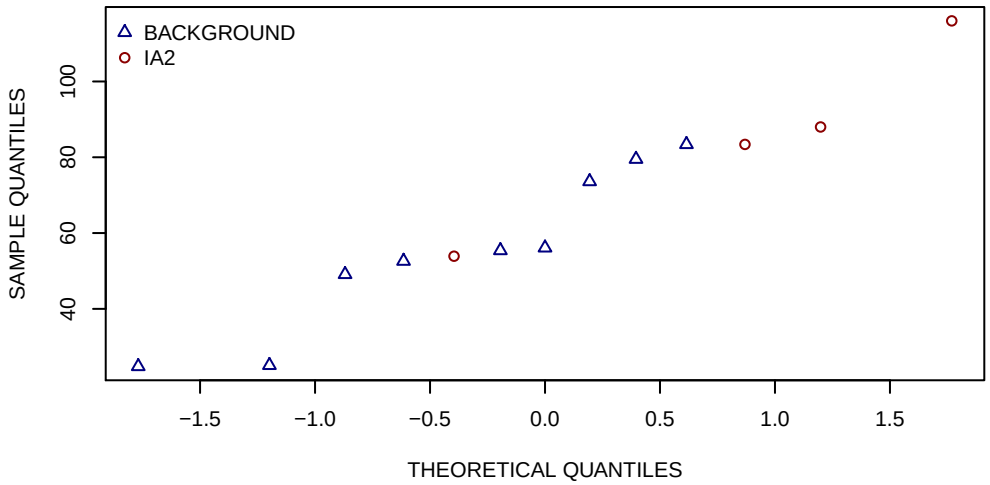
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# BARIUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 2 OF 11

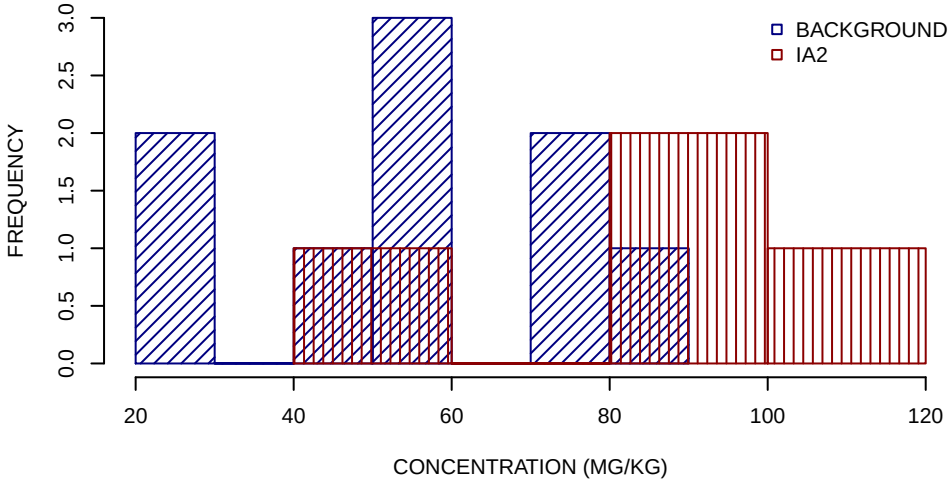
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| MINIMUM | 25 | 54 |
| 25TH PERCENTILE | 49 | 76 |
| MEDIAN | 55 | 86 |
| MEAN | 56 | 85 |
| 75TH PERCENTILE | 74 | 95 |
| MAXIMUM | 83 | 120 |

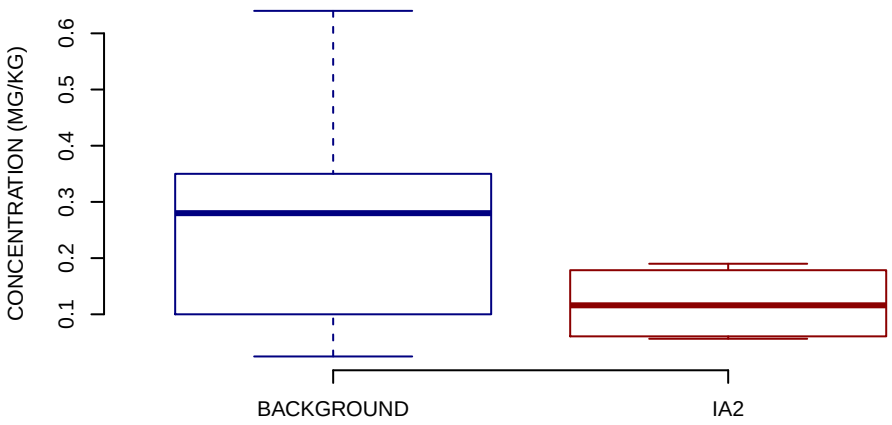
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

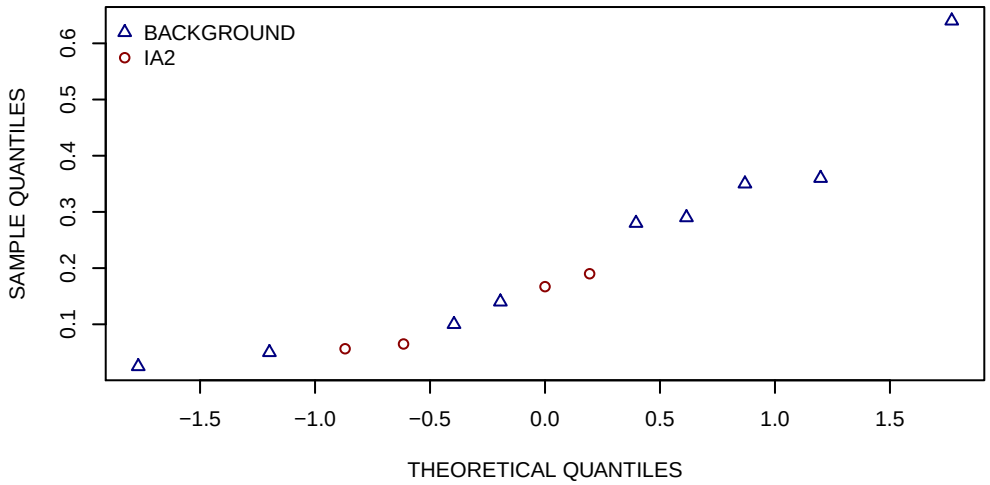
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CADMIUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 3 OF 11

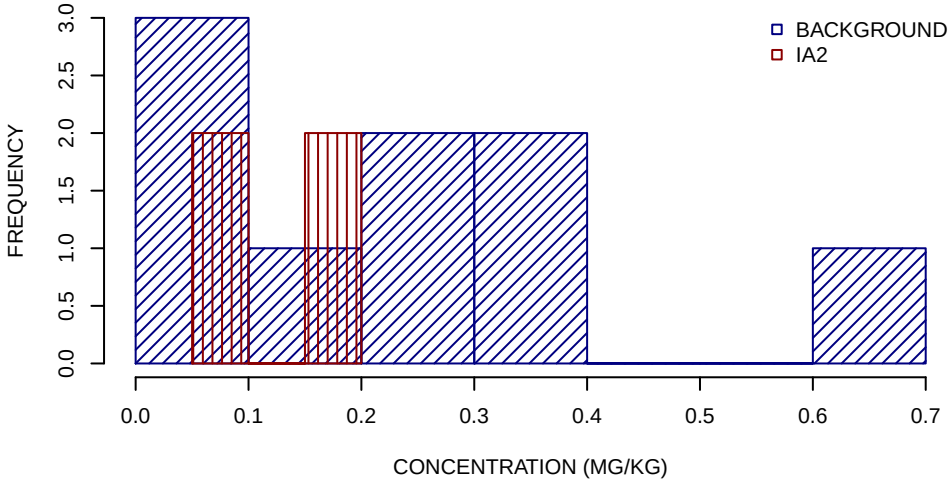
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| MINIMUM | 0.025 | 0.056 |
| 25TH PERCENTILE | 0.1 | 0.063 |
| MEDIAN | 0.28 | 0.12 |
| MEAN | 0.25 | 0.12 |
| 75TH PERCENTILE | 0.35 | 0.17 |
| MAXIMUM | 0.64 | 0.19 |

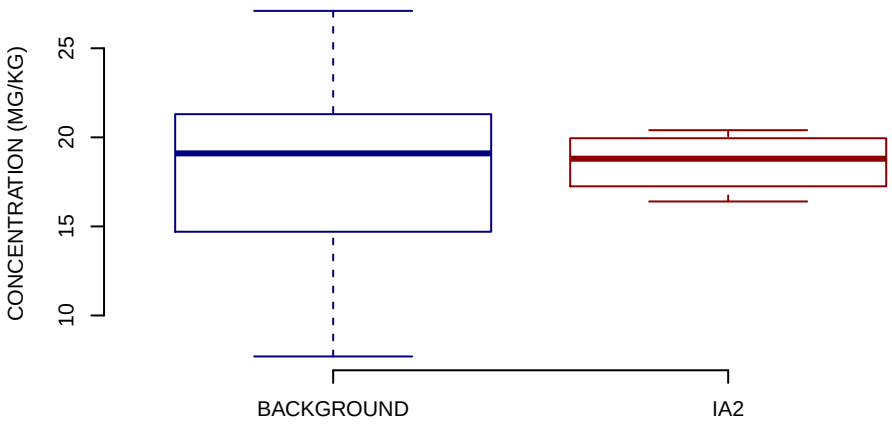
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

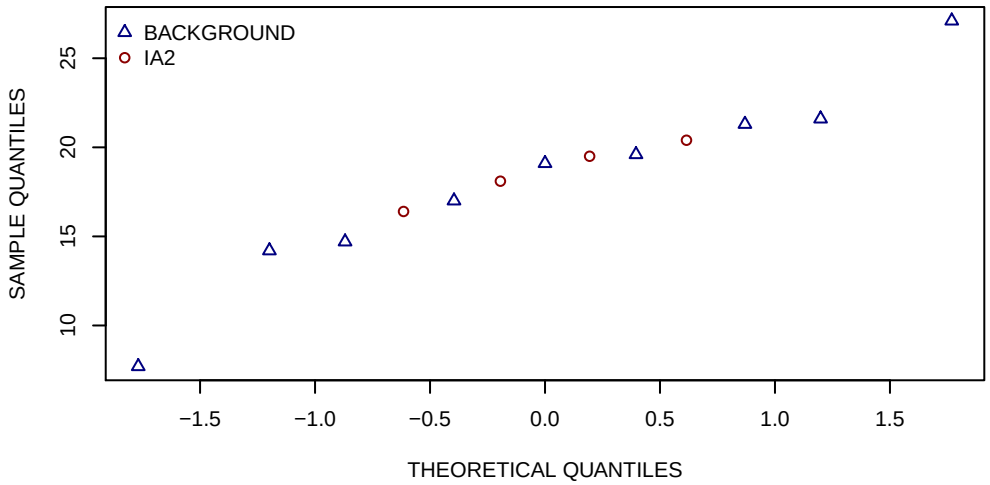
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# CHROMIUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 4 OF 11

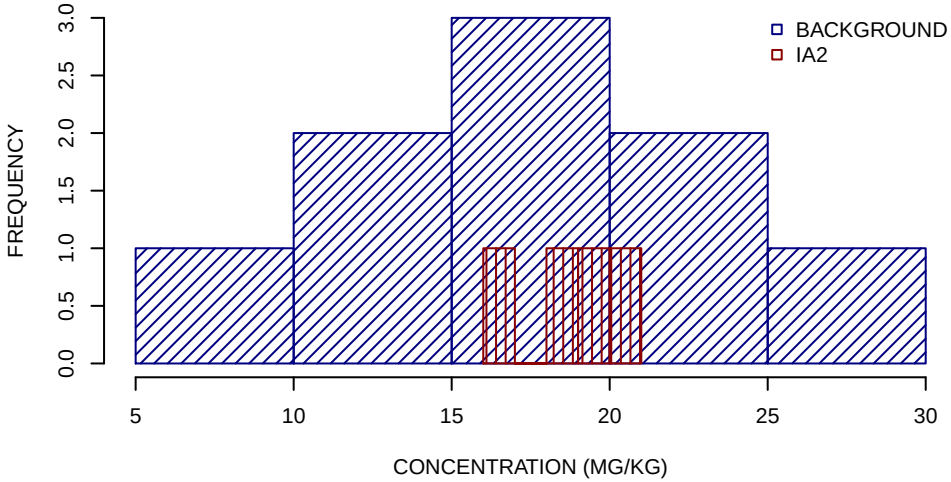
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 7.7 | 16 |
| **25TH PERCENTILE** | 15 | 18 |
| **MEDIAN** | 19 | 19 |
| **MEAN** | 18 | 19 |
| **75TH PERCENTILE** | 21 | 20 |
| **MAXIMUM** | 27 | 20 |

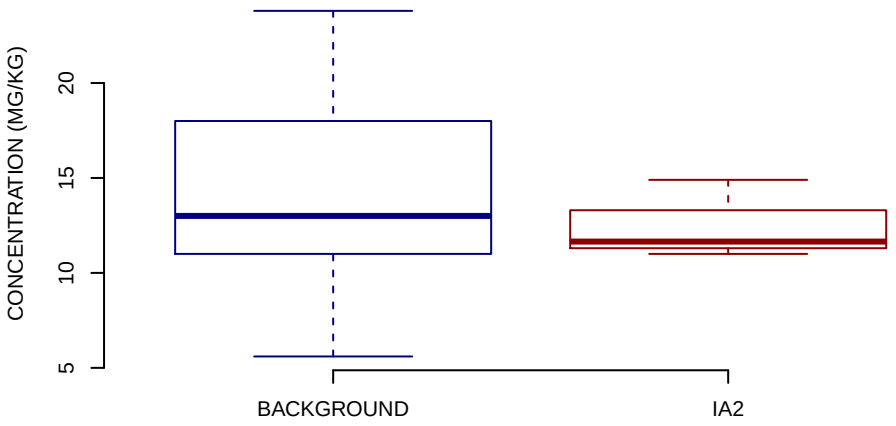
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

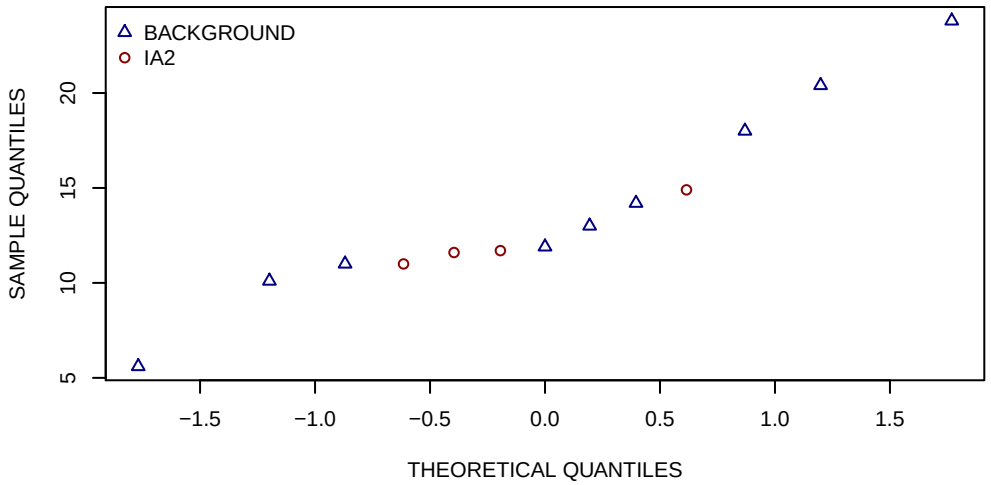
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# COPPER IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 5 OF 11

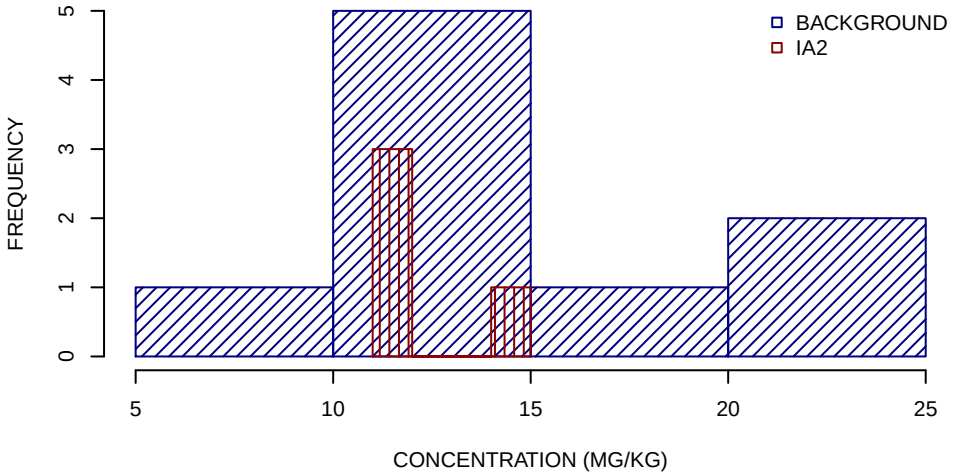
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 5.6 | 11 |
| **25TH PERCENTILE** | 11 | 11 |
| **MEDIAN** | 13 | 12 |
| **MEAN** | 14 | 12 |
| **75TH PERCENTILE** | 18 | 12 |
| **MAXIMUM** | 24 | 15 |

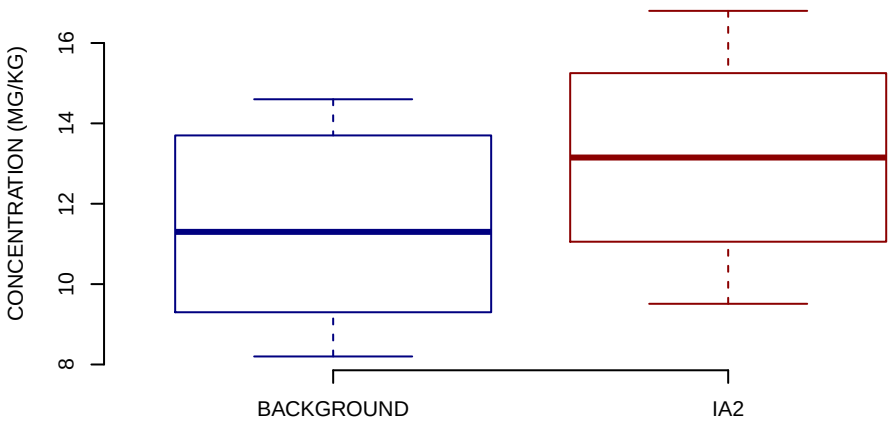
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

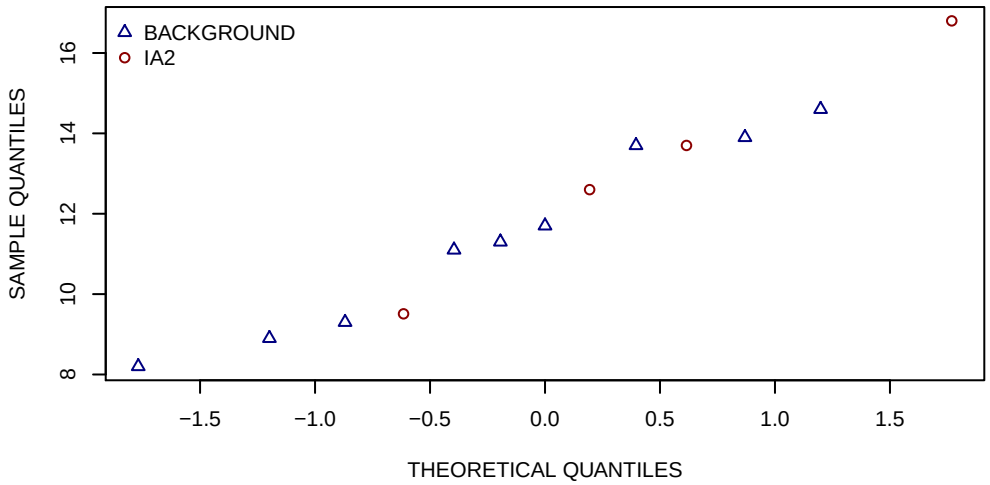
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# LEAD IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 6 OF 11

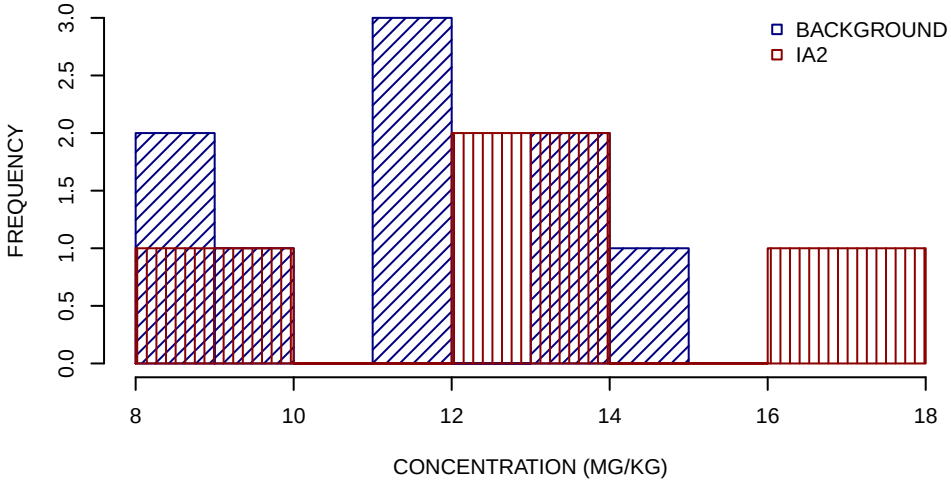
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 8.2 | 9.5 |
| **25TH PERCENTILE** | 9.3 | 12 |
| **MEDIAN** | 11 | 13 |
| **MEAN** | 11 | 13 |
| **75TH PERCENTILE** | 14 | 14 |
| **MAXIMUM** | 15 | 17 |

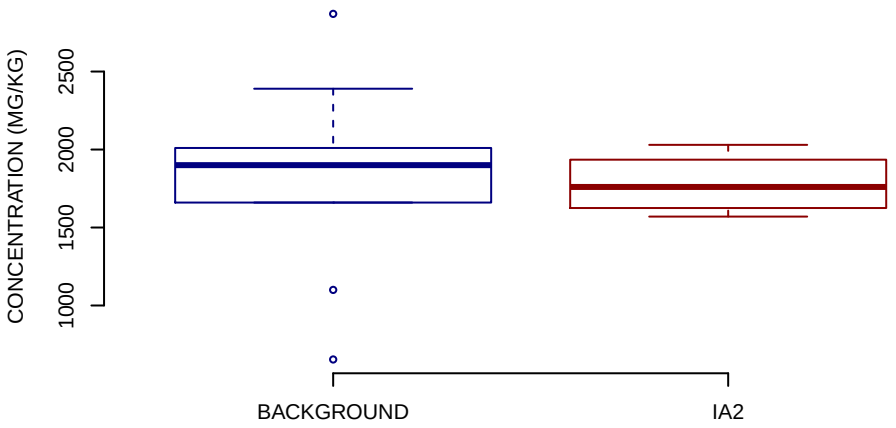
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

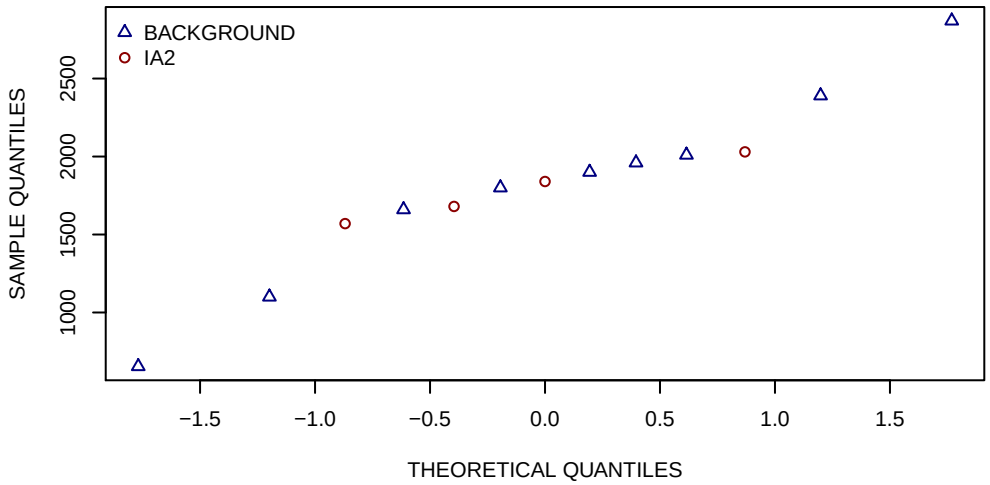
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MAGNESIUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 7 OF 11

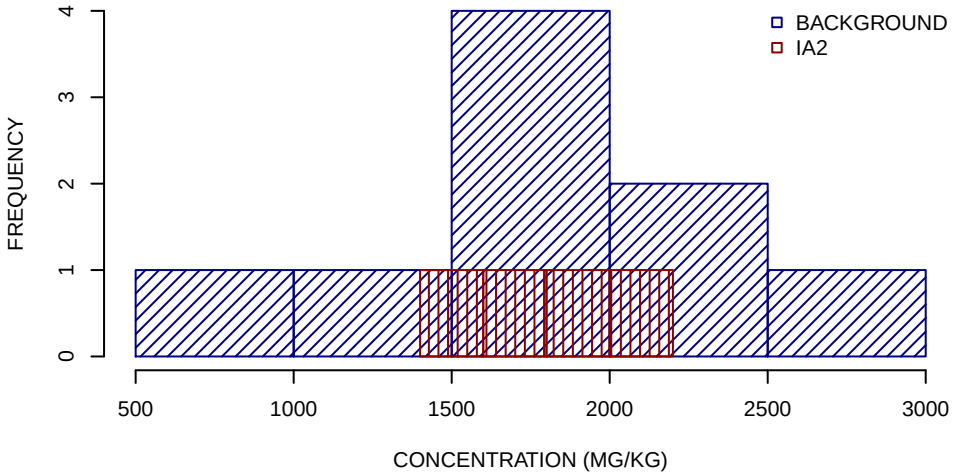
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| MINIMUM | 650 | 1600 |
| 25TH PERCENTILE | 1700 | 1700 |
| MEDIAN | 1900 | 1800 |
| MEAN | 1800 | 1800 |
| 75TH PERCENTILE | 2000 | 1900 |
| MAXIMUM | 2900 | 2000 |

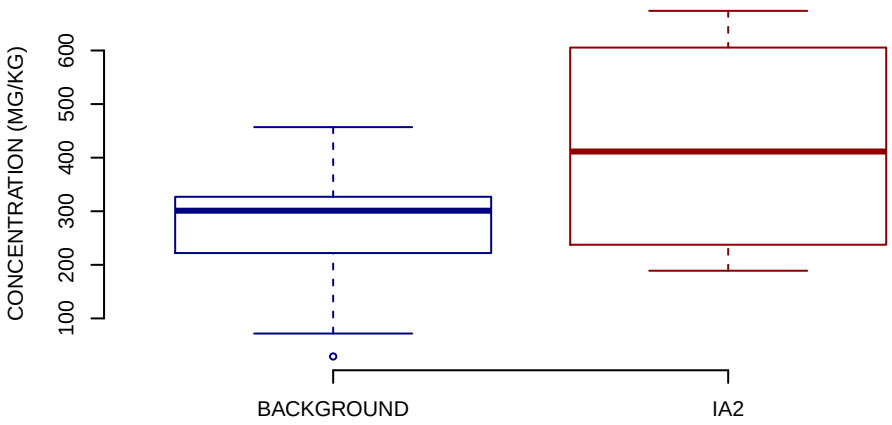
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

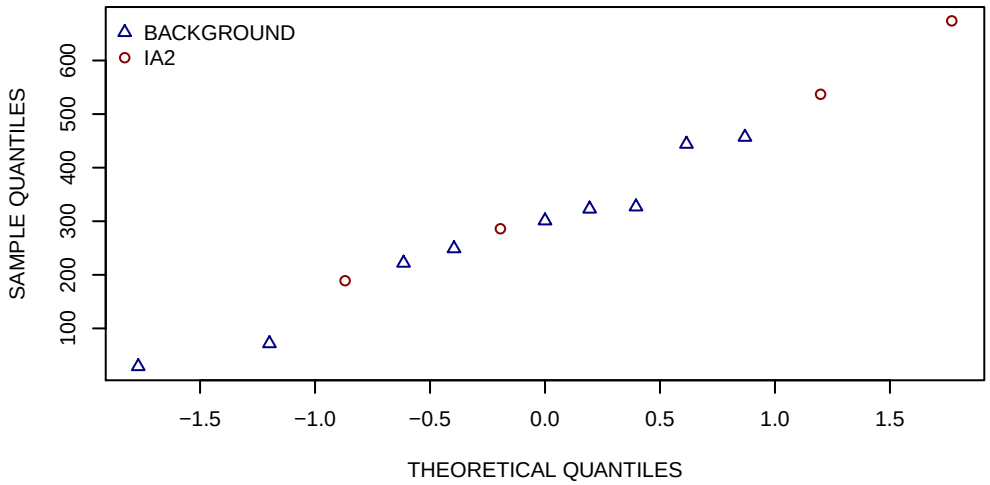
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# MANGANESE IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 8 OF 11

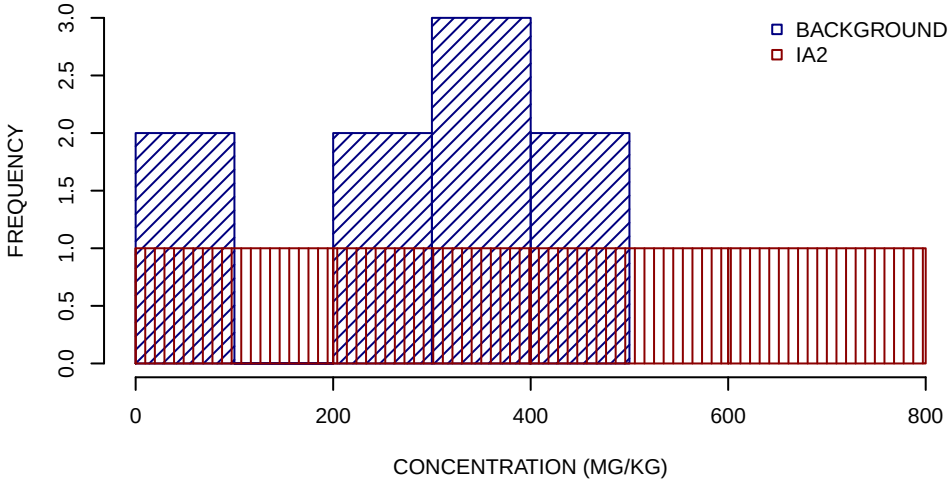
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| MINIMUM | 29 | 190 |
| 25TH PERCENTILE | 220 | 260 |
| MEDIAN | 300 | 410 |
| MEAN | 270 | 420 |
| 75TH PERCENTILE | 330 | 570 |
| MAXIMUM | 460 | 670 |

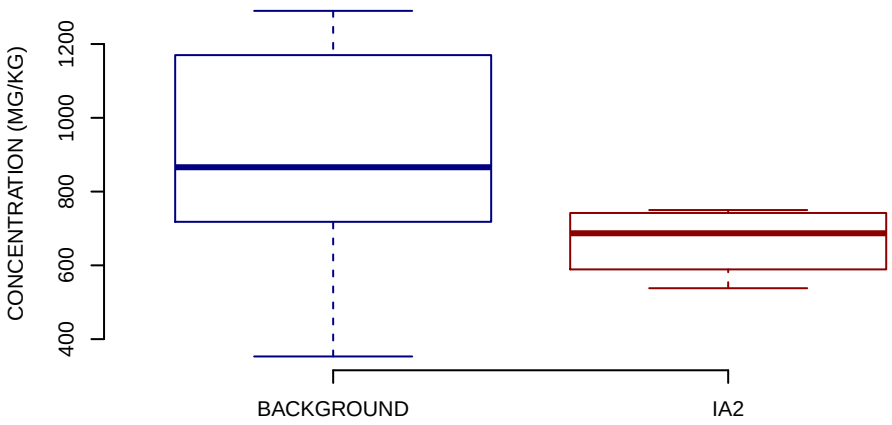
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

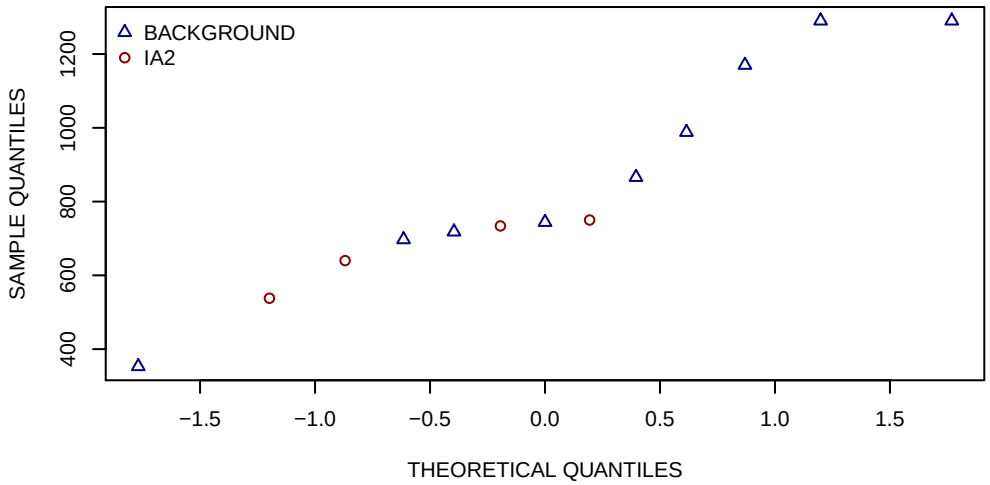
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# POTASSIUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 9 OF 11

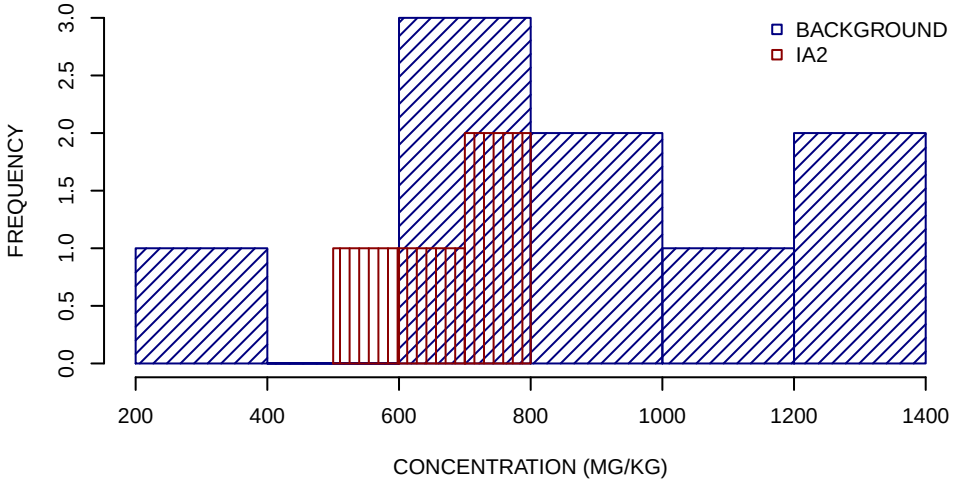
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| MINIMUM | 350 | 540 |
| 25TH PERCENTILE | 720 | 610 |
| MEDIAN | 870 | 690 |
| MEAN | 900 | 670 |
| 75TH PERCENTILE | 1200 | 740 |
| MAXIMUM | 1300 | 750 |

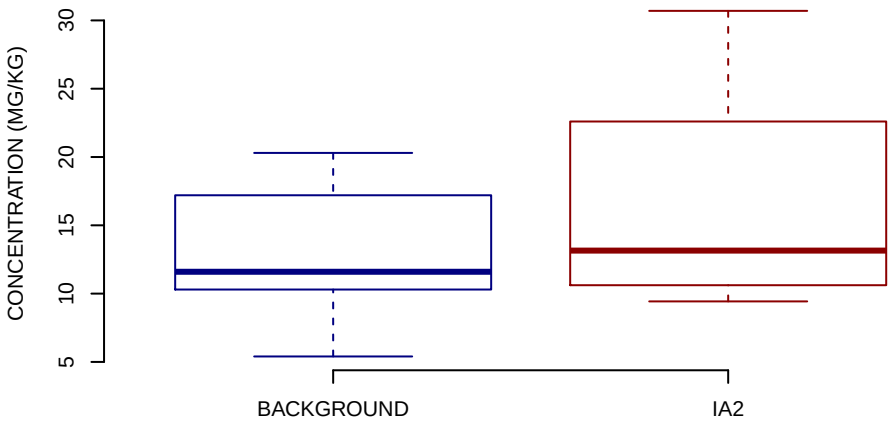
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

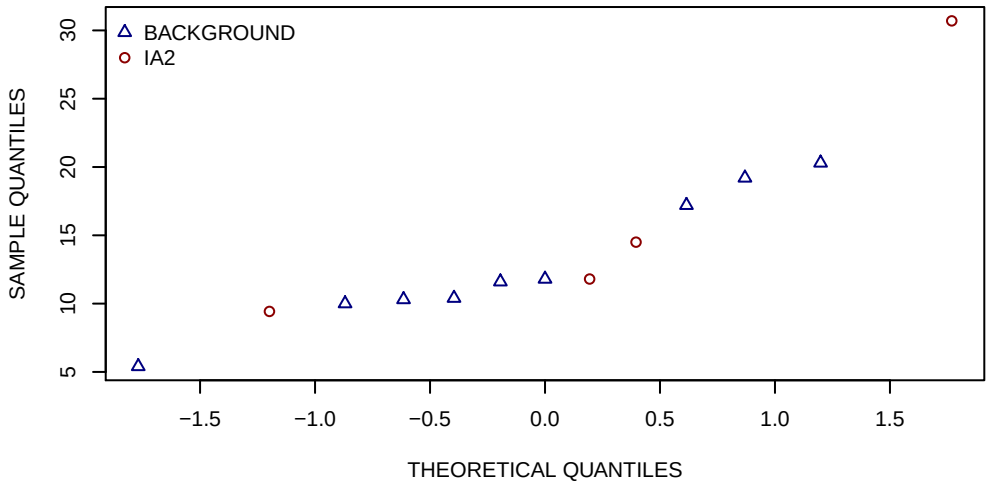
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# STRONTIUM IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 10 OF 11

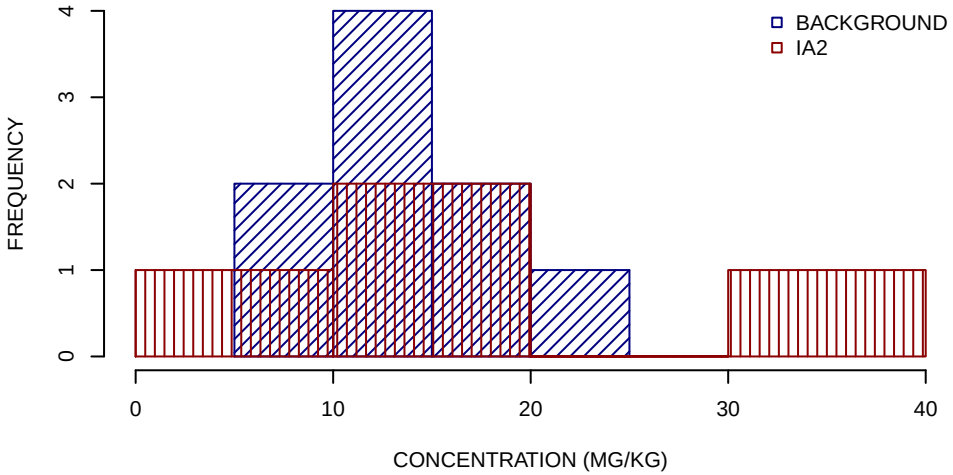
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 5.4 | 9.4 |
| **25TH PERCENTILE** | 10 | 11 |
| **MEDIAN** | 12 | 13 |
| **MEAN** | 13 | 17 |
| **75TH PERCENTILE** | 17 | 19 |
| **MAXIMUM** | 20 | 31 |

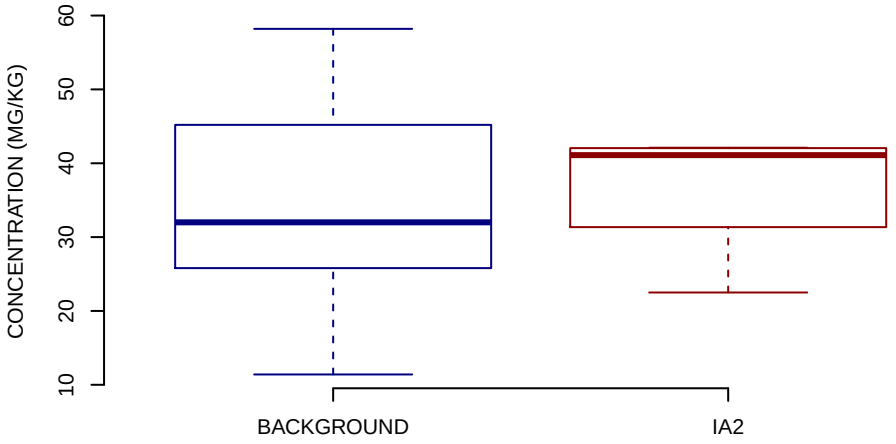
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

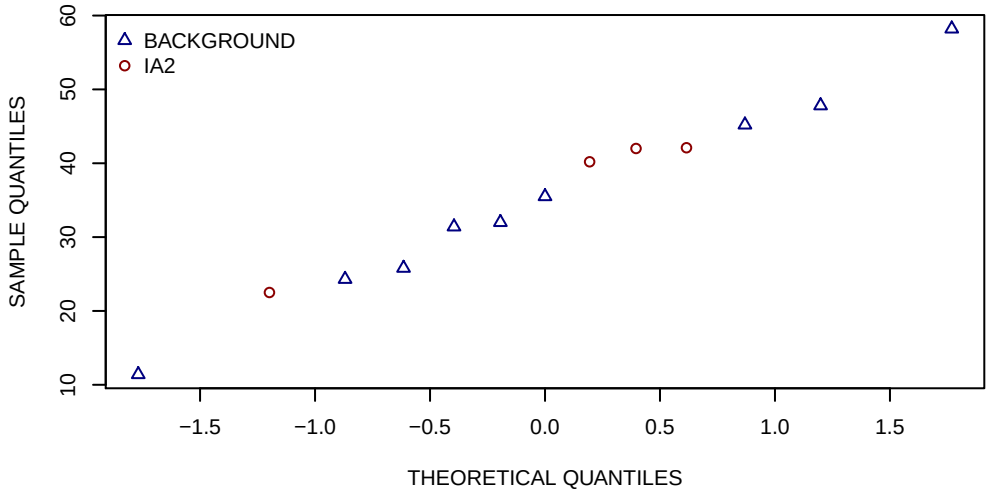
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# ZINC IA2 SUBSURFACE SOIL GRAPHICAL DISPLAYS
# SWMU 27 RFI
# NSA CRANE, CRANE, INDIANA
# FIGURE 11 OF 11

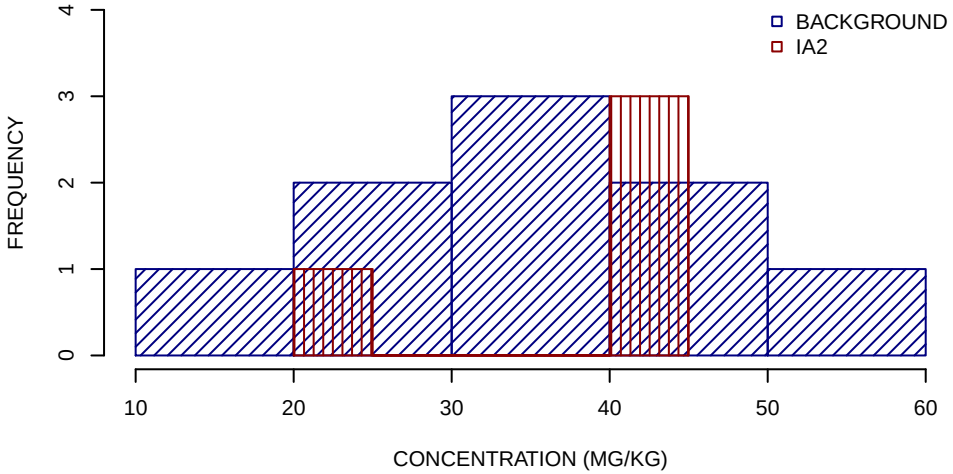
## BOXPLOTS




## NORMAL Q−Q PLOT




## HISTOGRAMS




## SUMMARY STATISTICS

| | BACKGROUND | IA2 |
|---|---|---|
| **MINIMUM** | 11 | 22 |
| **25TH PERCENTILE** | 26 | 36 |
| **MEDIAN** | 32 | 41 |
| **MEAN** | 35 | 37 |
| **75TH PERCENTILE** | 45 | 42 |
| **MAXIMUM** | 58 | 42 |

UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON−DETECTS

SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

# APPENDIX F

# SUPPORTING DOCUMENTATION FOR THE HUMAN HEALTH RISK ASSESSMENT

# APPENDIX F

## SUPPORTING INFORMATION FOR HUMAN HEALTH RISK ASSESSMENT


F.1 Samples Used in Risk Assessment
F.2 RAGS Part D Tables
F.3 ProUCL Outputs
F.4 Sample Calculations
F.5 Lead Modeling Results
F.6 RAGS Part D Tables for Chemicals Present at Naturally Occurring Levels

# APPENDIX F.1

# SAMPLES USED IN RISK ASSESSMENT

**TABLE 1**
**SAMPLES USED IN THE HUMAN HEALTH RISH ASSESSMENT**

| INVESTIGATION AREA 1 | | | INVESTIGATION AREA 2 | |
|---|---|---|---|---|
| **Surface Soil** | **Subsurface Soil** | **Pit/Sumps** | **Surface Soil** | **Subsurface Soil** |
| 27SS001G0001 | 27SB036G0406 | 27SS029C0002 | 27SS009G0001 | 27SB017G0204 |
| 27SS002G0001 | 27SB037G0507 | 27SS030C0002 | 27SS013G0002 | 27SB017G0406 |
| 27SS002G0001-D | 27SB038G0406 | 27SS031C0002 | 27SS014G0002 | 27SB018G0204 |
| 27SS003G0001 | 27SB038G0406 | 27SS032C0002 | 27SS015G0002 | 27SB018G0406 |
| 27SS004G0001 | 27SB038G0406-D | 27SS033C0002 | 27SS016G0002 | 27SB018G0406-D |
| 27SS005G0001 | 27SB039G0709 | 27SS034C0002 | 27SS017G0002 | |
| 27SS006G0001 | 27SB040G0406 | 27SS035C0002 | 27SS018G0002 | |
| 27SS007G0001 | 27SB041G0406 | 27SS056G0002 | 27SS058G0001 | |
| 27SS008G0001 | 27SB042G0406 | 27SS057G0002 | 27SS063G0002 | |
| 27SS010C0002 | 27SB065G0406 | 27SS066C0002 | | |
| 27SS011G0002 | 27SB055G0406 | | | |
| 27SS012G0002 | | | | |
| 27SS019C0002 | | | | |
| 27SS020C0002 | | | | |
| 27SS021C0002 | | | | |
| 27SS022C0002 | | | | |
| 27SS023C0002 | | | | |
| 27SS024C0002 | | | | |
| 27SS025C0002 | | | | |
| 27SS026C0002 | | | | |
| 27SS027C0002 | | | | |
| 27SS028C0002 | | | | |
| 27SS043C0002 | | | | |
| 27SS044C0002 | | | | |
| 27SS045C0002 | | | | |
| 27SS046C0002 | | | | |
| 27SS047C0002 | | | | |
| 27SS048C0002 | | | | |
| 27SS049C0002 | | | | |
| 27SS050C0002 | | | | |
| 27SS051C0002 | | | | |
| 27SS052C0002 | | | | |
| 27SS053G0002 | | | | |
| 27SS053G0002-D | | | | |
| 27SS054G0002 | | | | |
| 27SS055G0002 | | | | |
| 27SS059C0002 | | | | |
| 27SS060C0002 | | | | |
| 27SS061C0002 | | | | |
| 27SS062C0002 | | | | |
| 27SS064C0002 | | | | |

# APPENDIX F.2

# RAGS-PART D TABLES

# RAGS Part D Table 1

## Selection of Exposure Pathways

TABLE 1

SELECTION OF EXPOSURE PATHWAYS
SWMU 27 ILLUMINANT BUILDING 126
NSA CRANE, CRANE INDIANA


| 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/Future | Surface Soil | Surface Soil | SWMU 27 | Industrial Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Industrial workers may contact surface soil during normal work activities. |
| | | | | Construction Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Construction workers may contact surface soil during normal work activities. |
| | | Air | SWMU 27 | Industrial Worker | Adult | Inhalation | Quant | Industrial workers may be exposed to fugitive dust and volatile emissions during work activities. |
| | | | | Construction Worker | Adult | Inhalation | Quant | Construction workers may be exposed to fugitive dust and volatile emissions during construction activities. |
| | Subsurface Soil | Subsurface Soil | SWMU 27 | Industrial Worker | Adult | Ingestion<br>Dermal | None<br>None | Industrial workers are not expected to be exposed to subsurface soil. |
| | | | | Construction Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Construction workers may contact subsurface soil during normal work activities. |
| | | Air | SWMU 27 | Industrial Worker | Adult | Inhalation | None | Industrial workers are not expected to be exposed to subsurface soil. |
| | | | | Construction Worker | Adult | Inhalation | Quant | Construction workers may be exposed to fugitive dust and volatile emissions during construction activities. |
| Future | Surface Soil | Surface Soil | SWMU 27 | Residents | Child | Ingestion<br>Dermal | Quant<br>Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Ingestion<br>Dermal | Quant<br>Quant | |
| | | | | Recreational Users | Child | Ingestion<br>Dermal | Quant<br>Quant | A future child recreational user may be exposed to surface soil. |
| | | | | | Adult | Ingestion<br>Dermal | Quant<br>Quant | A future adult recreational user may be exposed to surface soil. |
| | | Air | SWMU 27 | Residents | Child | Inhalation | Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Inhalation | Quant | |
| | | | | Recreational Users | Child | Inhalation | Quant | Recreational users may be exposed to fugitive dust and volatile emissions while at the site. |
| | | | | | Adult | Inhalation | Quant | Recreational users may be exposed to fugitive dust and volatile emissions while at the site. |
| | Subsurface Soil | Subsurface Soil | SWMU 27 | Residents | Child | Inhalation | Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Inhalation | Quant | |
| | | | | Recreational Users | Child | Inhalation | Quant | A future child recreational user is not expected to be exposed to subsurface soil. |
| | | | | | Adult | Inhalation | Quant | A future adult recreational user is not expected to be exposed to subsurface soil. |

TABLE 1

SELECTION OF EXPOSURE PATHWAYS
SWMU 27 ILLUMINANT BUILDING 126
NSA CRANE, CRANE INDIANA


| Scenario Timeframe | Medium | Exposure Medium | Exposure Point | Receptor Population | Receptor Age | Exposure Route | Type of Analysis | Rationale for Selection or Exclusion of Exposure Pathway |
|---|---|---|---|---|---|---|---|---|
| Future | Subsurface Soil | Air | SWMU 27 | Residents | Child | Inhalation | Quant | Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions. |
| | | | | | Adult | Inhalation | Quant | |
| | | | | Recreational Users | Child | Inhalation | Quant | A future child recreational user is not expected to be exposed to subsurface soil. |
| | | | | | Adult | Inhalation | Quant | A future adult recreational user is not expected to be exposed to subsurface soil. |
| | Sumps/Pits | Sumps/Pits | SWMU 27 | Construction Worker | Adult | Ingestion<br>Dermal | Quant<br>Quant | Construction workers may contact material in the sumps/pits if the sumps/pits are removed. |
| | | Air | SWMU 27 | Construction Worker | Adult | Inhalation | Quant | Construction workers may be exposed to fugitive dust and volatile emissions during excavation activities. |

Notes:
Quant - Quantitative.

# RAGS Part D Table 2

## Occurrence, Distribution and Selection Of Chemicals of Potential Concern

## LIST OF TABLES
## RAGS PART D TABLE 2
## OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

**Table No.**


2.1 Investigation Area 1 - Surface Soil - Direct Contact
2.2 Investigation Area 1 - Surface Soil - Migration From Soil to Groundwater
2.3 Investigation Area 1 - Subsurface Soil - Direct Contact
2.4 Investigation Area 1 - Subsurface Soil - Migration From Soil to Groundwater
2.5 Investigation Area 1 - Sumps/Pits - Direct Contact
2.6 Investigation Area 2 - Surface Soil - Direct Contact
2.7 Investigation Area 2 - Surface Soil - Migration From Soil to Groundwater
2.8 Investigation Area 2 - Subsurface Soil - Direct Contact
2.9 Investigation Area 2 - Subsurface Soil - Migration From Soil to Groundwater

**TABLE 2.1**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Surface Soil**
**Exposure Medium: Surface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | Adjusted USEPA RSL Residential Soil[5] | IDEM Residential Soil[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 1 | **Volatile Organic Compounds** | | | | | | | | | | | | | |
| | 78-93-3 | 2-Butanone | 0.0125 J | 0.0222 J | mg/kg | 27SS007G0001 | 2/19 | 0.00444 - 0.0104 | 0.0222 | NA | 2,800 N | 28,000 S | No | BSL |
| | 108-10-1 | 4-Methyl-2-Pentanone | 0.00408 J | 0.00408 J | mg/kg | 27SS064C0002 | 1/19 | 0.00222 - 0.00525 | 0.00408 | NA | 530 N | 3,400 S | No | BSL |
| | 67-64-1 | Acetone | 0.112 J | 0.122 J | mg/kg | 27SS007G0001 | 2/19 | 0.00888 - 0.0208 | 0.122 | NA | 6,100 N | 85,000 N | No | BSL |
| | 156-59-2 | cis-1,2-Dichloroethene | 0.00179 J | 0.00179 J | mg/kg | 27SS003G0001 | 1/22 | 0.00211 - 0.00525 | 0.00179 | NA | 16 N | 220 N | No | BSL |
| | 75-09-2 | Methylene Chloride | 0.0267 | 0.0267 | mg/kg | 27SS064C0002 | 1/19 | 0.00444 - 0.0105 | 0.0267 | NA | 36 N[8] | 150 C | No | BSL |
| | 79-01-6 | Trichloroethene | 0.00429 J | 0.00439 J | mg/kg | 27SS064C0002 | 2/22 | 0.00211 - 0.00525 | 0.00439 | NA | 0.44 N[8] | 6.2 N | No | BSL |
| | **PCBs** | | | | | | | | | | | | | |
| | 11096-82-5 | Aroclor-1260 | 129 | 129 | ug/kg | 27SS054G0002 | 1/17 | 8.63 - 10.5 | 129 | NA | 220 C | 3,100 C | No | BSL |
| | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | **Aluminum** | 6,890 | 21,400 | mg/kg | 27SS001G0001 | 21/21 | - | 21,400 | Yes | 7,700 N | 100,000 L | Yes | ASL |
| | 7440-39-3 | **Barium** | 77.5 | 2,300 | mg/kg | 27SS025C0002 | 21/21 | - | 2,300 | Yes | 1,500 N | 21,000 N | Yes | ASL |
| | 7440-43-9 | Cadmium | 0.0786 J | 8.41 | mg/kg | 27SS002G0001 | 17/21 | 0.126 - 1.26 | 8.41 | No | 7 N | 98 N | No | BKG |
| | 7440-47-3 | **Chromium** | 12 J | 32.2 | mg/kg | 27SS001G0001 | 21/21 | - | 32.2 | Yes | 0.29 C[9] | 4.1 C[9] | Yes | ASL |
| | 7440-50-8 | Copper | 10.4 | 67 | mg/kg | 27SS006G0001 | 21/21 | - | 67 | Yes | 310 N | 4,300 N | No | BSL |
| | 7439-92-1 | Lead | 11 | 92 J | mg/kg | 27SS027C0002 | 21/21 | - | 92 | Yes | 400 | 400 | No | BSL |
| | 7439-95-4 | Magnesium | 715 J | 6,030 J | mg/kg | 27SS026C0002 | 21/21 | - | 6,030 | Yes | NA | NA | No | NUT |
| | 7439-96-5 | Manganese | 256 J | 5,550 J | mg/kg | 27SS001G0001 | 21/21 | - | 5,550 | No | 180 N | 2,500 N | No | BKG |
| | 7440-09-7 | Potassium | 455 J | 1,050 J | mg/kg | 27SS022C0002 | 21/21 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| | 7440-23-5 | Sodium | 71.7 J | 216 J | mg/kg | 27SS003G0001 | 7/21 | 168 - 935 | 216 | Yes | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 4.72 | 142 | mg/kg | 27SS026C0002 | 21/21 | - | 142 | Yes | 4,700 N | 66,000 N | No | BSL |
| | 7440-66-6 | Zinc | 30.2 J | 387 | mg/kg | 27SS007G0001 | 21/21 | - | 387 | Yes | 2,300 N | 32,000 N | No | BSL |
| | **Miscellaneous Parameters** | | | | | | | | | | | | | |
| | 57-12-5 | Cyanide | 0.19 J | 1.37 | mg/kg | 27SS002G0001 | 1/2 | 0.288 - 0.288 | 1.37 | NA | 4.7 N | 2,200 N | No | BSL |
| | 14797-73-0 | Perchlorate | 0.835 J | 1.75 J | ug/kg | 27SS027C0002 | 3/22 | 2.32 - 4.1 | 1.75 | NA | 5,500 N | 77,000 N | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
9 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | | |
|---|---|---|---|
| 27SS001G0001 | 27SS020C0002 | 27SS047C0002 | 27SS062C0002 |
| 27SS002G0001 | 27SS021C0002 | 27SS048C0002 | 27SS064C0002 |
| 27SS002G0001-D | 27SS022C0002 | 27SS049C0002 | |
| 27SS003G0001 | 27SS023C0002 | 27SS050C0002 | |
| 27SS004G0001 | 27SS024C0002 | 27SS051C0002 | |
| 27SS005G0001 | 27SS025C0002 | 27SS052C0002 | |
| 27SS006G0001 | 27SS026C0002 | 27SS053G0002 | |
| 27SS007G0001 | 27SS027C0002 | 27SS053G0002-D | |
| 27SS008G0001 | 27SS028C0002 | 27SS054G0002 | |
| 27SS010C0002 | 27SS043C0002 | 27SS055G0002 | |
| 27SS011G0002 | 27SS044C0002 | 27SS059C0002 | |
| 27SS012G0002 | 27SS045C0002 | 27SS060C0002 | |
| 27SS019C0002 | 27SS046C0002 | 27SS061C0002 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 2.2**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Surface Soil**
**Exposure Medium: Surface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | USEPA RSL Protection of Groundwater[5] | IDEM Migration to Groundwater[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 1 | **Volatile Organic Compounds** | | | | | | | | | | | | | |
| | 78-93-3 | 2-Butanone | 0.0125 J | 0.0222 J | mg/kg | 27SS007G0001 | 2/19 | 0.00444 - 0.0104 | 0.0222 | NA | 20 | 21 N | No | BSL |
| | 108-10-1 | 4-Methyl-2-Pentanone | 0.00408 J | 0.00408 J | mg/kg | 27SS064C0002 | 1/19 | 0.00222 - 0.00525 | 0.00408 | NA | 4.6 | 4.5 N | No | BSL |
| | 67-64-1 | Acetone | 0.112 J | 0.122 J | mg/kg | 27SS007G0001 | 2/19 | 0.00888 - 0.0208 | 0.122 | NA | 48 | 49 N | No | BSL |
| | 156-59-2 | cis-1,2-Dichloroethene | 0.00179 J | 0.00179 J | mg/kg | 27SS003G0001 | 1/22 | 0.00211 - 0.00525 | 0.00179 | NA | 0.16 | 0.41 M | No | BSL |
| | 75-09-2 | **Methylene Chloride** | 0.0267 | 0.0267 | mg/kg | 27SS064C0002 | 1/19 | 0.00444 - 0.0105 | 0.0267 | NA | 0.05 | 0.025 M | Yes | ASL |
| | 79-01-6 | **Trichloroethene** | 0.00429 J | 0.00439 J | mg/kg | 27SS064C0002 | 2/22 | 0.00211 - 0.00525 | 0.00439 | NA | 0.0032 | 0.036 M | Yes | ASL |
| | **PCBs** | | | | | | | | | | | | | |
| | 11096-82-5 | Aroclor-1260 | 129 | 129 | ug/kg | 27SS054G0002 | 1/17 | 8.63 - 10.5 | 129 | NA | 480 | 4,800 C | No | BSL |
| | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 6,890 | 21,400 | mg/kg | 27SS001G0001 | 21/21 | - | 21,400 | Yes | 460,000 | 1,000,000 R | No | BSL |
| | 7440-39-3 | **Barium** | 77.5 | 2,300 | mg/kg | 27SS025C0002 | 21/21 | - | 2,300 | Yes | 2,400 | 1,700 M | Yes | ASL |
| | 7440-43-9 | Cadmium | 0.0786 J | 8.41 | mg/kg | 27SS002G0001 | 17/21 | 0.126 - 1.26 | 8.41 | No | 10 | 7.5 M | No | BKG |
| | 7440-47-3 | **Chromium** | 12 J | 32.2 | mg/kg | 27SS001G0001 | 21/21 | - | 32.2 | Yes | 0.0118 [8] | 0.12 C[8] | Yes | ASL |
| | 7440-50-8 | Copper | 10.4 | 67 | mg/kg | 27SS006G0001 | 21/21 | - | 67 | Yes | 440 | 920 M | No | BSL |
| | 7439-92-1 | Lead | 11 | 92 J | mg/kg | 27SS027C0002 | 21/21 | - | 92 | Yes | 280 [9] | 270 M | No | BSL |
| | 7439-95-4 | Magnesium | 715 J | 6,030 J | mg/kg | 27SS026C0002 | 21/21 | - | 6,030 | Yes | NA | NA | No | NUT |
| | 7439-96-5 | Manganese | 256 J | 5,550 J | mg/kg | 27SS001G0001 | 21/21 | - | 5,550 | No | 420 | 420 N | No | BKG |
| | 7440-09-7 | Potassium | 455 J | 1,050 J | mg/kg | 27SS022C0002 | 21/21 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| | 7440-23-5 | Sodium | 71.7 J | 216 J | mg/kg | 27SS003G0001 | 7/21 | 168 - 935 | 216 | Yes | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 4.72 | 142 | mg/kg | 27SS026C0002 | 21/21 | - | 142 | Yes | 6,600 | 6,600 N | No | BSL |
| | 7440-66-6 | Zinc | 30.2 J | 387 | mg/kg | 27SS007G0001 | 21/21 | - | 387 | Yes | 5,800 | NA | No | BSL |
| | **Miscellaneous Parameters** | | | | | | | | | | | | | |
| | 57-12-5 | Cyanide | 0.19 J | 1.37 | mg/kg | 27SS002G0001 | 1/2 | 0.288 - 0.288 | 1.37 | NA | 1.9 | 40 M | No | BSL |
| | 14797-73-0 | Perchlorate | 0.835 J | 1.75 J | ug/kg | 27SS027C0002 | 3/22 | 2.32 - 4.1 | 1.75 | NA | NA | NA | No | NTX |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
9 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | |
|---|---|---|
| 27SS001G0001 | 27SS022C0002 | 27SS051C0002 |
| 27SS002G0001 | 27SS023C0002 | 27SS052C0002 |
| 27SS002G0001-D | 27SS024C0002 | 27SS053G0002 |
| 27SS003G0001 | 27SS025C0002 | 27SS053G0002-D |
| 27SS004G0001 | 27SS026C0002 | 27SS054G0002 |
| 27SS005G0001 | 27SS027C0002 | 27SS055G0002 |
| 27SS006G0001 | 27SS028C0002 | 27SS059C0002 |
| 27SS007G0001 | 27SS043C0002 | 27SS060C0002 |
| 27SS008G0001 | 27SS044C0002 | 27SS061C0002 |
| 27SS010C0002 | 27SS045C0002 | 27SS062C0002 |
| 27SS011G0002 | 27SS046C0002 | 27SS064C0002 |
| 27SS012G0002 | 27SS047C0002 | |
| 27SS019C0002 | 27SS048C0002 | |
| 27SS020C0002 | 27SS049C0002 | |
| 27SS021C0002 | 27SS050C0002 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level.
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg.

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient
NTX = No toxicity criteria

**TABLE 2.3**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Subsurface Soil**
**Exposure Medium: Subsurface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | Adjusted USEPA RSL Residential Soil[5] | IDEM Residential Soil Direct[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 1 | **Volatile Organic Compounds** | | | | | | | | | | | | | |
| | 67-64-1 | Acetone | 0.00553 J | 0.0101 J | mg/kg | 27SB040G0406 | 4/7 | 0.00913 - 0.00992 | 0.0101 | NA | 6,100 N | 85,000 N | No | BSL |
| | 156-59-2 | cis-1,2-Dichloroethene | 0.00796 | 0.00796 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00796 | NA | 16 N | 220 N | No | BSL |
| | 100-41-4 | Ethylbenzene | 0.00182 J | 0.00652 | mg/kg | 27SB036G0406 | 2/8 | 0.00213 - 0.00315 | 0.00652 | NA | 5.4 C | 76 C | No | BSL |
| | 79-20-9 | Methyl Acetate | 0.00373 J | 0.00373 J | mg/kg | 27SB065G0406 | 1/8 | 0.00427 - 0.00507 | 0.00373 | NA | 7,800 N | 29,000 S | No | BSL |
| | 1330-20-7 | Total Xylenes | 0.00462 J | 0.0226 | mg/kg | 27SB036G0406 | 2/8 | 0.0064 - 0.00944 | 0.0226 | NA | 63 N | 260 S | No | BSL |
| | 79-01-6 | Trichloroethene | 0.00521 | 0.0176 | mg/kg | 27SB065G0406 | 2/9 | 0.00213 - 0.00301 | 0.0176 | NA | 0.44 N[8] | 6.2 N | No | BSL |
| | 75-01-4 | Vinyl Chloride | 0.00683 | 0.00683 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00683 | NA | 0.06 C | 0.84 C | No | BSL |
| | **PCBs** | | | | | | | | | | | | | |
| | 11096-82-5 | Aroclor-1260 | 83.4 J | 83.4 J | ug/kg | 27SB055G0406 | 1/1 | - | 83.4 | NA | 220 C | 3,100 C | No | BSL |
| | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 2,960 | 18,900 | mg/kg | 27SB038G0406 | 8/8 | - | 18,900 | No | 7,700 N | 100,000 L | No | BKG |
| | 7440-39-3 | Barium | 22.9 | 99.6 | mg/kg | 27SB038G0406 | 8/8 | - | 99.6 | Yes | 1,500 N | 21,000 N | No | BSL |
| | 7440-43-9 | Cadmium | 0.0621 J | 0.501 | mg/kg | 27SB039G0709 | 6/8 | 0.106 - 0.248 | 0.501 | No | 7 N | 98 N | No | BSL, BKG |
| | 7440-47-3 | **Chromium** | 7.72 | 62.6 | mg/kg | 27SB042G0406 | 8/8 | - | 62.6 | Yes | 0.29 C[9] | 4.1 C[9] | Yes | ASL |
| | 7440-50-8 | Copper | 5.3 | 16.1 | mg/kg | 27SB042G0406 | 8/8 | - | 16.1 | No | 310 N | 4,300 N | No | BSL, BKG |
| | 7439-92-1 | Lead | 4.94 | 16.8 | mg/kg | 27SB038G0406-D | 8/8 | - | 16.8 | No | 400 | 400 | No | BSL, BKG |
| | 7439-95-4 | Magnesium | 327 | 4,910 | mg/kg | 27SB039G0709 | 8/8 | - | 4,910 | Yes | NA | NA | No | NUT |
| | 7439-96-5 | **Manganese** | 122 J | 900 J | mg/kg | 27SB039G0709 | 8/8 | - | 900 | Yes | 180 N | 2,500 N | Yes | ASL |
| | 7440-09-7 | Potassium | 533 J | 1,050 J | mg/kg | 27SB038G0406 | 8/8 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| | 7440-23-5 | Sodium | 101 J | 108 J | mg/kg | 27SB041G0406 | 2/8 | 159 - 373 | 108 | Yes | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 5.39 | 33 J | mg/kg | 27SB039G0709 | 8/8 | - | 33 | No | 4,700 N | 66,000 N | No | BSL, BKG |
| | 7440-66-6 | Zinc | 27.8 J | 104 J | mg/kg | 27SB039G0709 | 8/8 | - | 104 | Yes | 2,300 N | 32,000 N | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
9 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | | |
|---|---|---|---|
| 27SB036G0406 | 27SB038G0406 | 27SB040G0406 | 27SB065G0406 |
| 27SB037G0507 | 27SB038G0406-D | 27SB041G0406 | 27SB055G0406 |
| 27SB038G0406 | 27SB039G0709 | 27SB042G0406 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 2.4**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 1**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Subsurface Soil**
**Exposure Medium: Subsurface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | USEPA RSL Protection of Groundwater[5] | IDEM Migration to Groundwater[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 1 | **Volatile Organic Compounds** | | | | | | | | | | | | | |
| | 67-64-1 | Acetone | 0.00553 J | 0.0101 J | mg/kg | 27SB040G0406 | 4/7 | 0.00913 - 0.00992 | 0.0101 | NA | 48 | 49 N | No | BSL |
| | 156-59-2 | cis-1,2-Dichloroethene | 0.00796 | 0.00796 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00796 | NA | 0.16 | 0.41 M | No | BSL |
| | 100-41-4 | Ethylbenzene | 0.00182 J | 0.00652 | mg/kg | 27SB036G0406 | 2/8 | 0.00213 - 0.00315 | 0.00652 | NA | 0.03 | 16 M | No | BSL |
| | 79-20-9 | Methyl Acetate | 0.00373 J | 0.00373 J | mg/kg | 27SB065G0406 | 1/8 | 0.00427 - 0.00507 | 0.00373 | NA | 64 | 66 N | No | BSL |
| | 1330-20-7 | Total Xylenes | 0.00462 J | 0.0226 | mg/kg | 27SB036G0406 | 2/8 | 0.0064 - 0.00944 | 0.0226 | NA | 3.8 | 200 M | No | BSL |
| | 79-01-6 | Trichloroethene | 0.00521 | 0.0176 | mg/kg | 27SB065G0406 | 2/9 | 0.00213 - 0.00301 | 0.0176 | NA | 0.0032 | 0.036 M | Yes | ASL |
| | 75-01-4 | Vinyl Chloride | 0.00683 | 0.00683 | mg/kg | 27SB065G0406 | 1/9 | 0.00213 - 0.00301 | 0.00683 | NA | 0.00011 | 0.014 M | Yes | ASL |
| | **PCBs** | | | | | | | | | | | | | |
| | 11096-82-5 | Aroclor-1260 | 83.4 J | 83.4 J | ug/kg | 27SB055G0406 | 1/1 | - | 83.4 | NA | 480 | 4,800 C | No | BSL |
| | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 2,960 | 18,900 | mg/kg | 27SB038G0406 | 8/8 | - | 18,900 | No | 46,000 | 1,000,000 R | No | BSL, BKG |
| | 7440-39-3 | Barium | 22.9 | 99.6 | mg/kg | 27SB038G0406 | 8/8 | - | 99.6 | Yes | 2,400 | 1,700 M | No | BSL |
| | 7440-43-9 | Cadmium | 0.0621 J | 0.501 | mg/kg | 27SB039G0709 | 6/8 | 0.106 - 0.248 | 0.501 | No | 10 | 7.5 M | No | BSL, BKG |
| | 7440-47-3 | Chromium | 7.72 | 62.6 | mg/kg | 27SB042G0406 | 8/8 | - | 62.6 | Yes | 0.012 [9] | 38 C[9] | Yes | ASL |
| | 7440-50-8 | Copper | 5.3 | 16.1 | mg/kg | 27SB042G0406 | 8/8 | - | 16.1 | No | 440 | 920 M | No | BSL, BKG |
| | 7439-92-1 | Lead | 4.94 | 16.8 | mg/kg | 27SB038G0406-D | 8/8 | - | 16.8 | No | 280 [10] | 270 M | No | BSL, BKG |
| | 7439-95-4 | Magnesium | 327 | 4,910 | mg/kg | 27SB039G0709 | 8/8 | - | 4,910 | Yes | NA | NA | No | NUT |
| | 7439-96-5 | Manganese | 122 J | 900 J | mg/kg | 27SB039G0709 | 8/8 | - | 900 | Yes | 420 | 420 N | Yes | ASL |
| | 7440-09-7 | Potassium | 533 J | 1,050 J | mg/kg | 27SB038G0406 | 8/8 | - | 1,050 | No | NA | NA | No | NUT, BKG |
| | 7440-23-5 | Sodium | 101 J | 108 J | mg/kg | 27SB041G0406 | 2/8 | 159 - 373 | 108 | Yes | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 5.39 | 33 J | mg/kg | 27SB039G0709 | 8/8 | - | 33 | No | 6,600 | 6,600 N | No | BSL, BKG |
| | 7440-66-6 | Zinc | 27.8 J | 104 J | mg/kg | 27SB039G0709 | 8/8 | - | 104 | Yes | 5,800 | NA | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for total PCBs.
9 - Value is for hexavalent chromium.
10 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | |
|---|---|---|
| 27SB036G0406 | 27SB039G0709 | 27SB055G0406 |
| 27SB037G0507 | 27SB040G0406 | |
| 27SB038G0406 | 27SB041G0406 | |
| 27SB038G0406 | 27SB042G0406 | |
| 27SB038G0406-D | 27SB065G0406 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 2.5**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT - SUMPS/PITS**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Sumps/Pits**
**Exposure Medium: Sumps/Pits**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | Adjusted USEPA RSL Residential Soil[5] | IDEM Residential Soil[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 1 | **Volatile Organic Compounds** | | | | | | | | | | | | | |
| | 95-50-1 | 1,2-Dichlorobenzene | 0.00277 J | 0.0092 J | mg/kg | 27SS032C0002 | 2/10 | 0.00273 - 5.49 | 0.0092 | NA | 190 N | 380 S | No | BSL |
| | 106-46-7 | 1,4-Dichlorobenzene | 0.00604 J | 0.0241 J | mg/kg | 27SS032C0002 | 2/10 | 0.00273 - 5.49 | 0.0241 | NA | 2.4 C | 34 C | No | BSL |
| | 78-93-3 | 2-Butanone | 0.134 J | 0.236 J | mg/kg | 27SS066C0002 | 3/10 | 0.00546 - 11 | 0.236 | NA | 2,800 N | 28,000 S | No | BSL |
| | 67-64-1 | Acetone | 0.399 J | 0.777 J | mg/kg | 27SS066C0002 | 3/10 | 0.0109 - 22 | 0.777 | NA | 6,100 N | 85,000 N | No | BSL |
| | 71-43-2 | Benzene | 0.00331 J | 0.00359 J | mg/kg | 27SS033C0002 | 2/10 | 0.00273 - 5.49 | 0.00359 | NA | 1.1 C | 15 C | No | BSL |
| | 75-15-0 | Carbon Disulfide | 0.00888 J | 0.0315 J | mg/kg | 27SS066C0002 | 3/10 | 0.00273 - 5.49 | 0.0315 | NA | 82 N | 740 S | No | BSL |
| | 108-90-7 | Chlorobenzene | 0.00779 J | 0.00876 J | mg/kg | 27SS033C0002 | 2/10 | 0.00273 - 5.49 | 0.00876 | NA | 29 N | 410 N | No | BSL |
| | 156-59-2 | cis-1,2-Dichloroethene | 0.00799 J | 0.00799 J | mg/kg | 27SS066C0002 | 1/10 | 0.00273 - 5.49 | 0.00799 | NA | 16 N | 220 N | No | BSL |
| | 110-82-7 | Cyclohexane | 0.0416 J | 27.9 | mg/kg | 27SS029C0002 | 4/10 | 0.00273 - 0.00462 | 27.9 | NA | 700 N | 120 S | No | BSL |
| | 100-41-4 | **Ethylbenzene** | 0.00181 J | 297 | mg/kg | 27SS029C0002 | 4/10 | 0.00277 - 0.0114 | 297 | NA | 5.4 C | 76 C | Yes | ASL |
| | 98-82-8 | Isopropylbenzene | 0.442 J | 20.1 | mg/kg | 27SS029C0002 | 2/10 | 0.00273 - 0.0114 | 20.1 | NA | 210 N | 270 S | No | BSL |
| | 108-87-2 | Methyl Cyclohexane | 0.918 J | 349 | mg/kg | 27SS029C0002 | 3/10 | 0.00273 - 0.0113 | 349 | NA | NA | NA | No | NTX |
| | 75-09-2 | Methylene Chloride | 0.0778 | 0.173 J | mg/kg | 27SS066C0002 | 2/10 | 0.00546 - 11 | 0.173 | NA | 36 N[8] | 150 C | No | BSL |
| | 108-88-3 | Toluene | 0.0129 | 0.0415 J | mg/kg | 27SS066C0002 | 3/10 | 0.00273 - 5.49 | 0.0415 | NA | 500 N | 820 S | No | BSL |
| | 1330-20-7 | **Total Xylenes** | 0.00527 J | 829 | mg/kg | 27SS029C0002 | 6/10 | 0.0083 - 0.0131 | 829 | NA | 63 N | 260 S | Yes | ASL |
| | 79-01-6 | Trichloroethene | 0.00238 J | 0.0564 J | mg/kg | 27SS066C0002 | 2/10 | 0.00277 - 5.49 | 0.0564 | NA | 0.44 N[8] | 6.2 N | No | BSL |
| | 75-01-4 | Vinyl Chloride | 0.00724 J | 0.00724 J | mg/kg | 27SS066C0002 | 1/10 | 0.00273 - 5.49 | 0.00724 | NA | 0.06 C | 0.84 C | No | BSL |
| | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | **Aluminum** | 1,500 | 18,800 J | mg/kg | 27SS066C0002 | 10/10 | - | 18,800 | NA | 7,700 N | 100,000 L | Yes | ASL |
| | 7440-39-3 | Barium | 62.5 | 1,010 J | mg/kg | 27SS066C0002 | 10/10 | - | 1,010 | NA | 1,500 N | 21,000 N | No | BSL |
| | 7440-43-9 | **Cadmium** | 3.49 | 138 J | mg/kg | 27SS066C0002 | 8/10 | 12.8 - 18.1 | 138 | NA | 7 N | 98 N | Yes | ASL |
| | 7440-47-3 | **Chromium** | 13.8 J | 656 J | mg/kg | 27SS066C0002 | 6/10 | 29.3 - 94.6 | 656 | NA | 0.29 C[9] | 4.1 C[9] | Yes | ASL |
| | 7440-50-8 | **Copper** | 63.4 | 2,420 | mg/kg | 27SS032C0002 | 10/10 | - | 2,420 | NA | 310 N | 4,300 N | Yes | ASL |
| | 7439-92-1 | **Lead** | 221 J | 6,100 J | mg/kg | 27SS066C0002 | 10/10 | - | 6,100 | NA | 400 | 400 | Yes | ASL |
| | 7439-95-4 | Magnesium | 3,280 J | 45,300 J | mg/kg | 27SS032C0002 | 9/10 | 13600 - 13600 | 45,300 | NA | NA | NA | No | NUT |
| | 7439-96-5 | **Manganese** | 52 J | 279,000 J | mg/kg | 27SS057G0002 | 10/10 | - | 279,000 | NA | 180 N | 2,500 N | Yes | ASL |
| | 7440-09-7 | Potassium | 179 J | 1,320 J | mg/kg | 27SS056G0002 | 9/10 | 2790 - 2790 | 1,320 | NA | NA | NA | No | NUT |
| | 7440-23-5 | Sodium | 137 J | 1,380 J | mg/kg | 27SS031C0002 | 7/10 | 199 - 2790 | 1,380 | NA | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 11.7 | 538 J | mg/kg | 27SS057G0002 | 10/10 | - | 538 | NA | 4,700 N | 66,000 N | No | BSL |
| | 7440-66-6 | **Zinc** | 824 J | 18,900 J | mg/kg | 27SS032C0002 | 10/10 | - | 18,900 | NA | 2,300 N | 32,000 N | Yes | ASL |
| | **Miscellaneous Parameters** | | | | | | | | | | | | | |
| | 57-12-5 | Cyanide | 0.491 J | 0.491 J | mg/kg | 27SS029C0002 | 1/1 | - | 0.491 | NA | 4.7 N | 2,200 N | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22, 2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Ten percent of noncarcinogenic screening level is less than the carcinogenic screening level, therefore the noncarcinogenic value is presented.
9 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**

| | | |
|---|---|---|
| 27SS029C0002 | 27SS033C0002 | 27SS057G0002 |
| 27SS030C0002 | 27SS034C0002 | 27SS066C0002 |
| 27SS031C0002 | 27SS035C0002 | |
| 27SS032C0002 | 27SS056G0002 | |

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available
S = Soil saturation limit

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient
NTX = No toxicity criteria

**TABLE 2.6**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SURFACE SOIL- INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Surface Soil**
**Exposure Medium: Surface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | Adjusted USEPA RSL Residential Soil[5] | IDEM Residential Soil Direct[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 2 | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | **Aluminum** | 1,510 | 17,900 | mg/kg | 27SS017G0002 | 9/9 | - | 17,900 | Yes | **7,700 N** | 100,000 L | **Yes** | ASL |
| | 7440-39-3 | Barium | 29.5 J | 132 | mg/kg | 27SS063G0002 | 9/9 | - | 132 | No | 1,500 N | 21,000 N | No | BSL, BKG |
| | 7440-43-9 | Cadmium | 0.0598 J | 0.798 J | mg/kg | 27SS063G0002 | 5/9 | 0.12 - 2.74 | 0.798 | No | 7 N | 98 N | No | BSL, BKG |
| | 7440-47-3 | Chromium | 5.74 J | 20.4 J | mg/kg | 27SS017G0002 | 9/9 | - | 20.4 | No | **0.29 C[8]** | **4.1 C[8]** | No | BKG |
| | 7440-50-8 | Copper | 7.23 | 19.5 | mg/kg | 27SS017G0002 | 8/9 | 10.3 - 10.3 | 19.5 | Yes | 310 N | 4,300 N | No | BSL |
| | 7439-92-1 | Lead | 4.84 | 18.2 | mg/kg | 27SS017G0002 | 9/9 | - | 18.2 | No | 400 | 560 N | No | BSL, BKG |
| | 7439-95-4 | Magnesium | 1,120 J | 11,000 J | mg/kg | 27SS063G0002 | 9/9 | - | 11,000 | Yes | NA | NA | No | NUT |
| | 7439-96-5 | Manganese | 53.1 J | 849 | mg/kg | 27SS013G0002 | 9/9 | - | 849 | No | **180 N** | 2,500 N | No | BKG |
| | 7440-09-7 | Potassium | 322 J | 1,170 J | mg/kg | 27SS017G0002 | 9/9 | - | 1,170 | No | NA | NA | No | NUT, BKG |
| | 7440-23-5 | Sodium | 85.1 J | 773 J | mg/kg | 27SS063G0002 | 7/9 | 175 - 186 | 773 | Yes | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 7.96 | 234 | mg/kg | 27SS063G0002 | 9/9 | - | 234 | Yes | 4,700 N | 66,000 N | No | BSL |
| | 7440-66-6 | Zinc | 15.8 J | 60.2 J | mg/kg | 27SS063G0002 | 7/9 | 20.5 - 48.4 | 60.2 | Yes | 2,300 N | 32,000 N | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SS009G0001
27SS013G0002
27SS014G0002
27SS015G0002
27SS016G0002
27SS017G0002
27SS018G0002
27SS058G0001
27SS063G0002

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 2.7**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SURFACE SOIL TO GROUNDWATER - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Surface Soil**
**Exposure Medium: Surface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration[1] | Maximum Concentration[1] | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects[2] | Concentration Used for Screening[3] | Above Background Concentration?[4] | USEPA RSL Protection of Groundwater[5] | IDEM Migration to Groundwater[6] | COPC Flag | Rationale for Contaminant Deletion or Selection[7] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 2 | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 1,510 | 17,900 | mg/kg | 27SS017G0002 | 9/9 | - | 17,900 | Yes | 460,000 | 1,000,000 R | No | BSL |
| | 7440-39-3 | Barium | 29.5 J | 132 | mg/kg | 27SS063G0002 | 9/9 | - | 132 | No | 2,400 | 1,700 M | No | BSL, BKG |
| | 7440-43-9 | Cadmium | 0.0598 J | 0.798 J | mg/kg | 27SS063G0002 | 5/9 | 0.12 - 2.74 | 0.798 | No | 10 | 7.5 M | No | BSL, BKG |
| | 7440-47-3 | Chromium | 5.74 J | 20.4 J | mg/kg | 27SS017G0002 | 9/9 | - | 20.4 | No | 0.012 [8] | 0.12 C[6] | No | BKG |
| | 7440-50-8 | Copper | 7.23 | 19.5 | mg/kg | 27SS017G0002 | 8/9 | 10.3 - 10.3 | 19.5 | Yes | 440 | 920 M | No | BSL |
| | 7439-92-1 | Lead | 4.84 | 18.2 | mg/kg | 27SS017G0002 | 9/9 | - | 18.2 | No | 280 [9] | 270 M | No | BSL, BKG |
| | 7439-95-4 | Magnesium | 1,120 J | 11,000 J | mg/kg | 27SS063G0002 | 9/9 | - | 11,000 | Yes | NA | NA | No | NUT |
| | 7439-96-5 | Manganese | 53.1 J | 849 | mg/kg | 27SS013G0002 | 9/9 | - | 849 | No | 420 | 420 N | No | BKG |
| | 7440-09-7 | Potassium | 322 J | 1,170 J | mg/kg | 27SS017G0002 | 9/9 | - | 1,170 | No | NA | NA | No | NUT, BKG |
| | 7440-23-5 | Sodium | 85.1 J | 773 J | mg/kg | 27SS063G0002 | 7/9 | 175 - 186 | 773 | Yes | NA | NA | No | NUT |
| | 7440-24-6 | Strontium | 7.96 | 234 | mg/kg | 27SS063G0002 | 9/9 | - | 234 | Yes | 6,600 | 6600 N | No | BSL |
| | 7440-66-6 | Zinc | 15.8 J | 60.2 J | mg/kg | 27SS063G0002 | 7/9 | 20.5 - 48.4 | 60.2 | Yes | 5,800 | NA | No | BSL |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. Values are based on a dilution attenuation factor of 20.
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
9 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SS009G0001
27SS013G0002
27SS014G0002
27SS015G0002
27SS016G0002
27SS017G0002
27SS018G0002
27SS058G0001
27SS063G0002

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 2.8**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - DIRECT CONTACT WITH SUBSURFACE SOIL - INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Subsurface Soil**
**Exposure Medium: Subsurface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | Adjusted USEPA RSL Residential Soil(5) | IDEM Residential Soil Direct(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 2 | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 12,600 | 15,000 | mg/kg | 27SB017G0406 | 4/4 | - | 15,000 | No | 7.700 N | 100,000 L | No | BKG |
| | 7440-39-3 | Barium | 53.9 | 116 | mg/kg | 27SB017G0204 | 4/4 | - | 116 | Yes | 1,500 N | 21,000 N | No | BSL |
| | 7440-43-9 | Cadmium | 0.131 J | 0.19 J | mg/kg | 27SB018G0406 | 2/4 | 0.113 - 0.13 | 0.19 | No | 7 N | 98 N | No | BSL, BKG |
| | 7440-47-3 | Chromium | 14.4 | 20.4 | mg/kg | 27SB018G0204 | 4/4 | - | 20.4 | No | 0.29 C(8) | 4.1 C(8) | No | BKG |
| | 7440-50-8 | Copper | 11 | 14.9 | mg/kg | 27SB017G0406 | 4/4 | - | 14.9 | No | 310 N | 4,300 N | No | BSL, BKG |
| | 7439-92-1 | Lead | 9.51 | 16.8 | mg/kg | 27SB018G0406 | 4/4 | - | 16.8 | No | 400 | 400 | No | BSL, BKG |
| | 7439-95-4 | Magnesium | 1,570 | 2,030 | mg/kg | 27SB017G0406 | 4/4 | - | 2,030 | No | NA | NA | No | NUT, BKG |
| | 7439-96-5 | Manganese | 189 J | 725 J | mg/kg | 27SB018G0406-D | 4/4 | - | 725 | No | 180 N | 2,500 N | No | BKG |
| | 7440-09-7 | Potassium | 538 J | 750 J | mg/kg | 27SB017G0204 | 4/4 | - | 750 | No | NA | NA | No | NUT, BKG |
| | 7440-24-6 | Strontium | 9.43 J | 30.7 J | mg/kg | 27SB018G0204 | 4/4 | - | 30.7 | No | 4,700 N | 66,000 N | No | BSL, BKG |
| | 7440-66-6 | Zinc | 22.5 J | 45 J | mg/kg | 27SB018G0406-D | 4/4 | - | 45 | No | 2,300 N | 32,000 N | No | BSL, BKG |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2012. The noncarcinogenic values (denoted with a "N" flag) are the screening level divided by 10 to correspond to a target hazard quotient of 0.1. Carcinogenic values represent an incremental cancer risk of 1.0E-06 (carcinogens denoted with a "C" flag).
6 - IDEM Closure Guide, March 22,2012.
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SB017G0204
27SB017G0406
27SB018G0204
27SB018G0406
27SB018G0406
27SB018G0406-D

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
L = Capped at 100,000 mg/kg
N = Noncarcinogen
NA = Not Applicable/Not Available

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

**TABLE 2.9**
**OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - MIGRATION FROM SUBSURFACE SOIL TO GROUNDWATER INVESTIGATION AREA 2**
**SWMU 27 ILLUMINANT BUILDING 126**
**NSA CRANE, CRANE, INDIANA**

**Scenario Timeframe: Current/Future**
**Medium: Subsurface Soil**
**Exposure Medium: Subsurface Soil**

| Exposure Point | CAS Number | Chemical | Minimum Concentration(1) | Maximum Concentration(1) | Units | Sample of Maximum Concentration | Frequency of Detection | Range of Nondetects(2) | Concentration Used for Screening(3) | Above Background Concentration?(4) | USEPA RSL Protection of Groundwater(5) | IDEM Migration to Groundwater(6) | COPC Flag | Rationale for Contaminant Deletion or Selection(7) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Investigation Area 2 | **Metals** | | | | | | | | | | | | | |
| | 7429-90-5 | Aluminum | 12,600 | 15,000 | mg/kg | 27SB017G0406 | 4/4 | - | 15,000 | No | 460,000 | 1,000,000 R | No | BSL, BKG |
| | 7440-39-3 | Barium | 53.9 | 116 | mg/kg | 27SB017G0204 | 4/4 | - | 116 | Yes | 2,400 | 1,700 M | No | BSL |
| | 7440-43-9 | Cadmium | 0.131 J | 0.19 J | mg/kg | 27SB018G0406 | 2/4 | 0.113 - 0.13 | 0.19 | No | 10 | 7.5 M | No | BSL, BKG |
| | 7440-47-3 | Chromium | 14.4 | 20.4 | mg/kg | 27SB018G0204 | 4/4 | - | 20.4 | No | 0.012 (8) | 0.12 C(8) | No | BKG |
| | 7440-50-8 | Copper | 11 | 14.9 | mg/kg | 27SB017G0406 | 4/4 | - | 14.9 | No | 440 | 920 M | No | BSL, BKG |
| | 7439-92-1 | Lead | 9.51 | 16.8 | mg/kg | 27SB018G0406 | 4/4 | - | 16.8 | No | 280 (9) | 270 M | No | BSL, BKG |
| | 7439-95-4 | Magnesium | 1,570 | 2,030 | mg/kg | 27SB017G0406 | 4/4 | - | 2,030 | No | NA | NA | No | NUT, BKG |
| | 7439-96-5 | Manganese | 189 J | 725 J | mg/kg | 27SB018G0406-D | 4/4 | - | 725 | No | 420 | 420 N | No | BKG |
| | 7440-09-7 | Potassium | 538 J | 750 J | mg/kg | 27SB017G0204 | 4/4 | - | 750 | No | NA | NA | No | NUT, BKG |
| | 7440-24-6 | Strontium | 9.43 J | 30.7 J | mg/kg | 27SB018G0204 | 4/4 | - | 30.7 | No | 6,600 | 6,600 N | No | BSL, BKG |
| | 7440-66-6 | Zinc | 22.5 J | 45 J | mg/kg | 27SB018G0406-D | 4/4 | - | 45 | No | 5,800 | NA | No | BSL, BKG |

**Footnotes:**
1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.
2 - Values presented are sample-specific quantitation limits.
3 - The maximum detected concentration is used for screening purposes.
4 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites, November 2011. Values are based on a dilution attenuation factor of 20.
6 - Indiana Department of Environmental Management (IDEM), Risk Integrated System of Closure (RISC) migration to groundwater for soil (IDEM, May 2009).
7 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
8 - Value is for hexavalent chromium.
9 - Value is MCL based soil screening level.
Shaded criterion indicates that the maximum detected concentration exceeds one or more screening criteria. Shaded chemical name indicates that the chemical was retained as a COPC.

**Associated Samples**
27SB017G0204
27SB017G0406
27SB018G0204
27SB018G0406
27SB018G0406
27SB018G0406-D

**Definitions:**
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
M - Maximum contaminant level
N = Noncarcinogen
NA = Not Applicable/Not Available
R = Capped at 1,000,000 mg/kg

**Rationale Codes:**
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level
NUT = Essential nutrient

# RAGS Part D Table 3

## Medium-Specific Exposure Point Concentration Summary

**LIST OF TABLES**
**RAGS PART D TABLE 3**
**MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY**

**Table No.**


| | |
|---|---|
| 3.1.RME | Investigation Area 1 - Surface Soil |
| 3.2.RME | Investigation Area 2 - Subsurface Soil |
| 3.3.RME | Investigation Area 1 - Sump - Location 27SB029 |
| 3.4.RME | Investigation Area 1 - Sump - Location 27SB030 |
| 3.5.RME | Investigation Area 1 - Sump - Location 27SB031 |
| 3.6.RME | Investigation Area 1 - Sump - Location 27SB032 |
| 3.7.RME | Investigation Area 1 - Sump - Location 27SB033 |
| 3.8.RME | Investigation Area 1 - Sump - Location 27SB034 |
| 3.9.RME | Investigation Area 1 - Sump - Location 27SB035 |
| 3.10.RME | Investigation Area 1 - Sump - Location 27SB056 |
| 3.11.RME | Investigation Area 1 - Sump - Location 27SB057 |
| 3.12.RME | Investigation Area 1 - Sump - Location 27SB066 |
| 3.13.RME | Investigation Area 2 - Surface Soil |
| 3.14.RME | Investigation Area 2 - Subsurface Soil |

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 | Aluminum | mg/kg | | 13,200 (N) | 21,400 | 13,200 | mg/kg | 95% Student's-t UCL | ProUCL 4.1.01 |
| | Barium | mg/kg | | 1,000 (NP) | 2,300 | 1,000 | mg/kg | 95% Chebyshev (Mean, Sd) UCL | ProUCL 4.1.01 |
| | Chromium | mg/kg | | 20 (G) | 32.2 | 20 | mg/kg | 95% Approximate Gamma UCL | ProUCL 4.1.01 |

Notes:
G = Gamma
N = Normal
NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 | Chromium | mg/kg | 24 | 40 (G) | 62.6 | 40 | mg/kg | 95% Approximate Gamma UCL | ProUCL 4.1.00 |
| | Manganese | mg/kg | 440 | 630 (N) | 900 J | 630 | mg/kg | 95% Student's-t UCL | ProUCL 4.1.00 |

Notes:
G = Gamma
N = Normal

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB029 | Ethylbenzene | mg/kg | (1) | (1) | 297 | 297 | mg/kg | Maximum Detected Concentration | (1) |
| | Total Xylenes | mg/kg | (1) | (1) | 829 | 829 | mg/kg | Maximum Detected Concentration | (1) |
| | Aluminum | mg/kg | (1) | (1) | 3,190 | 3,190 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 12 | 12 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | (1) | (1) | 240 J | 240 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 277 | 277 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 597 | 597 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 640 | 640 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 4580 J | 4580 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.4.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB030 | Aluminum | mg/kg | (1) | (1) | 6230 | 6230 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 3.49 | 3.49 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | (1) | (1) | 18.9 | 18.9 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 498 | 498 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 266 | 266 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 365 | 365 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 2530 | 2530 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.5.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB031 | Ethylbenzene | mg/kg | (1) | (1) | 1.85 J | 1.85 | mg/kg | Maximum Detected Concentration | (1) |
| | Total Xylenes | mg/kg | (1) | (1) | 3.3 J | 3.3 | mg/kg | Maximum Detected Concentration | (1) |
| | Aluminum | mg/kg | (1) | (1) | 10600 J | 10600 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 14.3 J | 14.3 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | (1) | (1) | 56.7 J | 56.7 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 1200 J | 1200 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 738 J | 738 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 120000 J | 120000 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 6410 J | 6410 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.6.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB032 | Aluminum | mg/kg | (1) | (1) | 1500 | 1500 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 2420 | 2420 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 1570 | 1570 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 208000 | 208000 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 18900 J | 18900 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.7.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB033 | Ethylbenzene | mg/kg | (1) | (1) | 0.00397 J | 0.00397 | mg/kg | Maximum Detected Concentration | (1) |
| | Total Xylenes | mg/kg | (1) | (1) | 0.0171 J | 0.0171 | mg/kg | Maximum Detected Concentration | (1) |
| | Aluminum | mg/kg | (1) | (1) | 3690 | 3690 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 154 | 154 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 396 | 396 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 125000 | 125000 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 12400 J | 12400 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.8.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB034 | Total Xylenes | mg/kg | (1) | (1) | 0.0171 J | 0.0171 | mg/kg | Maximum Detected Concentration | (1) |
| | Aluminum | mg/kg | (1) | (1) | 10900 J | 10900 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 7.63 J | 7.63 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | (1) | (1) | 39.5 J | 39.5 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 168 J | 168 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 221 J | 221 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 2400 J | 2400 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 2120 J | 2120 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.9.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB035 | Ethylbenzene | mg/kg | (1) | (1) | 0.00181 J | 0.00181 | mg/kg | Maximum Detected Concentration | (1) |
| | Total Xylenes | mg/kg | (1) | (1) | 0.00527 J | 0.00527 | mg/kg | Maximum Detected Concentration | (1) |
| | Aluminum | mg/kg | (1) | (1) | 6830 | 6830 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 18.8 | 18.8 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | (1) | (1) | 13.8 J | 13.8 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 63.4 | 63.4 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 442 | 442 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 267 | 267 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 824 J | 824 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.10.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB056 | Aluminum | mg/kg | (1) | (1) | 7230 | 7230 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 7.97 J | 7.97 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 233 | 233 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 1270 J | 1270 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 67900 J | 67900 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 7240 J | 7240 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.11.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB057 | Aluminum | mg/kg | (1) | (1) | 5670 | 5670 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 10.2 J | 10.2 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 515 | 515 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 840 J | 840 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 279000 J | 279000 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 3250 J | 3250 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.12.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 Sample 27SB066 | Total Xylenes | mg/kg | (1) | (1) | 0.051 J | 0.051 | mg/kg | Maximum Detected Concentration | (1) |
| | Aluminum | mg/kg | (1) | (1) | 18800 J | 18800 | mg/kg | Maximum Detected Concentration | (1) |
| | Cadmium | mg/kg | (1) | (1) | 138 J | 138 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | (1) | (1) | 656 J | 656 | mg/kg | Maximum Detected Concentration | (1) |
| | Copper | mg/kg | (1) | (1) | 765 J | 765 | mg/kg | Maximum Detected Concentration | (1) |
| | Lead | mg/kg | (1) | (1) | 6100 J | 6100 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | (1) | (1) | 52 J | 52 | mg/kg | Maximum Detected Concentration | (1) |
| | Zinc | mg/kg | (1) | (1) | 7010 J | 7010 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - Only one sampe was collected from a sump therefore no statistics could be calculated.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.13.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 2 | Aluminum | mg/kg | 11,585 | 15,060 (N) | 17,900 | 15,060 | mg/kg | 95% Student's-t UCL | ProUCL 4.1.01 |

Notes:
N = Normal

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.14.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 2 | Aluminum | mg/kg | 13,950 | (1) | 15,000 | 15,000 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | 18 | (1) | 20.4 | 20.4 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | 445 | (1) | 725 J | 725 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - An UCL could not be calculated because there were only four samples, therefore the maximum detected concentration was used as the exposure point concentration.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

# RAGS Part D Table 4

## Values Used For Daily Intake Calculations

**LIST OF TABLES**
**RAGS PART D TABLE 4**
**VALUES USED FOR DAILY INTAKE CALCULATIONS**


**Table No.**

**Reasonable Maximum Exposures**

4.1.RME Construction Workers Exposed to Surface Soil/Subsurface Soil
4.2.RME Construction Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.3.RME Construction Workers Exposed to Sumps/Pits
4.4.RME Construction Workers Exposed to Dust Emissions from Sump/Pits
4.5.RME Industrial Workers Exposed to Surface Soil/Subsurface Soil
4.6.RME Industrial Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.7.RME Child Recreational Users Exposed to Surface Soil/Subsurface Soil
4.8.RME Child Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.9.RME Adult Recreational Users Exposed to Surface Soil/Subsurface Soil
4.10.RME Adult Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.11.RME Child Residents Exposed to Surface Soil/Subsurface Soil
4.12.RME Child Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.13.RME Adult Residents Exposed to Surface Soil/Subsurface Soil
4.14.RME Adult Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil

**Central Tendency Exposures**

4.1.CTE Construction Workers Exposed to Surface Soil/Subsurface Soil
4.2.CTE Construction Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.3.CTE Construction Workers Exposed to Sumps/Pits
4.4.CTE Construction Workers Exposed to Dust Emissions from Sump/Pits
4.5.CTE Industrial Workers Exposed to Surface Soil/Subsurface Soil
4.6.CTE Industrial Workers Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.7.CTE Child Recreational Users Exposed to Surface Soil/Subsurface Soil
4.8.CTE Child Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.9.CTE Adult Recreational Users Exposed to Surface Soil/Subsurface Soil
4.10.CTE Adult Recreational Users Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.11.CTE Child Residents Exposed to Surface Soil/Subsurface Soil
4.12.CTE Child Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil
4.13.CTE Adult Residents Exposed to Surface Soil/Subsurface Soil
4.14.CTE Adult Residents Exposed to Air Emissions from Surface Soil/Subsurface Soil

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 330 | mg/day | USEPA, 2002b | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 2002b | BW x AT |
| | | | | EF | Exposure Frequency | 150 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| Dermal | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3300 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.3 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 150 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |

Notes:

1 - Professional judgment. Assume a 30 week construction project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.77E-08 Cancer Dermal Intake = 8.30E-08

Noncancer Ingestion Intake = 1.94E-06 Noncancer Dermal Intake = 5.81E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Construction Workers | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 8 | hours/day | (1) | $\frac{CA \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$ |
| | | | | EF | Exposure Frequency | 150 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.34E+06 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |

Notes:

1 - Professional judgment. Assume a 30 week construction project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 1.96E-03 Noncancer Inhalation Intake = 1.37E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - Excavation WORKERS- SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sumps/Pits
Exposure Medium: Sumps/Pits

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in sump | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 330 | mg/day | IDEM, 2012 | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 2002b | BW x AT |
| | | | | EF | Exposure Frequency | 45 | days/year | IDEM, 2012 | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1991 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | IDEM, 2012 | |
| Dermal | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in sump | Max or 95% UCL | mg/kg | USEPA, 2002a | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3300 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.3 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 45 | days/year | IDEM, 2012 | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | IDEM, 2012 | |

Notes:

1 - Professional judgment. Assume a 30 week Excavation project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

IDEM, 2012: Remediation Closure Guide.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 8.30E-09 Cancer Dermal Intake = 2.49E-08

Noncancer Ingestion Intake = 5.81E-07 Noncancer Dermal Intake = 1.74E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - Excavation WORKERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sumps/Pits
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Construction Workers | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in sump | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 8 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 45 | days/year | IDEM, 2012 | AT x 24 hours/day |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | IDEM, 2012 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA 2012 | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA 2012 | |

Notes:

1 - Professional judgment. Assume a 30 week Excavation project.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

IDEM, 2012: Remediation Closure Guide.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 5.87E-04 Noncancer Inhalation Intake = 4.11E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Industrial Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 100 | mg/day | USEPA, 2002b | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 2002b | BW x AT |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 2002b | |
| | | | | ED | Exposure Duration | 25 | years | USEPA, 2002b | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9125 | days | USEPA, 1989 | |
| Dermal | Industrial Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3300 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 2002b | |
| | | | | ED | Exposure Duration | 25 | years | USEPA, 1989 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9125 | days | USEPA, 1989 | |

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 3.49E-07 Cancer Dermal Intake = 2.31E-06

Noncancer Ingestion Intake = 9.78E-07 Noncancer Dermal Intake = 6.46E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Industrial Workers | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 8 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 250 | days/year | USEPA, 2002a | AT x 24 hours/day |
| | | | | ED | Exposure Duration | 25 | years | USEPA, 2002a | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 9125 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA 2008 | |

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 8.15E-02 Noncancer Inhalation Intake = 2.28E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Recreational User | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 200 | mg/day | USEPA, 1991 | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 0.5 | unitless | (1) | BW x AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 2 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 4 | years | (3), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2190 | days | USEPA, 1989 | |
| Dermal | Recreational User | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3,300 | cm2 | (4) | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 2 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 4 | years | (3), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2190 | days | USEPA, 1989 | |

Notes:

1 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. OSWER Directive 9285.6-03.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 8.14E-08 Cancer Dermal Intake (Age 0 - 6) = 5.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 2.71E-08 Cancer Dermal Intake (Age 0 - 2) = 1.79E-07

Cancer Ingestion Intake (Age 2 - 6) = 5.43E-08 Cancer Dermal Intake (Age 2 - 6) = 3.58E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 9.50E-07 Noncancer Dermal Intake = 6.27E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Recreational User | Child | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 4 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 2 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 4 | years | (3), USEPA, 1989, 2005 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.32E+09 | m3/kg | USEPA 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 2.04E-03 Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 6.78E-04

Cancer Inhalation Intake (Age 2 - 6) = 1.36E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Recreational User | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 100 | mg/day | USEPA, 1991 | |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 0.5 | unitless | (1) | BW x AT |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 10 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 14 | years | (3), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| Dermal | Recreational User | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 9,070 | cm2 | (4) | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.07 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 10 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 14 | years | (3), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |

Notes:

1 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume that head, arms, hands, lower legs, and feet are exposed, U.S. EPA, 1997.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 3.49E-08 Cancer Dermal Intake (Age 6 - 30) = 4.43E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.45E-08 Cancer Dermal Intake (Age 6 - 16) = 1.85E-07

Cancer Ingestion Intake Age 16 - 30) = 2.04E-08 Cancer Dermal Intake (Age 16 - 30) = 2.58E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.02E-07 Noncancer Dermal Intake = 1.29E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Recreational User | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 4 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 52 | days/year | (2) | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 10 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 14 | years | (3), USEPA, 1989, 2005 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8760 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 8.14E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 3.39E-03

Cancer Inhalation Intake (Age 16 - 30) = 4.75E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 200 | mg/day | USEPA, 1991 | |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 1991 | BW x AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 2 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 4 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |
| Dermal | Resident | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 1E-06 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 2,800 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.2 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 2 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 4 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,190 | days | USEPA, 1989 | |

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 6) = 1.10E-06 Cancer Dermal Intake (Age 0 - 6) = 3.07E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.65E-07 Cancer Dermal Intake (Age 0 - 2) = 1.02E-06

Cancer Ingestion Intake (Age 2 - 6) = 7.31E-07 Cancer Dermal Intake (Age 2 - 6) = 2.05E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.28E-05 Noncancer Dermal Intake = 3.58E-05

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Child | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 24 | hours/day | USEPA, 1991 | CA x ET x EF x ED / AT x 24 hours/day |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 2 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 4 | years | (1), USEPA, 1989, 2005 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2190 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA 2004 | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA 2008 | |

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 6) = 8.22E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 1.92E+00

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 2.74E-02

Cancer Inhalation Intake (Age 2 - 6) = 5.48E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 100 | mg/day | USEPA, 1991 | |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 1991 | BW x AT |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 10 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 14 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |
| Dermal | Resident | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 5,700 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.07 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 10 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 14 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8,760 | days | USEPA, 1989 | |

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

USEPA, 2002:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 30) = 4.70E-07 Cancer Dermal Intake (Age 6 - 30) = 1.87E-06

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.96E-07 Cancer Dermal Intake (Age 6 - 16) = 7.81E-07

Cancer Ingestion Intake (Age 16 - 30) = 2.74E-07 Cancer Dermal Intake (Age 16 - 30) = 1.09E-06

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.37E-06 Noncancer Dermal Intake = 5.47E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.14.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 24 | hours/day | USEPA, 1991 | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 350 | days/year | USEPA, 1991 | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 10 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 14 | years | (1), USEPA, 1989, 2005 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 8760 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1991: Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Default Exposure Factors Interim Final.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 30) = 3.29E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.37E-01

Cancer Inhalation Intake (Age 16 - 30) = 1.92E-01

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 165 | mg/day | (1) | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 2002b | BW x AT |
| | | | | EF | Exposure Frequency | 75 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| Dermal | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002a | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3300 | cm2 | USEPA, 2002b | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.1 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 75 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 6.92E-09 Cancer Dermal Intake = 1.38E-08

Noncancer Ingestion Intake = 4.84E-07 Noncancer Dermal Intake = 9.69E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Construction Workers | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 8 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 75 | days/year | (1) | AT x 24 hours/day |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.34E+06 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 9.78E-04 Noncancer Inhalation Intake = 6.85E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - Excavation WORKERS - SOILS

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sumps/Pits
Exposure Medium: Sumps/Pits

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in sump | Max or 95% UCL | mg/kg | USEPA, 2002a | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 165 | mg/day | (1) | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 2002b | BW x AT |
| | | | | EF | Exposure Frequency | 23 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | IDEM, 2012 | |
| Dermal | Construction Workers | Adult | SWMU 27 | CS | Chemical concentration in sump | Max or 95% UCL | mg/kg | USEPA, 2002a | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3300 | cm2 | USEPA, 2002b | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.1 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 23 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | IDEM, 2012 | |

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 2002a:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

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

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

IDEM, 2012: Remediation Closure Guide.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 2.12E-09 Cancer Dermal Intake = 4.24E-09

Noncancer Ingestion Intake = 1.49E-07 Noncancer Dermal Intake = 2.97E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - Excavation WORKERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Sumps/Pits
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Construction Workers | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration (mg/m$^3$) = |
| | | | | CS | Chemical concentration in sump | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 8 | hours/day | (1) | CA x ET x EF x ED / AT x 24 hours/day |
| | | | | EF | Exposure Frequency | 23 | days/year | (1) | |
| | | | | ED | Exposure Duration | 1 | years | (1) | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 365 | days | IDEM, 2012 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA 2012 | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA 2012 | |

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

IDEM, 2012: Remediation Closure Guide.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 3.00E-04 Noncancer Inhalation Intake = 2.10E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.5.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Industrial Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 50 | mg/day | USEPA, 1993 | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 1993 | BW x AT |
| | | | | EF | Exposure Frequency | 219 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 9 | years | USEPA, 1993 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3285 | days | USEPA, 1989 | |
| Dermal | Industrial Workers | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3300 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.02 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 219 | days/year | USEPA, 1993 | |
| | | | | ED | Exposure Duration | 9 | years | USEPA, 1993 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3285 | days | USEPA, 1989 | |

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

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

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Cancer Ingestion Intake = 5.51E-08 Cancer Dermal Intake = 7.27E-08

Noncancer Ingestion Intake = 4.29E-07 Noncancer Dermal Intake = 5.66E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Industrial Workers | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 8 | hours/day | (1) | CA x ET x EF x ED / AT x 24 hours/day |
| | | | | EF | Exposure Frequency | 219 | days/year | USEPA, 2002a | |
| | | | | ED | Exposure Duration | 9 | years | USEPA, 1993 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 3285 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA 2004 | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Length of typical work day.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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

USEPA, 2002b:Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Cancer Inhalation Intake = 2.57E-02 Noncancer Inhalation Intake = 2.00E-01

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.7.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Recreational User | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 100 | mg/day | USEPA, 1993 | |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | CSs x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 0.5 | unitless | (1) | BW x AT |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 1 | years | USEPA, 1989 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 1 | years | USEPA, 1989 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 730 | days | USEPA, 1989 | |
| Dermal | Recreational User | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 0.000001 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 3,300 | cm2 | (4) | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.04 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 1 | years | USEPA, 1989 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 1 | years | USEPA, 1989 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 730 | days | USEPA, 1989 | |

Notes:

1 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume 50 percent of total body surface area is exposed, U.S. EPA, 2004.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

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

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 6.78E-09 Cancer Dermal Intake = 1.79E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 3.39E-09 Cancer Dermal Intake (Age 0 - 2) = 8.95E-09

Cancer Ingestion Intake (Age 2 - 6) = 3.39E-09 Cancer Dermal Intake (Age 2 - 6) = 8.95E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.37E-07 Noncancer Dermal Intake = 6.27E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Recreational User | Child | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 2 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 1 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 1 | years | (3), USEPA, 1989, 2005 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 730 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.32E+09 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Professional judgment.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, children recreational users will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.70E-04 Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 8.48E-05

Cancer Inhalation Intake (Age 2 - 6) = 8.48E-05

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.9.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Recreational User | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 50 | mg/day | USEPA, 1993 | |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 0.5 | unitless | (1) | BW x AT |
| | | | | EF | Exposure Frequency | 26 | days/year | (1) | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 2 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 5 | years | (3), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,555 | days | USEPA, 1989 | |
| Dermal | Recreational User | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 9,070 | cm2 | (4) | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.01 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 26 | days/year | (1) | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 2 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 5 | years | (3), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,555 | days | USEPA, 1989 | |

Notes:

1 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for reasonable maximum exposure and one day a week for central tendency exposure.

3 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

4 - Assume that head, arms, hands, lower legs, and feet are exposed, U.S. EPA, 1997.

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 2.54E-09 Cancer Dermal Intake = 9.23E-09

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 7.27E-10 Cancer Dermal Intake (Age 6 - 16) = 2.64E-09

Cancer Ingestion Intake Age 16 - 30) = 1.82E-09 Cancer Dermal Intake (Age 16 - 30) = 6.59E-09

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.54E-08 Noncancer Dermal Intake = 9.23E-08

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS TO AIR

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Recreational User | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 2 | hours/day | (1) | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 26 | days/year | (2) | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 2 | years | (3), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 5 | years | (3), USEPA, 1989, 2005 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2555 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.32E+09 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Professional judgment. Assume four days a week in warm weather months for RME and two days a week for CTE.

2 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, adult recreational users will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 5.94E-04

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.70E-04

Cancer Inhalation Intake (Age 16 - 30) = 4.24E-04

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.11.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS

NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 100 | mg/day | USEPA, 1993 | |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 1993 | BW x AT |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 1 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 1 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 730 | days | USEPA, 1989 | |
| Dermal | Resident | Child | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 1E-06 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 2,800 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.04 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 1 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 1 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 15 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 730 | days | USEPA, 1989 | |

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. EPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 1.22E-07 Cancer Dermal Intake = 1.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 6.11E-08 Cancer Dermal Intake (Age 0 - 2) = 6.84E-08

Cancer Ingestion Intake (Age 2 - 6) = 6.11E-08 Cancer Dermal Intake (Age 2 - 6) = 6.84E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.27E-06 Noncancer Dermal Intake = 4.79E-06

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.12.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS TO AIR
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Child | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 24 | hours/day | USEPA, 1993 | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 0 - 2) | 1 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 2 - 6) | 1 | years | (1), USEPA, 1989, 2005 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 730 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Children will be evaluated as one age group (0 - 6 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential children will be evaluated as two age groups, 0 - 2 years and 2 - 6 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 1994: USEPA Region I Risk Updates, August 1994.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, December.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.83E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 9.16E-03

Cancer Inhalation Intake (Age 2 - 6) = 9.16E-03

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

TABLE 4.13.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface Soil/Subsurface Soil
Exposure Medium: Surface/Subsurface Soil

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Ingestion | Resident | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Intake (mg/kg/day) = |
| | | | | IR-S | Ingestion Rate | 50 | mg/day | USEPA, 1993 | |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | CS x IRS x CF3 x FI x EF x ED |
| | | | | FI | Fraction Ingested | 1 | unitless | USEPA, 1993 | BW x AT |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 2 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 5 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,555 | days | USEPA, 1989 | |
| Dermal | Resident | Adult | SWMU 27 | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002 | Dermally Absorbed Dose (mg/kg/day) = |
| | | | | CF3 | Conversion Factor 3 | 1.0E-06 | kg/mg | -- | |
| | | | | SA | Skin Surface Available for Contact | 5,700 | cm2 | USEPA, 2004 | CS x CF3 x SA x SSAF x DABS x EV x EF x ED |
| | | | | SSAF | Soil to Skin Adherence Factor | 0.01 | mg/cm2/event | USEPA, 2004 | BW x AT |
| | | | | DABS | Absorption Factor | Chemical Specific | unitless | USEPA, 2004 | |
| | | | | EV | Events Frequency | 1 | events/day | USEPA, 2004 | |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 2 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 5 | years | (1), USEPA, 1989, 2005 | |
| | | | | BW | Body Weight | 70 | kg | USEPA, 1989 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2,555 | days | USEPA, 1989 | |

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

USEPA, 2002: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

**Unit Intake Calculations**

Incidental Ingestion Intake = (IR-S x CF3 x FI x EF x ED)/(BW x AT)

Dermal Intake = (CF3 x SA x SSAF x EF x ED)/(BW x AT)

Non-Mutagenic Chemicals

Cancer Ingestion Intake = 4.58E-08 Cancer Dermal Intake = 5.22E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.31E-08 Cancer Dermal Intake (Age 6 - 16) = 1.49E-08

Cancer Ingestion Intake (Age 16 - 30) = 3.27E-08 Cancer Dermal Intake (Age 16 - 30) = 3.73E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.58E-07 Noncancer Dermal Intake = 5.22E-07

Cancer risk from ingestion = Soil concentration x Cancer Ingestion Intake x Oral Cancer Slope Factor

Cancer risk from dermal contact = Soil concentration x Cancer Dermal Intake x Absorption Factor x Dermal Cancer Slope Factor

Hazard Index from ingestion = Soil concentration x Noncancer Ingestion Intake / Oral Reference Dose

Hazard Index from dermal contact = Soil concentration x Noncancer Dermal Intake x Absorption Factor / Dermal Reference Dose

TABLE 4.14.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS TO AIR
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Medium: Surface/Subsurface Soil
Exposure Medium: Air

| Exposure Route | Receptor Population | Receptor Age | Exposure Point | Parameter Code | Parameter Definition | Value | Units | Rationale/ Reference | Intake Equation/ Model Name |
|---|---|---|---|---|---|---|---|---|---|
| Inhalation | Resident | Adult | SWMU 27 | CA | Chemical concentration in air | Calculated | mg/m3 | USEPA, 2002a | Exposure Concentration ($mg/m^3$) = |
| | | | | CS | Chemical concentration in soil | Max or 95% UCL | mg/kg | USEPA, 2002b | |
| | | | | ET | Exposure Time | 24 | hours/day | USEPA, 1993 | CA x ET x EF x ED |
| | | | | EF | Exposure Frequency | 234 | days/year | USEPA, 1993 | AT x 24 hours/day |
| | | | | ED1 | Exposure Duration (Age 6 - 16) | 2 | years | (1), USEPA, 1989, 2005 | |
| | | | | ED2 | Exposure Duration (Age 16 - 30) | 5 | years | (1), USEPA, 1989, 2005 | |
| | | | | AT-C | Averaging Time (Cancer) | 25,550 | days | USEPA, 1989 | CA = (1/PEF + 1/VF) x Cs |
| | | | | AT-N | Averaging Time (Non-Cancer) | 2555 | days | USEPA, 1989 | |
| | | | | PEF | Particulate Emission Factor | 1.316E+09 | m3/kg | USEPA, 2002a | |
| | | | | VF | Volatilization Factor | Chemical-specific | m3/kg | USEPA, 2002a | |
| | | | | Q/C | Inverse of mean concentration at center of source | 68.81 | g/m2-s per kg/m3 | USEPA, 2002a | |

Notes:

1 - Adults will be evaluated as one age group (7 - 30 years) for non-mutagenic chemicals. For chemicals that act via the mutagenic mode of action, residential adults will be evaluated as two age groups, 7 - 16 years and 16 - 30 years in accordance with USEPA's Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. USEPA/540/1-86/060.

USEPA, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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

USEPA, 2002b: Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

**Unit Intake Calculations**

Unit Exposure Concentration = (ET x EF x ED)/(AT x 24 hours/day)

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 6.41E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.83E-02

Cancer Inhalation Intake (Age 16 - 30) = 4.58E-02

Cancer risk from ingestion = Air concentration x Cancer Inhalation Intake x Inhalation Cancer Slope Factor

Hazard Index from ingestion = Air concentration x Noncancer Inhalation Intake / Inhalation Reference Dose

# RAGS Part D Table 5

# Non-Cancer Toxicity Data

**LIST OF TABLES**
**RAGS PART D TABLE 5**
**NON-CANCER TOXICITY DATA**

**Table No.**


5-1 Non-Cancer Toxicity Data - Oral/Dermal
5-2 Non-Cancer Toxicity Data - Inhalation

## TABLE 5.1

## NON-CANCER TOXICITY DATA -- ORAL/DERMAL
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Chronic/ Subchronic | Oral RfD | | Oral Absorption Efficiency for Dermal[1] | Absorbed RfD for Dermal[2] | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfD:Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | | | | |
| Ethylbenzene | Chronic | 1.0E-01 | mg/kg/day | 1 | 1.0E-01 | mg/kg/day | Liver, Kidney | 1000/1 | IRIS | 8/20/2012 |
| Xylenes | Subchronic | 4.0E-01 | mg/kg/day | 1 | 4.0E-01 | mg/kg/day | Body Weight | 300/1 | PPRTV | 9/30/2009 |
| | Chronic | 2.0E-01 | mg/kg/day | 1 | 2.0E-01 | mg/kg/day | Body Weight | 1000/1 | IRIS | 8/20/2012 |
| **Metals** | | | | | | | | | | |
| Aluminum | Chronic | 1.0E+00 | mg/kg/day | 1 | 1.0E+00 | mg/kg/day | Central Nervous System | 100 | PPRTV | 10/23/2006 |
| Barium | Chronic | 2.0E-01 | mg/kg/day | 0.07 | 1.4E-02 | mg/kg/day | Kidney | 300/1 | IRIS | 8/20/2012 |
| Cadmium | Chronic | 5.0E-04 | mg/kg/day | 0.05 | 2.5E-05 | mg/kg/day | Kidney | 10/1 | IRIS | 8/20/2012 |
| Chromium[3] | Subchronic | 2.0E-02 | mg/kg/day | 0.025 | 5.0E-04 | mg/kg/day | None Reported | 100/1 | HEAST | 7/1997 |
| | Chronic | 3.0E-03 | mg/kg/day | 0.025 | 7.5E-05 | mg/kg/day | None Reported | 300/3 | IRIS | 8/20/2012 |
| Copper | Subchronic | 1.0E-02 | mg/kg/day | 1 | 1.0E-02 | mg/kg/day | Gastrointestinal System | 3/1 | ATSDR | 10/2004 |
| | Chronic | 4.0E-02 | mg/kg/day | 1 | 4.0E-02 | mg/kg/day | Gastrointestinal System | NA | HEAST | 7/1997 |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese[4] | Chronic | 2.4E-02 | mg/kg/day | 0.04 | 9.6E-04 | mg/kg/day | Central Nervous System | 1 | IRIS | 8/20/2012 |
| Zinc | Chronic | 3.0E-01 | mg/kg/day | 1 | 3.0E-01 | mg/kg/day | Blood | 3/1 | IRIS | 8/20/2012 |

Notes:

1 - U.S. EPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted dermal RfD = Oral RfD x Oral Absorption Efficiency for Dermal.

3 - Values are for hexavalent chromium.

4 - Adjusted IRIS value in accordance with IRIS.

Definitions:

ATSDR = Agency for Toxic Substances and Disease Registry

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not Available.

PPRTV = Provisional Peer Reviewed Toxicity Value.

## TABLE 5.2

## NON-CANCER TOXICITY DATA -- INHALATION
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Chronic/ Subchronic | Inhalation RfC | | Extrapolated RfD[1] | | Primary Target Organ(s) | Combined Uncertainty/Modifying Factors | RfC : Target Organ(s) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Value | Units | Value | Units | | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | | | |
| Ethylbenzene | Subchronic | 9.0E+00 | $mg/m^3$ | 2.6E+00 | (mg/kg/day) | Ear | 100/1 | PPRTV | 9/10/2009 |
| | Chronic | 1.0E+00 | $mg/m^3$ | 2.9E-01 | (mg/kg/day) | Developmental | 300/1 | IRIS | 8/20/2012 |
| Xylenes | Subchronic | 4.0E-01 | $mg/m^3$ | 1.1E-01 | (mg/kg/day) | Central Nervous System | 300/1 | PPRTV | 9/30/2009 |
| | Chronic | 1.0E-01 | $mg/m^3$ | 2.9E-02 | (mg/kg/day) | Central Nervous System | 1000/1 | IRIS | 8/20/2012 |
| **Metals** | | | | | | | | | |
| Aluminum | Chronic | 5.0E-03 | $mg/m^3$ | 1.4E-03 | (mg/kg/day) | Central Nervous System | 300/1 | PPRTV | 10/23/2006 |
| Barium | Subchronic | 5.0E-03 | $mg/m^3$ | 1.4E-03 | (mg/kg/day) | Fetotoxicity | 100/1 | HEAST | 7/1997 |
| | Chronic | 5.0E-04 | $mg/m^3$ | 1.4E-04 | (mg/kg/day) | Fetotoxicity | 1000/1 | HEAST | 7/1997 |
| Cadmium | Chronic | 2.0E-05 | mg/m3 | 5.7E-06 | (mg/kg/day) | Kidney, Respiratory | NA | Cal EPA | 9/2009 |
| Chromium[2] | Chronic | 1.0E-04 | $mg/m^3$ | 2.9E-05 | (mg/kg/day) | Respiratory | 300/1 | IRIS | 8/20/2012 |
| Copper | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Lead | NA | NA | NA | NA | NA | NA | NA | NA | NA |
| Manganese | Chronic | 5.0E-05 | $mg/m^3$ | 1.4E-05 | (mg/kg/day) | Central Nervous System | 1000/1 | IRIS | 8/20/2012 |
| Zinc | NA | NA | NA | NA | NA | NA | NA | NA | NA |

Notes:

1 - Extrapolated RfD = RfC *$20m^3$/day / 70 kg

2 - Values are for hexavalent chromium.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

NA = Not Applicable

PPRTV = Provisional Peer Reviewed Toxicity Value.

# RAGS Part D Table 6

## Cancer Toxicity Data

**LIST OF TABLES**
**RAGS PART D TABLE 6**
**CANCER TOXICITY DATA**

**Table No.**


6-1 Cancer Toxicity Data - Oral/Dermal
6-2 Cancer Toxicity Data - Inhalation

## TABLE 6.1

## CANCER TOXICITY DATA -- ORAL/DERMAL
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Oral Cancer Slope Factor | | Oral Absorption Efficiency for Dermal[1] | Absorbed Cancer Slope Factor for Dermal[2] | | Weight of Evidence/ Cancer Guideline Description | Oral CSF | |
|---|---|---|---|---|---|---|---|---|
| | Value | Units | | Value | Units | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | | |
| Ethylbenzene | 1.1E-02 | $(mg/kg/day)^{-1}$ | 0.025 | 4.4E-01 | $(mg/kg/day)^{-1}$ | D (Not classifiable as to human carcinogenicity) | Cal EPA | 9/2009 |
| Xylenes | NA | NA | NA | NA | NA | Data are inadequate for an assessment of human carcinogenic potential | IRIS | 8/20/2012 |
| **Metals** | | | | | | | | |
| Aluminum | NA | NA | NA | NA | NA | NA | NA | NA |
| Barium | NA | NA | NA | NA | NA | Not likely to be carcinogenic to humans | IRIS | 8/20/2012 |
| Cadmium | NA | NA | NA | NA | NA | B1 /Known/likely human carcinogen. | IRIS | 8/20/2012 |
| Chromium[3,4] | 5.0E-01 | $(mg/kg/day)^{-1}$ | 0.025 | 2.0E+01 | $(mg/kg/day)^{-1}$ | Carcinogenic potential cannot be determined | NJDEP | 4/8/2009 |
| Copper | NA | NA | NA | NA | NA | D (Not classifiable as to human carcinogenicity) | IRIS | 8/20/2012 |
| Lead | NA | NA | NA | NA | NA | B2 / Probable human carcinogen | IRIS | 8/20/2012 |
| Manganese | NA | NA | NA | NA | NA | D (Not classifiable as to human carcinogenicity) | IRIS | 8/20/2012 |
| Zinc | NA | NA | NA | NA | NA | Inadequate information to assess carcinogenic potential | IRIS | 8/20/2012 |

Notes:

1 - USEPA, 2004: Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

2 - Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral absorption efficiency for dermal.

3 - Hexavalent chromium is considered to act via the mutagenic mode of action. This chemical is evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

4 - Values are for hexavalent chromium.

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System.

NA = Not Available.

NJDEP = New Jersey Department of Environmental Protection.

## TABLE 6.2

## CANCER TOXICITY DATA -- INHALATION
## SWMU 27 ILLUMINANT BUILDING 126
## NSA CRANE, CRANE, INDIANA

| Chemical of Potential Concern | Unit Risk | | Inhalation Cancer Slope Factor[1] | | Weight of Evidence/ Cancer Guideline Description | Unit Risk : Inhalation CSF | |
|---|---|---|---|---|---|---|---|
| | Value | Units | Value | Units | | Source(s) | Date(s) (MM/DD/YYYY) |
| **Votalile Organic Compounds** | | | | | | | |
| Ethylbenzene | 2.5E-06 | $(ug/m^3)^{-1}$ | 8.8E-03 | $(mg/kg/day)^{-1}$ | D (Not classifiable as to human carcinogenicity) | Cal EPA | 9/2009 |
| Xylenes | NA | NA | NA | NA | Data are inadequate for an assessment of human carcinogenic potential | IRIS | 8/20/2012 |
| **Metals** | | | | | | | |
| Aluminum | NA | NA | NA | NA | NA | NA | NA |
| Barium | NA | NA | NA | NA | Carcinogenic potential cannot be determined | IRIS | 8/20/2012 |
| Cadmium | 1.8E-03 | $(ug/m^3)^{-1}$ | 6.3E+00 | $(mg/kg/day)^{-1}$ | B1 /Known/likely human carcinogen. | IRIS | 8/20/2012 |
| Chromium[2,3] | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.9E+02 | $(mg/kg/day)^{-1}$ | Known/likely human carcinogen | IRIS | 8/20/2012 |
| Copper | NA | NA | NA | NA | D / Not classifiable as to human carcinogenicity | IRIS | 8/20/2012 |
| Lead | NA | NA | NA | NA | B2 / Probable human carcinogen | IRIS | 8/20/2012 |
| Manganese | NA | NA | NA | NA | D / Not classifiable as to human carcinogenicity | IRIS | 8/20/2012 |
| Zinc | NA | NA | NA | NA | Inadequate information to assess carcinogenic potential | IRIS | 8/20/2012 |

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / $20m^3$/day.

2 - Hexavalent chromium is considered to act via the mutagenic mode of action. This chemical is evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

3 - Values are for hexavalent chromium.

Definitions:

Cal EPA = California Environmental Protection Agency, Technical Support Document for Describing Available Cancer Slope Factors, September 2009.

IRIS = Integrated Risk Information System.

NA = Not Available.

# RAGS Part D Table 7

## Calculation of Cancer Risks and Non-Cancer Hazards

**LIST OF TABLES**

**RAGS PART D TABLE 7**

**CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS**


| Table No. | |
|---|---|
| | **Reasonable Maximum Exposures** |
| 7.1.RME | Investigation Area 1 - Construction Workers - Soil |
| 7.2.RME | Investigation Area 1 - Construction Workers - Sump/Pits |
| 7.3.RME | Investigation Area 1 - Industrial Workers |
| 7.4.RME | Investigation Area 1 - Child Recreational Users |
| 7.5.RME | Investigation Area 1 - Adult Recreational Users |
| 7.6.RME | Investigation Area 1 - Child Residents |
| 7.7.RME | Investigation Area 1 - Adult Residents |
| 7.8.RME | Investigation Area 2 - Construction Workers |
| 7.9.RME | Investigation Area 2 - Industrial Workers |
| 7.10.RME | Investigation Area 2 - Child Recreational Users |
| 7.11.RME | Investigation Area 2 - Adult Recreational Users |
| 7.12.RME | Investigation Area 2 - Child Residents |
| 7.13.RME | Investigation Area 2 - Adult Residents |
| | **Central Tendency Exposures** |
| 7.1.CTE | Investigation Area 1 - Construction Workers - Soil |
| 7.2.CTE | Investigation Area 1 - Construction Workers - Sump/Pits |
| 7.3.CTE | Investigation Area 1 - Industrial Workers |
| 7.4.CTE | Investigation Area 1 - Child Recreational Users |
| 7.5.CTE | Investigation Area 1 - Adult Recreational Users |
| 7.6.CTE | Investigation Area 1 - Child Residents |
| 7.7.CTE | Investigation Area 1 - Adult Residents |
| 7.8.CTE | Investigation Area 2 - Construction Workers |
| 7.9.CTE | Investigation Area 2 - Industrial Workers |
| 7.10.CTE | Investigation Area 2 - Child Recreational Users |
| 7.11.CTE | Investigation Area 2 - Adult Recreational Users |
| 7.12.CTE | Investigation Area 2 - Child Residents |
| 7.13.CTE | Investigation Area 2 - Adult Residents |

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 3.7E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.6E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.03 |
| | | | | Barium | 1000 | mg/kg | 2.8E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.9E-03 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.010 |
| | | | | Chromium | 20.0 | mg/kg | 5.5E-07 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 2.8E-07 | 3.9E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 2.8E-07 | | | | | 0.04 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 2.8E-07 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-07 | | | | | 0.04 |
| | Air | SWMU 27 | Inhalation | Aluminum | 0.010 | mg/m$^3$ | 1.9E-05 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.3E-03 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.3 |
| | | | | Barium | 7.5E-4 | mg/m$^3$ | 1.5E-06 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.0E-04 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.02 |
| | | | | Chromium | 1.5E-5 | mg/m$^3$ | 2.9E-08 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 2.5E-06 | 2.0E-06 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.02 |
| | | | Exp. Route Total | | | | | | | | 2.5E-06 | | | | | 0.3 |
| | | Exposure Point Total | | | | | | | | | 2.5E-06 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | | | | 2.5E-06 | | | | | 0.3 |
| Medium Total | | | | | | | | | | | 2.7E-06 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 1.1E-06 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 5.5E-07 | 7.7E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.004 |
| | | | | Manganese | 630 | mg/kg | 1.7E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.2E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.05 |
| | | | Exp. Route Total | | | | | | | | 5.5E-07 | | | | | 0.05 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.5E-07 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | | | | 5.5E-07 | | | | | 0.05 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-5 | mg/m$^3$ | 5.8E-08 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 4.9E-06 | 4.1E-06 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.04 |
| | | | | Manganese | 4.7E-4 | mg/m$^3$ | 9.2E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 6.4E-05 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 1.3 |
| | | | Exp. Route Total | | | | | | | | 4.9E-06 | | | | | 1.3 |
| | | Exposure Point Total | | | | | | | | | 4.9E-06 | | | | | 1.3 |
| | Exposure Medium Total | | | | | | | | | | 4.9E-06 | | | | | 1.3 |
| Medium Total | | | | | | | | | | | 5.5E-06 | | | | | 1.4 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB029 | 27SB029 | 27SB029 | Ingestion | Ethylbenzene | 297 | mg/kg | 2.5E-06 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 2.7E-08 | 1.7E-04 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 0.002 |
| | | | | Total Xylenes | 829 | mg/kg | 6.9E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 4.8E-04 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.001 |
| | | | | Aluminum | 3,190 | mg/kg | 2.6E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.9E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | | Cadmium | 11.9 | mg/kg | 9.9E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 6.9E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.007 |
| | | | | Chromium | 240 | mg/kg | 2.0E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.0E-06 | 1.4E-04 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.007 |
| | | | | Copper | 277 | mg/kg | 2.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.6E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.02 |
| | | | | Lead | 597 | mg/kg | 5.0E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 3.5E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 640 | mg/kg | 5.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 3.7E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.02 |
| | | | | Zinc | 4,580 | mg/kg | 3.8E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.7E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.009 |
| | | | Exp. Route Total | | | | | | | | 1.0E-06 | | | | | 0.06 |
| | | | Dermal | Ethylbenzene | 297 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 829 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 3,190 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 11.9 | mg/kg | 3.0E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.1E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0008 |
| | | | | Chromium | 240 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 277 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 597 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 640 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 4,580 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | 0.0008 |
| | | Exposure Point Total | | | | | | | | | 1.0E-06 | | | | | 0.06 |
| | Exposure Medium Total | | | | | | | | | | 1.0E-06 | | | | | 0.06 |
| | Air | 27SB029 | Inhalation | Ethylbenzene | 0.049 | $mg/m^3$ | 2.9E-05 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 7.2E-08 | 2.0E-03 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 0.0002 |
| | | | | Total Xylenes | 0.041 | $mg/m^3$ | 2.4E-05 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.7E-03 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.02 |
| | | | | Aluminum | 2.4E-6 | $mg/m^3$ | 1.4E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.0E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00002 |
| | | | | Cadmium | 9.0E-9 | $mg/m^3$ | 5.3E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 9.6E-12 | 3.7E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00002 |
| | | | | Chromium | 1.8E-7 | $mg/m^3$ | 1.1E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 9.0E-09 | 7.5E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00007 |
| | | | | Copper | 2.1E-7 | $mg/m^3$ | 1.2E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 8.7E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 4.5E-7 | $mg/m^3$ | 2.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.9E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 4.9E-7 | $mg/m^3$ | 2.9E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.0E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0004 |
| | | | | Zinc | 3.5E-6 | $mg/m^3$ | 2.0E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.4E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 8.1E-08 | | | | | 0.02 |
| | | Exposure Point Total | | | | | | | | | 8.1E-08 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 8.1E-08 | | | | | 0.02 |
| Medium Total | | | | | | | | | | | 1.1E-06 | | | | | 0.08 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB030 | 27SB030 | 27SB030 | Ingestion | Aluminum | 6,230 | mg/kg | 5.2E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.6E-03 | (mg/kg/dey) | 1.0E+00 | (mg/kg/day) | 0.004 |
| | | | | Cadmium | 3.49 | mg/kg | 2.9E-08 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.0E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 18.9 | mg/kg | 1.6E-07 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 7.8E-08 | 1.1E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0005 |
| | | | | Copper | 498 | mg/kg | 4.1E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.9E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.03 |
| | | | | Lead | 266 | mg/kg | 2.2E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.5E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 365 | mg/kg | 3.0E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.1E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.009 |
| | | | | Zinc | 2,530 | mg/kg | 2.1E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.5E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.005 |
| | | | Exp. Route Total | | | | | | | | 7.8E-08 | | | | | 0.05 |
| | | | Dermal | Aluminum | 6,230 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 3.49 | mg/kg | 8.7E-11 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 6.1E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0002 |
| | | | | Chromium | 18.9 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 498 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 266 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 365 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 2,530 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 7.8E-08 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | | | | 7.8E-08 | | | | | 0.05 |
| | Air | 27SB030 | Inhalation | Aluminum | 4.7E-6 | mg/m$^3$ | | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | -- |
| | | | | Cadmium | 2.7E-9 | mg/m$^3$ | | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | -- |
| | | | | Chromium | 1.4E-8 | mg/m$^3$ | | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | -- |
| | | | | Copper | 3.8E-7 | mg/m$^3$ | | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | | Lead | 2.0E-7 | mg/m$^3$ | | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | | Manganese | 2.8E-7 | mg/m$^3$ | | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | -- |
| | | | | Zinc | 1.9E-6 | mg/m$^3$ | | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | -- |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | -- |
| Medium Total | | | | | | | | | | | 7.8E-08 | | | | | 0.05 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB031 | 27SB031 | 27SB031 | Ingestion | Ethylbenzene | 1.85 | mg/kg | 1.5E-08 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 1.7E-10 | 1.1E-06 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 0.00001 |
| | | | | Total Xylenes | 3.30 | mg/kg | 2.7E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.9E-06 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.000005 |
| | | | | Aluminum | 10,600 | mg/kg | 8.8E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 6.2E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | | Cadmium | 14.3 | mg/kg | 1.2E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 8.3E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.008 |
| | | | | Chromium | 56.7 | mg/kg | 4.7E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 2.4E-07 | 3.3E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.002 |
| | | | | Copper | 1,200 | mg/kg | 1.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 7.0E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.07 |
| | | | | Lead | 738 | mg/kg | 6.1E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 4.3E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 120,000 | mg/kg | 1.0E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 7.0E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 2.9 |
| | | | | Zinc | 6,410 | mg/kg | 5.3E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 3.7E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 2.4E-07 | | | | | 3.0 |
| | | | Dermal | Ethylbenzene | 1.85 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 3.30 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 10,600 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 14.3 | mg/kg | 3.6E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.5E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0010 |
| | | | | Chromium | 56.7 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 1,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 738 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 120,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 6,410 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | 0.0010 |
| | | Exposure Point Total | | | | | | | | | 2.4E-07 | | | | | 3.0 |
| | Exposure Medium Total | | | | | | | | | | 2.4E-07 | | | | | 3.0 |
| | Air | 27SB031 | Inhalation | Ethylbenzene | 3.1E-4 | $mg/m^3$ | 1.8E-07 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 4.5E-10 | 1.3E-05 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 0.000001 |
| | | | | Total Xylenes | 5.3E-4 | $mg/m^3$ | 3.1E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.2E-05 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.0002 |
| | | | | Aluminum | 8.1E-6 | $mg/m^3$ | 4.7E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.3E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00007 |
| | | | | Cadmium | 1.1E-8 | $mg/m^3$ | 6.4E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 1.1E-11 | 4.5E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00002 |
| | | | | Chromium | 4.3E-8 | $mg/m^3$ | 2.5E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.1E-09 | 1.8E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00002 |
| | | | | Copper | 9.1E-7 | $mg/m^3$ | 5.4E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.7E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 5.6E-7 | $mg/m^3$ | 3.3E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.3E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 9.1E-5 | $mg/m^3$ | 5.4E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.7E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.07 |
| | | | | Zinc | 4.9E-6 | $mg/m^3$ | 2.9E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.0E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 2.6E-09 | | | | | 0.08 |
| | | Exposure Point Total | | | | | | | | | 2.6E-09 | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | | | | 2.6E-09 | | | | | 0.08 |
| Medium Total | | | | | | | | | | | 2.4E-07 | | | | | 3.1 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB032 | 27SB032 | 27SB032 | Ingestion | Aluminum | 1,500 | mg/kg | 1.2E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 8.7E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0009 |
| | | | | Copper | 2,420 | mg/kg | 2.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-03 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.1 |
| | | | | Lead | 1,570 | mg/kg | 1.3E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.1E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 208,000 | mg/kg | 1.7E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.2E-01 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 5.0 |
| | | | | Zinc | 18,900 | mg/kg | 1.6E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-02 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.04 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 5.2 |
| | | | Dermal | Aluminum | 1,500 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Copper | 2,420 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 1,570 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 208,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 18,900 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 5.2 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 5.2 |
| | Air | 27SB032 | Inhalation | Aluminum | 1.1E-6 | $mg/m^3$ | 6.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.7E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.000009 |
| | | | | Copper | 1.8E-6 | $mg/m^3$ | 1.1E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.6E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 1.2E-6 | $mg/m^3$ | 7.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.9E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 1.6E-4 | $mg/m^3$ | 9.3E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.5E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.1 |
| | | | | Zinc | 1.4E-5 | $mg/m^3$ | 8.4E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 5.9E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.1 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.1 |
| Medium Total | | | | | | | | | | | - - | | | | | 5.3 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB033 | 27SB033 | 27SB033 | Ingestion | Ethylbenzene | 0.004 | mg/kg | 3.3E-11 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 3.6E-13 | 2.3E-09 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 0.00000002 |
| | | | | Total Xylenes | 0.017 | mg/kg | 1.4E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 9.9E-09 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.00000002 |
| | | | | Aluminum | 3,690 | mg/kg | 3.1E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.1E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | | Copper | 154 | mg/kg | 1.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 9.0E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.009 |
| | | | | Lead | 396 | mg/kg | 3.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.3E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 125,000 | mg/kg | 1.0E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 7.3E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 3.0 |
| | | | | Zinc | 12,400 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 7.2E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | 3.6E-13 | | | | | 3.1 |
| | | | Dermal | Ethylbenzene | 0.004 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 0.017 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 3,690 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Copper | 154 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 396 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 125,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 12,400 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 3.6E-13 | | | | | 3.1 |
| | Exposure Medium Total | | | | | | | | | | 3.6E-13 | | | | | 3.1 |
| | Air | 27SB033 | Inhalation | Ethylbenzene | 6.5E-7 | $mg/m^3$ | 3.8E-10 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 9.6E-13 | 2.7E-08 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 2.99018E-09 |
| | | | | Total Xylenes | 2.7E-6 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.1E-07 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.000001 |
| | | | | Aluminum | 2.8E-6 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.2E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00002 |
| | | | | Copper | 1.2E-7 | $mg/m^3$ | 6.9E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 4.8E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 3.0E-7 | $mg/m^3$ | 1.8E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.2E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 9.5E-5 | $mg/m^3$ | 5.6E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.9E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.08 |
| | | | | Zinc | 9.4E-6 | $mg/m^3$ | 5.5E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.9E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 9.6E-13 | | | | | 0.08 |
| | | Exposure Point Total | | | | | | | | | 9.6E-13 | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | | | | 9.6E-13 | | | | | 0.08 |
| Medium Total | | | | | | | | | | | 1.3E-12 | | | | | 3.1 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB034 | 27SB034 | 27SB034 | Ingestion | Total Xylenes | 0.017 | mg/kg | 1.4E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 9.9E-09 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.00000002 |
| | | | | Aluminum | 10,900 | mg/kg | 9.1E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 6.3E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | | Cadmium | 7.63 | mg/kg | 6.3E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 4.4E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.004 |
| | | | | Chromium | 39.5 | mg/kg | 3.3E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.6E-07 | 2.3E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.001 |
| | | | | Copper | 168 | mg/kg | 1.4E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 9.8E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.010 |
| | | | | Lead | 221 | mg/kg | 1.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.3E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 2,400 | mg/kg | 2.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.4E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.06 |
| | | | | Zinc | 2,120 | mg/kg | 1.8E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.2E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.004 |
| | | | Exp. Route Total | | | | | | | | 1.6E-07 | | | | | 0.08 |
| | | | Dermal | Total Xylenes | 0.017 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 10,900 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 7.63 | mg/kg | 1.9E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.3E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0005 |
| | | | | Chromium | 39.5 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 168 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 221 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 2,400 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 2,120 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | 0.0005 |
| | | Exposure Point Total | | | | | | | | | 1.6E-07 | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | | | | 1.6E-07 | | | | | 0.08 |
| | Air | 27SB034 | Inhalation | Total Xylenes | 2.7E-6 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.1E-07 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.000001 |
| | | | | Aluminum | 8.3E-6 | $mg/m^3$ | 4.9E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.4E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00007 |
| | | | | Cadmium | 5.8E-9 | $mg/m^3$ | 3.4E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 6.1E-12 | 2.4E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00001 |
| | | | | Chromium | 3.0E-8 | $mg/m^3$ | 1.8E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.5E-09 | 1.2E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00001 |
| | | | | Copper | 1.3E-7 | $mg/m^3$ | 7.5E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 5.2E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 1.7E-7 | $mg/m^3$ | 9.9E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 6.9E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 1.8E-6 | $mg/m^3$ | 1.1E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 7.5E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.001 |
| | | | | Zinc | 1.6E-6 | $mg/m^3$ | 9.5E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 6.6E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 1.5E-09 | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 1.5E-09 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 1.5E-09 | | | | | 0.002 |
| Medium Total | | | | | | | | | | | 1.7E-07 | | | | | 0.09 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB035 | 27SB035 | 27SB035 | Ingestion | Ethylbenzene | 0.002 | mg/kg | 1.5E-11 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 1.7E-13 | 1.1E-09 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 0.00000001 |
| | | | | Total Xylenes | 0.005 | mg/kg | 4.4E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 3.1E-09 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 7.65749E-09 |
| | | | | Aluminum | 6,830 | mg/kg | 5.7E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 4.0E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.004 |
| | | | | Cadmium | 18.8 | mg/kg | 1.6E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.1E-05 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.01 |
| | | | | Chromium | 13.8 | mg/kg | 1.1E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 5.7E-08 | 8.0E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0004 |
| | | | | Copper | 63.4 | mg/kg | 5.3E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 3.7E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.004 |
| | | | | Lead | 442 | mg/kg | 3.7E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.6E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 267 | mg/kg | 2.2E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.6E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.006 |
| | | | | Zinc | 824 | mg/kg | 6.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 4.8E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 5.7E-08 | | | | | 0.03 |
| | | | Dermal | Ethylbenzene | 0.002 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 0.005 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 6,830 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 18.8 | mg/kg | 4.7E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 3.3E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.001 |
| | | | | Chromium | 13.8 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 63.4 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 442 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 267 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 824 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | 5.7E-08 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | 5.7E-08 | | | | | 0.03 |
| | Air | 27SB035 | Inhalation | Ethylbenzene | 3.0E-7 | $mg/m^3$ | 1.8E-10 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 4.4E-13 | 1.2E-08 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 1.36328E-09 |
| | | | | Total Xylenes | 8.5E-7 | $mg/m^3$ | 5.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 3.5E-08 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.0000003 |
| | | | | Aluminum | 5.2E-6 | $mg/m^3$ | 3.0E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.1E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00004 |
| | | | | Cadmium | 1.4E-8 | $mg/m^3$ | 8.4E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 1.5E-11 | 5.9E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00003 |
| | | | | Chromium | 1.0E-8 | $mg/m^3$ | 6.2E-12 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 5.2E-10 | 4.3E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000004 |
| | | | | Copper | 4.8E-8 | $mg/m^3$ | 2.8E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.0E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 3.4E-7 | $mg/m^3$ | 2.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.4E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 2.0E-7 | $mg/m^3$ | 1.2E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 8.3E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | | Zinc | 6.3E-7 | $mg/m^3$ | 3.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.6E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 5.3E-10 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 5.3E-10 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 5.3E-10 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 5.8E-08 | | | | | 0.03 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB056 | 27SB056 | 27SB056 | Ingestion | Aluminum | 7,230 | mg/kg | 6.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.2E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.004 |
| | | | | Cadmium | 7.97 | mg/kg | 6.6E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.6E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.005 |
| | | | | Copper | 233 | mg/kg | 1.9E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.01 |
| | | | | Lead | 1,270 | mg/kg | 1.1E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.4E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 67,900 | mg/kg | 5.6E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.9E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 1.6 |
| | | | | Zinc | 7,240 | mg/kg | 6.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.2E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 1.7 |
| | | | Dermal | Aluminum | 7,230 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 7.97 | mg/kg | 2.0E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0006 |
| | | | | Copper | 233 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 1,270 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 67,900 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 7,240 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 1.7 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 1.7 |
| | Air | 27SB056 | Inhalation | Aluminum | 5.5E-6 | $mg/m^3$ | 3.2E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.3E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | | Cadmium | 6.1E-9 | $mg/m^3$ | 3.6E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 6.4E-12 | 2.5E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00001 |
| | | | | Copper | 1.8E-7 | $mg/m^3$ | 1.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.3E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 9.7E-7 | $mg/m^3$ | 5.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.0E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 5.2E-5 | $mg/m^3$ | 3.0E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.1E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.04 |
| | | | | Zinc | 5.5E-6 | $mg/m^3$ | 3.2E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.3E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 6.4E-12 | | | | | 0.04 |
| | | Exposure Point Total | | | | | | | | | 6.4E-12 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 6.4E-12 | | | | | 0.04 |
| Medium Total | | | | | | | | | | | 6.4E-12 | | | | | 1.7 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB057 | 27SB057 | 27SB057 | Ingestion | Aluminum | 5,670 | mg/kg | 4.7E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.3E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.003 |
| | | | | Cadmium | 10.2 | mg/kg | 8.5E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 5.9E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.006 |
| | | | | Copper | 515 | mg/kg | 4.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.0E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.03 |
| | | | | Lead | 840 | mg/kg | 7.0E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.9E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 279,000 | mg/kg | 2.3E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.6E-01 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 6.8 |
| | | | | Zinc | 3,250 | mg/kg | 2.7E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.9E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.006 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 6.8 |
| | | | Dermal | Aluminum | 5,670 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 10.2 | mg/kg | 2.5E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0007 |
| | | | | Copper | 515 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 840 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 279,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 3,250 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0007 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 6.8 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 6.8 |
| | Air | 27SB057 | Inhalation | Aluminum | 4.3E-6 | $mg/m^3$ | 2.5E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.8E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00004 |
| | | | | Cadmium | 7.8E-9 | $mg/m^3$ | 4.6E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 8.2E-12 | 3.2E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00002 |
| | | | | Copper | 3.9E-7 | $mg/m^3$ | 2.3E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.6E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 6.4E-7 | $mg/m^3$ | 3.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.6E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 2.1E-4 | $mg/m^3$ | 1.2E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.7E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.2 |
| | | | | Zinc | 2.5E-6 | $mg/m^3$ | 1.4E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.0E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 8.2E-12 | | | | | 0.2 |
| | | Exposure Point Total | | | | | | | | | 8.2E-12 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | 8.2E-12 | | | | | 0.2 |
| Medium Total | | | | | | | | | | | 8.2E-12 | | | | | 7.0 |

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB066 | 27SB066 | 27SB066 | Ingestion | Total Xylenes | 0.051 | mg/kg | 4.2E-10 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.0E-08 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.00000007 |
| | | | | Aluminum | 18,800 | mg/kg | 1.6E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.1E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | | Cadmium | 138 | mg/kg | 1.1E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 8.0E-05 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.08 |
| | | | | Chromium | 656 | mg/kg | 5.4E-06 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 2.7E-06 | 3.8E-04 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.02 |
| | | | | Copper | 765 | mg/kg | 6.4E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 4.4E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.04 |
| | | | | Lead | 6,100 | mg/kg | 5.1E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.5E-03 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 52.0 | mg/kg | 4.3E-07 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.0E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.001 |
| | | | | Zinc | 7,010 | mg/kg | 5.8E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 4.1E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 2.7E-06 | | | | | 0.2 |
| | | | Dermal | Total Xylenes | 0.051 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 18,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 138 | mg/kg | 3.4E-09 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.4E-07 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.010 |
| | | | | Chromium | 656 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 765 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 6,100 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 52.0 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 7,010 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.010 |
| | | Exposure Point Total | | | | | | | | | 2.7E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | 2.7E-06 | | | | | 0.2 |
| | Air | 27SB066 | Inhalation | Total Xylenes | 8.2E-6 | mg/m$^3$ | 4.8E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 3.4E-07 | (mg/m$^3$) | 1.0E-01 | (mg/m$^3$) | 0.000003 |
| | | | | Aluminum | 1.4E-5 | mg/m$^3$ | 8.4E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 5.9E-07 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.0001 |
| | | | | Cadmium | 1.0E-7 | mg/m$^3$ | 6.2E-11 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 1.1E-10 | 4.3E-09 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.0002 |
| | | | | Chromium | 5.0E-7 | mg/m$^3$ | 2.9E-10 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 2.5E-08 | 2.0E-08 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.0002 |
| | | | | Copper | 5.8E-7 | mg/m$^3$ | 3.4E-10 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 2.4E-08 | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | | Lead | 4.6E-6 | mg/m$^3$ | 2.7E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.9E-07 | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | | Manganese | 4.0E-8 | mg/m$^3$ | 2.3E-11 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.6E-09 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.00003 |
| | | | | Zinc | 5.3E-6 | mg/m$^3$ | 3.1E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 2.2E-07 | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | Exp. Route Total | | | | | | | | 2.5E-08 | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | 2.5E-08 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | | | | 2.5E-08 | | | | | 0.0006 |
| Medium Total | | | | | | | | | | | 2.7E-06 | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 4.6E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.3E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | | Barium | 1000 | mg/kg | 3.5E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.8E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.005 |
| | | | | Chromium | 20.0 | mg/kg | 7.0E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 3.5E-06 | 2.0E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.007 |
| | | | Exp. Route Total | | | | | | | | 3.5E-06 | | | | | 0.02 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 3.5E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 3.5E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 8.2E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.3E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.0005 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 6.2E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.7E-07 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.0003 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.2E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.0E-07 | 3.5E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00003 |
| | | | Exp. Route Total | | | | | | | | 1.0E-07 | | | | | 0.0008 |
| | | Exposure Point Total | | | | | | | | | 1.0E-07 | | | | | 0.0008 |
| | Exposure Medium Total | | | | | | | | | | 1.0E-07 | | | | | 0.0008 |
| Medium Total | | | | | | | | | | | 3.6E-06 | | | | | 0.03 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 1.4E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.0E-06 | 3.9E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.01 |
| | | | | Manganese | 630 | mg/kg | 2.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.2E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | 7.0E-06 | | | | | 0.04 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.0E-06 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 7.0E-06 | | | | | 0.04 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 2.5E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.1E-07 | 6.9E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00007 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 3.9E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.002 |
| | | | Exp. Route Total | | | | | | | | 2.1E-07 | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 2.1E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 2.1E-07 | | | | | 0.002 |
| Medium Total | | | | | | | | | | | 7.2E-06 | | | | | 0.04 |

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 1.1E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.3E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | | Barium | 1000 | mg/kg | 8.1E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.5E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.005 |
| | | | | Chromium | 20.0 | mg/kg | 8.7E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.3E-06 | 1.9E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.006 |
| | | | Exp. Route Total | | | | | | | | 4.3E-06 | | | | | 0.02 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.3E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 4.3E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 2.0E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.4E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 1.5E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.8E-08 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.00004 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.6E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.4E-08 | 3.6E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000004 |
| | | | Exp. Route Total | | | | | | | | 1.4E-08 | | | | | 0.00009 |
| | | Exposure Point Total | | | | | | | | | 1.4E-08 | | | | | 0.00009 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-08 | | | | | 0.00009 |
| Medium Total | | | | | | | | | | | 4.4E-06 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 1.7E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 8.7E-06 | 3.8E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.01 |
| | | | | Manganese | 630 | mg/kg | 5.1E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.0E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | 8.7E-06 | | | | | 0.04 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 8.7E-06 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 8.7E-06 | | | | | 0.04 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 3.3E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.8E-08 | 7.2E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000007 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 9.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 2.8E-08 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 2.8E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 8.7E-06 | | | | | 0.04 |

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 4.6E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.3E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.001 |
| | | | | Barium | 1000 | mg/kg | 3.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.0E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.0005 |
| | | | | Chromium | 20.0 | mg/kg | 1.3E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 6.4E-07 | 2.0E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0007 |
| | | | Exp. Route Total | | | | | | | | 6.4E-07 | | | | | 0.003 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 6.4E-07 | | | | | 0.003 |
| | Exposure Medium Total | | | | | | | | | | 6.4E-07 | | | | | 0.003 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 8.2E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.4E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 6.2E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.8E-08 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.00004 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 2.3E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.9E-08 | 3.6E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000004 |
| | | | Exp. Route Total | | | | | | | | 1.9E-08 | | | | | 0.00009 |
| | | Exposure Point Total | | | | | | | | | 1.9E-08 | | | | | 0.00009 |
| | Exposure Medium Total | | | | | | | | | | 1.9E-08 | | | | | 0.00009 |
| Medium Total | | | | | | | | | | | 6.6E-07 | | | | | 0.003 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 2.6E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.3E-06 | 4.1E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Manganese | 630 | mg/kg | 2.2E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.4E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 1.3E-06 | | | | | 0.004 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.3E-06 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-06 | | | | | 0.004 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 4.5E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 3.8E-08 | 7.2E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000007 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 3.9E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 3.8E-08 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 3.8E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 3.8E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 1.3E-06 | | | | | 0.004 |

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 1.4E-02 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.7E-01 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.2 |
| | | | | Barium | 1000 | mg/kg | 1.1E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.3E-02 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.06 |
| | | | | Chromium | 20.0 | mg/kg | 1.2E-04 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 5.8E-05 | 2.6E-04 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.09 |
| | | | Exp. Route Total | | | | | | | | 5.8E-05 | | | | | 0.3 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.8E-05 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | | | | 5.8E-05 | | | | | 0.3 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 8.2E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 9.6E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.002 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 6.2E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.3E-07 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.001 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 6.7E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 5.6E-07 | 1.5E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0001 |
| | | | Exp. Route Total | | | | | | | | 5.6E-07 | | | | | 0.004 |
| | | Exposure Point Total | | | | | | | | | 5.6E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | 5.6E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | | | | 5.9E-05 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 2.3E-04 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.2E-04 | 5.1E-04 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.2 |
| | | | | Manganese | 630 | mg/kg | 6.9E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 8.1E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.3 |
| | | | Exp. Route Total | | | | | | | | 1.2E-04 | | | | | 0.5 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.2E-04 | | | | | 0.5 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-04 | | | | | 0.5 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 1.3E-08 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.1E-06 | 2.9E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0003 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 3.9E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.6E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.009 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 0.009 |
| | | Exposure Point Total | | | | | | | | | 1.1E-06 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-06 | | | | | 0.009 |
| Medium Total | | | | | | | | | | | 1.2E-04 | | | | | 0.5 |

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 6.2E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.02 |
| | | | | Barium | 1000 | mg/kg | 4.7E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-03 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.007 |
| | | | | Chromium | 20.0 | mg/kg | 1.7E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 8.6E-06 | 2.7E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.009 |
| | | | Exp. Route Total | | | | | | | | 8.6E-06 | | | | | 0.03 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 8.6E-06 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | 8.6E-06 | | | | | 0.03 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 3.3E-06 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 9.6E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.002 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 2.5E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.3E-07 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.001 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 9.2E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 7.7E-07 | 1.5E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0001 |
| | | | Exp. Route Total | | | | | | | | 7.7E-07 | | | | | 0.004 |
| | | Exposure Point Total | | | | | | | | | 7.7E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | 7.7E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | | | | 9.4E-06 | | | | | 0.04 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 3.4E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.7E-05 | 5.5E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.02 |
| | | | | Manganese | 630 | mg/kg | 3.0E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 8.6E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.04 |
| | | | Exp. Route Total | | | | | | | | 1.7E-05 | | | | | 0.05 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.7E-05 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | | | | 1.7E-05 | | | | | 0.05 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 1.8E-08 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.5E-06 | 2.9E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0003 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 1.6E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.6E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.009 |
| | | | Exp. Route Total | | | | | | | | 1.5E-06 | | | | | 0.009 |
| | | Exposure Point Total | | | | | | | | | 1.5E-06 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 1.5E-06 | | | | | 0.009 |
| Medium Total | | | | | | | | | | | 1.9E-05 | | | | | 0.06 |

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 4.2E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.9E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.03 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.03 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 0.011 | mg/m$^3$ | 2.2E-05 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.5E-03 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.3 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.3 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.3 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.3 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.9 RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 5.3E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.5E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.01 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 9.3E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.6E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.0005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.0005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.0005 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.10.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 1.2E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.01 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 2.3E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.11.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 5.3E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.5E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 9.3E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.002 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.12.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 1.7E-02 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.9E-01 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.2 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.2 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.2 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 9.4E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-05 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.13.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 7.1E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.1E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.02 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.02 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 3.8E-06 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-05 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 9.1E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 6.4E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | | Barium | 1000 | mg/kg | 6.9E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 4.8E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 20.0 | mg/kg | 1.4E-07 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 6.9E-08 | 9.7E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0005 |
| | | | Exp. Route Total | | | | | | | | 6.9E-08 | | | | | 0.009 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 6.9E-08 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 6.9E-08 | | | | | 0.009 |
| | Air | SWMU 27 | Inhalation | Aluminum | 0.010 | mg/m$^3$ | 9.6E-06 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 6.7E-04 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.1 |
| | | | | Barium | 7.5E-4 | mg/m$^3$ | 7.3E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 5.1E-05 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.01 |
| | | | | Chromium | 1.5E-5 | mg/m$^3$ | 1.5E-08 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 1.2E-06 | 1.0E-06 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 1.2E-06 | | | | | 0.2 |
| | | Exposure Point Total | | | | | | | | | 1.2E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-06 | | | | | 0.2 |
| Medium Total | | | | | | | | | | | 1.3E-06 | | | | | 0.2 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 2.8E-07 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 1.4E-07 | 1.9E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0010 |
| | | | | Manganese | 630 | mg/kg | 4.4E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.1E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 1.4E-07 | | | | | 0.01 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.4E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-07 | | | | | 0.01 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-5 | mg/m$^3$ | 2.9E-08 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 2.5E-06 | 2.0E-06 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.02 |
| | | | | Manganese | 4.7E-4 | mg/m$^3$ | 4.6E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 3.2E-05 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.6 |
| | | | Exp. Route Total | | | | | | | | 2.5E-06 | | | | | 0.7 |
| | | Exposure Point Total | | | | | | | | | 2.5E-06 | | | | | 0.7 |
| | Exposure Medium Total | | | | | | | | | | 2.5E-06 | | | | | 0.7 |
| Medium Total | | | | | | | | | | | 2.6E-06 | | | | | 0.7 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB029 | 27SB029 | 27SB029 | Ingestion | Ethylbenzene | 297 | mg/kg | 6.3E-07 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 6.9E-09 | 4.4E-05 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 0.0004 |
| | | | | Total Xylenes | 829 | mg/kg | 1.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.2E-04 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.0003 |
| | | | | Aluminum | 3,190 | mg/kg | 6.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.7E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0005 |
| | | | | Cadmium | 11.9 | mg/kg | 2.5E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 240 | mg/kg | 5.1E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 2.5E-07 | 3.6E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.002 |
| | | | | Copper | 277 | mg/kg | 5.9E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.1E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.004 |
| | | | | Lead | 597 | mg/kg | 1.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 8.9E-05 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 640 | mg/kg | 1.4E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.5E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.004 |
| | | | | Zinc | 4,580 | mg/kg | 9.7E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.8E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 2.6E-07 | | | | | 0.02 |
| | | | Dermal | Ethylbenzene | 297 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 829 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 3,190 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 11.9 | mg/kg | 5.1E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.5E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0001 |
| | | | | Chromium | 240 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 277 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 597 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 640 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 4,580 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0001 |
| | | Exposure Point Total | | | | | | | | | 2.6E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 2.6E-07 | | | | | 0.02 |
| | Air | 27SB029 | Inhalation | Ethylbenzene | 0.049 | $mg/m^3$ | 1.5E-05 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 3.7E-08 | 1.0E-03 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 0.0001 |
| | | | | Total Xylenes | 0.041 | $mg/m^3$ | 1.2E-05 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.7E-04 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.009 |
| | | | | Aluminum | 2.4E-6 | $mg/m^3$ | 7.3E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 5.1E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | | Cadmium | 9.0E-9 | $mg/m^3$ | 2.7E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 4.9E-12 | 1.9E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.000009 |
| | | | | Chromium | 1.8E-7 | $mg/m^3$ | 5.5E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 4.6E-09 | 3.8E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00004 |
| | | | | Copper | 2.1E-7 | $mg/m^3$ | 6.3E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.4E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 4.5E-7 | $mg/m^3$ | 1.4E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 9.5E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 4.9E-7 | $mg/m^3$ | 1.5E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.0E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | | Zinc | 3.5E-6 | $mg/m^3$ | 1.0E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.3E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 4.1E-08 | | | | | 0.009 |
| | | Exposure Point Total | | | | | | | | | 4.1E-08 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 4.1E-08 | | | | | 0.009 |
| Medium Total | | | | | | | | | | | 3.0E-07 | | | | | 0.02 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB030 | 27SB030 | 27SB030 | Ingestion | Aluminum | 6,230 | mg/kg | 1.3E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.3E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0009 |
| | | | | Cadmium | 3.49 | mg/kg | 7.4E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 5.2E-07 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.0005 |
| | | | | Chromium | 18.9 | mg/kg | 4.0E-08 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 2.0E-08 | 2.8E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0001 |
| | | | | Copper | 498 | mg/kg | 1.1E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.4E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.007 |
| | | | | Lead | 266 | mg/kg | 5.6E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.0E-05 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 365 | mg/kg | 7.7E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 5.4E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.002 |
| | | | | Zinc | 2,530 | mg/kg | 5.4E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.8E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.001 |
| | | | Exp. Route Total | | | | | | | | 2.0E-08 | | | | | 0.01 |
| | | | Dermal | Aluminum | 6,230 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 3.49 | mg/kg | 1.5E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.0E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00004 |
| | | | | Chromium | 18.9 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 498 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 266 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 365 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 2,530 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00004 |
| | | Exposure Point Total | | | | | | | | | 2.0E-08 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 2.0E-08 | | | | | 0.01 |
| | Air | 27SB030 | Inhalation | Aluminum | 4.7E-6 | $mg/m^3$ | | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | -- |
| | | | | Cadmium | 2.7E-9 | $mg/m^3$ | | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | -- |
| | | | | Chromium | 1.4E-8 | $mg/m^3$ | | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | -- |
| | | | | Copper | 3.8E-7 | $mg/m^3$ | | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 2.0E-7 | $mg/m^3$ | | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 2.8E-7 | $mg/m^3$ | | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | -- |
| | | | | Zinc | 1.9E-6 | $mg/m^3$ | | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | -- |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | -- |
| Medium Total | | | | | | | | | | | 2.0E-08 | | | | | 0.01 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB031 | 27SB031 | 27SB031 | Ingestion | Ethylbenzene | 1.85 | mg/kg | 3.9E-09 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 4.3E-11 | 2.7E-07 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 0.000003 |
| | | | | Total Xylenes | 3.30 | mg/kg | 7.0E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.9E-07 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.000001 |
| | | | | Aluminum | 10,600 | mg/kg | 2.2E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.6E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | | Cadmium | 14.3 | mg/kg | 3.0E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.1E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 56.7 | mg/kg | 1.2E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 6.0E-08 | 8.4E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0004 |
| | | | | Copper | 1,200 | mg/kg | 2.5E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.02 |
| | | | | Lead | 738 | mg/kg | 1.6E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 120,000 | mg/kg | 2.5E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.7 |
| | | | | Zinc | 6,410 | mg/kg | 1.4E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.5E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 6.0E-08 | | | | | 0.8 |
| | | | Dermal | Ethylbenzene | 1.85 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 3.30 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 10,600 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 14.3 | mg/kg | 6.1E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.2E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0002 |
| | | | | Chromium | 56.7 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 1,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 738 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 120,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 6,410 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 6.0E-08 | | | | | 0.8 |
| | Exposure Medium Total | | | | | | | | | | 6.0E-08 | | | | | 0.8 |
| | Air | 27SB031 | Inhalation | Ethylbenzene | 3.1E-4 | $mg/m^3$ | 9.2E-08 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 2.3E-10 | 6.4E-06 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 0.0000007 |
| | | | | Total Xylenes | 5.3E-4 | $mg/m^3$ | 1.6E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-05 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.0001 |
| | | | | Aluminum | 8.1E-6 | $mg/m^3$ | 2.4E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00003 |
| | | | | Cadmium | 1.1E-8 | $mg/m^3$ | 3.3E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 5.9E-12 | 2.3E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00001 |
| | | | | Chromium | 4.3E-8 | $mg/m^3$ | 1.3E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.1E-09 | 9.0E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000009 |
| | | | | Copper | 9.1E-7 | $mg/m^3$ | 2.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.9E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 5.6E-7 | $mg/m^3$ | 1.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.2E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 9.1E-5 | $mg/m^3$ | 2.7E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.9E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.04 |
| | | | | Zinc | 4.9E-6 | $mg/m^3$ | 1.5E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.0E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 1.3E-09 | | | | | 0.04 |
| | | Exposure Point Total | | | | | | | | | 1.3E-09 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-09 | | | | | 0.04 |
| Medium Total | | | | | | | | | | | 6.2E-08 | | | | | 0.8 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB032 | 27SB032 | 27SB032 | Ingestion | Aluminum | 1,500 | mg/kg | 3.2E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.2E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0002 |
| | | | | Copper | 2,420 | mg/kg | 5.1E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.6E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.04 |
| | | | | Lead | 1,570 | mg/kg | 3.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.3E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 208,000 | mg/kg | 4.4E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.1E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 1.3 |
| | | | | Zinc | 18,900 | mg/kg | 4.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.8E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.009 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 1.3 |
| | | | Dermal | Aluminum | 1,500 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Copper | 2,420 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 1,570 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 208,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 18,900 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 1.3 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 1.3 |
| | Air | 27SB032 | Inhalation | Aluminum | 1.1E-6 | $mg/m^3$ | 3.4E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.4E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.000005 |
| | | | | Copper | 1.8E-6 | $mg/m^3$ | 5.5E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.9E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 1.2E-6 | $mg/m^3$ | 3.6E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.5E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 1.6E-4 | $mg/m^3$ | 4.7E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.3E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.07 |
| | | | | Zinc | 1.4E-5 | $mg/m^3$ | 4.3E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.0E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.07 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.07 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.07 |
| Medium Total | | | | | | | | | | | - - | | | | | 1.4 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB033 | 27SB033 | 27SB033 | Ingestion | Ethylbenzene | 0.004 | mg/kg | 8.4E-12 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 9.3E-14 | 5.9E-10 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 5.89673E-09 |
| | | | | Total Xylenes | 0.017 | mg/kg | 3.6E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.5E-09 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 6.34976E-09 |
| | | | | Aluminum | 3,690 | mg/kg | 7.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 5.5E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0005 |
| | | | | Copper | 154 | mg/kg | 3.3E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.3E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.002 |
| | | | | Lead | 396 | mg/kg | 8.4E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 5.9E-05 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 125,000 | mg/kg | 2.7E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.9E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.8 |
| | | | | Zinc | 12,400 | mg/kg | 2.6E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.8E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.006 |
| | | | Exp. Route Total | | | | | | | | 9.3E-14 | | | | | 0.8 |
| | | | Dermal | Ethylbenzene | 0.004 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 0.017 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 3,690 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Copper | 154 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 396 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 125,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 12,400 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 9.3E-14 | | | | | 0.8 |
| | Exposure Medium Total | | | | | | | | | | 9.3E-14 | | | | | 0.8 |
| | Air | 27SB033 | Inhalation | Ethylbenzene | 6.5E-7 | $mg/m^3$ | 2.0E-10 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 4.9E-13 | 1.4E-08 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 1.52831E-09 |
| | | | | Total Xylenes | 2.7E-6 | $mg/m^3$ | 8.2E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 5.8E-08 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.0000006 |
| | | | | Aluminum | 2.8E-6 | $mg/m^3$ | 8.4E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 5.9E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | | Copper | 1.2E-7 | $mg/m^3$ | 3.5E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.5E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 3.0E-7 | $mg/m^3$ | 9.0E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 6.3E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 9.5E-5 | $mg/m^3$ | 2.9E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.0E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.04 |
| | | | | Zinc | 9.4E-6 | $mg/m^3$ | 2.8E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 2.0E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 4.9E-13 | | | | | 0.04 |
| | | Exposure Point Total | | | | | | | | | 4.9E-13 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 4.9E-13 | | | | | 0.04 |
| Medium Total | | | | | | | | | | | 5.8E-13 | | | | | 0.8 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB034 | 27SB034 | 27SB034 | Ingestion | Total Xylenes | 0.017 | mg/kg | 3.6E-11 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 2.5E-09 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 6.34976E-09 |
| | | | | Aluminum | 10,900 | mg/kg | 2.3E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 1.6E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | | Cadmium | 7.63 | mg/kg | 1.6E-08 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 1.1E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Chromium | 39.5 | mg/kg | 8.4E-08 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 4.2E-08 | 5.9E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0003 |
| | | | | Copper | 168 | mg/kg | 3.6E-07 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 2.5E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.002 |
| | | | | Lead | 221 | mg/kg | 4.7E-07 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 3.3E-05 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 2,400 | mg/kg | 5.1E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 3.6E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | | Zinc | 2,120 | mg/kg | 4.5E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 3.1E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.001 |
| | | | Exp. Route Total | | | | | | | | 4.2E-08 | | | | | 0.02 |
| | | | Dermal | Total Xylenes | 0.017 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 10,900 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 7.63 | mg/kg | 3.2E-11 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 2.3E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00009 |
| | | | | Chromium | 39.5 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 168 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 221 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 2,400 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 2,120 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | 0.00009 |
| | | Exposure Point Total | | | | | | | | | 4.2E-08 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 4.2E-08 | | | | | 0.02 |
| | Air | 27SB034 | Inhalation | Total Xylenes | 2.7E-6 | mg/m$^3$ | 8.2E-10 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 5.8E-08 | (mg/m$^3$) | 1.0E-01 | (mg/m$^3$) | 0.0000006 |
| | | | | Aluminum | 8.3E-6 | mg/m$^3$ | 2.5E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 1.7E-07 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.00003 |
| | | | | Cadmium | 5.8E-9 | mg/m$^3$ | 1.7E-12 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 3.1E-12 | 1.2E-10 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.000006 |
| | | | | Chromium | 3.0E-8 | mg/m$^3$ | 9.0E-12 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 7.6E-10 | 6.3E-10 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.000006 |
| | | | | Copper | 1.3E-7 | mg/m$^3$ | 3.8E-11 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 2.7E-09 | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | | Lead | 1.7E-7 | mg/m$^3$ | 5.0E-11 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 3.5E-09 | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | | Manganese | 1.8E-6 | mg/m$^3$ | 5.5E-10 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 3.8E-08 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.0008 |
| | | | | Zinc | 1.6E-6 | mg/m$^3$ | 4.8E-10 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 3.4E-08 | (mg/m$^3$) | NA | (mg/m$^3$) | -- |
| | | | Exp. Route Total | | | | | | | | 7.6E-10 | | | | | 0.0008 |
| | | Exposure Point Total | | | | | | | | | 7.6E-10 | | | | | 0.0008 |
| | Exposure Medium Total | | | | | | | | | | 7.6E-10 | | | | | 0.0008 |
| Medium Total | | | | | | | | | | | 4.3E-08 | | | | | 0.02 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB035 | 27SB035 | 27SB035 | Ingestion | Ethylbenzene | 0.002 | mg/kg | 3.8E-12 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | 4.2E-14 | 2.7E-10 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | 2.68843E-09 |
| | | | | Total Xylenes | 0.005 | mg/kg | 1.1E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 7.8E-10 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 1.95691E-09 |
| | | | | Aluminum | 6,830 | mg/kg | 1.4E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.0E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.001 |
| | | | | Cadmium | 18.8 | mg/kg | 4.0E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 2.8E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Chromium | 13.8 | mg/kg | 2.9E-08 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.5E-08 | 2.0E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0001 |
| | | | | Copper | 63.4 | mg/kg | 1.3E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 9.4E-06 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.0009 |
| | | | | Lead | 442 | mg/kg | 9.4E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 6.6E-05 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 267 | mg/kg | 5.7E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 4.0E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.002 |
| | | | | Zinc | 824 | mg/kg | 1.7E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 1.2E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.0004 |
| | | | Exp. Route Total | | | | | | | | 1.5E-08 | | | | | 0.007 |
| | | | Dermal | Ethylbenzene | 0.002 | mg/kg | 0.0E+00 | (mg/kg/day) | 1.1E-02 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-01 | (mg/kg/day) | -- |
| | | | | Total Xylenes | 0.005 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 6,830 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 18.8 | mg/kg | 8.0E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 5.6E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0002 |
| | | | | Chromium | 13.8 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 63.4 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 442 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 267 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 824 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 1.5E-08 | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | 1.5E-08 | | | | | 0.007 |
| | Air | 27SB035 | Inhalation | Ethylbenzene | 3.0E-7 | $mg/m^3$ | 9.0E-11 | $(mg/m^3)$ | 2.5E-06 | $(ug/m^3)^{-1}$ | 2.2E-13 | 6.3E-09 | $(mg/m^3)$ | 9.0E+00 | $(mg/m^3)$ | 6.96787E-10 |
| | | | | Total Xylenes | 8.5E-7 | $mg/m^3$ | 2.5E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.8E-08 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.0000002 |
| | | | | Aluminum | 5.2E-6 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.1E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00002 |
| | | | | Cadmium | 1.4E-8 | $mg/m^3$ | 4.3E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 7.7E-12 | 3.0E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00002 |
| | | | | Chromium | 1.0E-8 | $mg/m^3$ | 3.1E-12 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.6E-10 | 2.2E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000002 |
| | | | | Copper | 4.8E-8 | $mg/m^3$ | 1.4E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.0E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 3.4E-7 | $mg/m^3$ | 1.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 7.1E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 2.0E-7 | $mg/m^3$ | 6.1E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 4.3E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00009 |
| | | | | Zinc | 6.3E-7 | $mg/m^3$ | 1.9E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | -- | 1.3E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 2.7E-10 | | | | | 0.0001 |
| | | Exposure Point Total | | | | | | | | | 2.7E-10 | | | | | 0.0001 |
| | Exposure Medium Total | | | | | | | | | | 2.7E-10 | | | | | 0.0001 |
| Medium Total | | | | | | | | | | | 1.5E-08 | | | | | 0.007 |

TABLE 7.2 CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB056 | 27SB056 | 27SB056 | Ingestion | Aluminum | 7,230 | mg/kg | 1.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.001 |
| | | | | Cadmium | 7.97 | mg/kg | 1.7E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.2E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Copper | 233 | mg/kg | 4.9E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.5E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.003 |
| | | | | Lead | 1,270 | mg/kg | 2.7E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.9E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 67,900 | mg/kg | 1.4E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.0E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.4 |
| | | | | Zinc | 7,240 | mg/kg | 1.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.004 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.4 |
| | | | Dermal | Aluminum | 7,230 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 7.97 | mg/kg | 3.4E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.4E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00009 |
| | | | | Copper | 233 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 1,270 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 67,900 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 7,240 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00009 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.4 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.4 |
| | Air | 27SB056 | Inhalation | Aluminum | 5.5E-6 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.2E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00002 |
| | | | | Cadmium | 6.1E-9 | $mg/m^3$ | 1.8E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 3.3E-12 | 1.3E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.000006 |
| | | | | Copper | 1.8E-7 | $mg/m^3$ | 5.3E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.7E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 9.7E-7 | $mg/m^3$ | 2.9E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.0E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 5.2E-5 | $mg/m^3$ | 1.5E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.02 |
| | | | | Zinc | 5.5E-6 | $mg/m^3$ | 1.7E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.2E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 3.3E-12 | | | | | 0.02 |
| | | Exposure Point Total | | | | | | | | | 3.3E-12 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 3.3E-12 | | | | | 0.02 |
| Medium Total | | | | | | | | | | | 3.3E-12 | | | | | 0.5 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB057 | 27SB057 | 27SB057 | Ingestion | Aluminum | 5,670 | mg/kg | 1.2E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 8.4E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0008 |
| | | | | Cadmium | 10.2 | mg/kg | 2.2E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.5E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Copper | 515 | mg/kg | 1.1E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.6E-05 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.008 |
| | | | | Lead | 840 | mg/kg | 1.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.2E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 279,000 | mg/kg | 5.9E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.1E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 1.7 |
| | | | | Zinc | 3,250 | mg/kg | 6.9E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.8E-04 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 1.7 |
| | | | Dermal | Aluminum | 5,670 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 10.2 | mg/kg | 4.3E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.0E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0001 |
| | | | | Copper | 515 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 840 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 279,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 3,250 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 1.7 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 1.7 |
| | Air | 27SB057 | Inhalation | Aluminum | 4.3E-6 | $mg/m^3$ | 1.3E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 9.0E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00002 |
| | | | | Cadmium | 7.8E-9 | $mg/m^3$ | 2.3E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 4.2E-12 | 1.6E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.000008 |
| | | | | Copper | 3.9E-7 | $mg/m^3$ | 1.2E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.2E-09 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 6.4E-7 | $mg/m^3$ | 1.9E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.3E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 2.1E-4 | $mg/m^3$ | 6.4E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.5E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.09 |
| | | | | Zinc | 2.5E-6 | $mg/m^3$ | 7.4E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 5.2E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 4.2E-12 | | | | | 0.09 |
| | | Exposure Point Total | | | | | | | | | 4.2E-12 | | | | | 0.09 |
| | Exposure Medium Total | | | | | | | | | | 4.2E-12 | | | | | 0.09 |
| Medium Total | | | | | | | | | | | 4.2E-12 | | | | | 1.8 |

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| 27SB066 | 27SB066 | 27SB066 | Ingestion | Total Xylenes | 0.051 | mg/kg | 1.1E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.6E-09 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | 0.00000002 |
| | | | | Aluminum | 18,800 | mg/kg | 4.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.8E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.003 |
| | | | | Cadmium | 138 | mg/kg | 2.9E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.0E-05 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.02 |
| | | | | Chromium | 656 | mg/kg | 1.4E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.0E-07 | 9.7E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.005 |
| | | | | Copper | 765 | mg/kg | 1.6E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-04 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | 0.01 |
| | | | | Lead | 6,100 | mg/kg | 1.3E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.1E-04 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 52.0 | mg/kg | 1.1E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.7E-06 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.0003 |
| | | | | Zinc | 7,010 | mg/kg | 1.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.0E-03 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 7.0E-07 | | | | | 0.04 |
| | | | Dermal | Total Xylenes | 0.051 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 4.0E-01 | (mg/kg/day) | -- |
| | | | | Aluminum | 18,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Cadmium | 138 | mg/kg | 5.9E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.1E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 656 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Copper | 765 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E-02 | (mg/kg/day) | -- |
| | | | | Lead | 6,100 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day) | -- |
| | | | | Manganese | 52.0 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | | Zinc | 7,010 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 3.0E-01 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 7.0E-07 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 7.0E-07 | | | | | 0.04 |
| | Air | 27SB066 | Inhalation | Total Xylenes | 8.2E-6 | $mg/m^3$ | 2.5E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.7E-07 | $(mg/m^3)$ | 1.0E-01 | $(mg/m^3)$ | 0.000002 |
| | | | | Aluminum | 1.4E-5 | $mg/m^3$ | 4.3E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.0E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00006 |
| | | | | Cadmium | 1.0E-7 | $mg/m^3$ | 3.1E-11 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 5.7E-11 | 2.2E-09 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.0001 |
| | | | | Chromium | 5.0E-7 | $mg/m^3$ | 1.5E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.3E-08 | 1.0E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0001 |
| | | | | Copper | 5.8E-7 | $mg/m^3$ | 1.7E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.2E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Lead | 4.6E-6 | $mg/m^3$ | 1.4E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 9.7E-08 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | | Manganese | 4.0E-8 | $mg/m^3$ | 1.2E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.3E-10 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00002 |
| | | | | Zinc | 5.3E-6 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-07 | $(mg/m^3)$ | NA | $(mg/m^3)$ | -- |
| | | | Exp. Route Total | | | | | | | | 1.3E-08 | | | | | 0.0003 |
| | | Exposure Point Total | | | | | | | | | 1.3E-08 | | | | | 0.0003 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-08 | | | | | 0.0003 |
| Medium Total | | | | | | | | | | | 7.1E-07 | | | | | 0.05 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 7.3E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 5.7E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | | Barium | 1000 | mg/kg | 5.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.3E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 20.0 | mg/kg | 1.1E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 5.5E-07 | 8.6E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 5.5E-07 | | | | | 0.01 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.5E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 5.5E-07 | | | | | 0.01 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 2.6E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.0E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.0004 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 2.0E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.5E-07 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.0003 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 3.9E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 3.3E-08 | 3.0E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00003 |
| | | | Exp. Route Total | | | | | | | | 3.3E-08 | | | | | 0.0007 |
| | | Exposure Point Total | | | | | | | | | 3.3E-08 | | | | | 0.0007 |
| | Exposure Medium Total | | | | | | | | | | 3.3E-08 | | | | | 0.0007 |
| Medium Total | | | | | | | | | | | 5.8E-07 | | | | | 0.01 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 2.2E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.1E-06 | 1.7E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.006 |
| | | | | Manganese | 630 | mg/kg | 3.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.7E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 0.02 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.1E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 7.8E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 6.6E-08 | 6.1E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00006 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 1.2E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 9.6E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.002 |
| | | | Exp. Route Total | | | | | | | | 6.6E-08 | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 6.6E-08 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 6.6E-08 | | | | | 0.002 |
| Medium Total | | | | | | | | | | | 1.2E-06 | | | | | 0.02 |

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 9.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.1E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.003 |
| | | | | Barium | 1000 | mg/kg | 6.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.4E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.001 |
| | | | | Chromium | 20.0 | mg/kg | 8.8E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.4E-07 | 4.7E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 4.4E-07 | | | | | 0.006 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.4E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | 4.4E-07 | | | | | 0.006 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 1.7E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 5.9E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 1.3E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.5E-09 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.000009 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.7E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.4E-09 | 9.0E-11 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0000009 |
| | | | Exp. Route Total | | | | | | | | 1.4E-09 | | | | | 0.00002 |
| | | Exposure Point Total | | | | | | | | | 1.4E-09 | | | | | 0.00002 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-09 | | | | | 0.00002 |
| Medium Total | | | | | | | | | | | 4.4E-07 | | | | | 0.006 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 1.8E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 8.8E-07 | 9.5E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Manganese | 630 | mg/kg | 4.3E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.5E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.006 |
| | | | Exp. Route Total | | | | | | | | 8.8E-07 | | | | | 0.009 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 8.8E-07 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 8.8E-07 | | | | | 0.009 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 3.3E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.8E-09 | 1.8E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000002 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 8.1E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.8E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00006 |
| | | | Exp. Route Total | | | | | | | | 2.8E-09 | | | | | 0.00006 |
| | | Exposure Point Total | | | | | | | | | 2.8E-09 | | | | | 0.00006 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-09 | | | | | 0.00006 |
| Medium Total | | | | | | | | | | | 8.8E-07 | | | | | 0.009 |

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 3.4E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.4E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0003 |
| | | | | Barium | 1000 | mg/kg | 2.5E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.5E-05 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.0001 |
| | | | | Chromium | 20.0 | mg/kg | 8.0E-08 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.0E-08 | 5.1E-07 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 4.0E-08 | | | | | 0.0006 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.0E-08 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | | | | 4.0E-08 | | | | | 0.0006 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 6.0E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.0E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 4.5E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.5E-09 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.000009 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.4E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.2E-09 | 9.0E-11 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0000009 |
| | | | Exp. Route Total | | | | | | | | 1.2E-09 | | | | | 0.00002 |
| | | Exposure Point Total | | | | | | | | | 1.2E-09 | | | | | 0.00002 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-09 | | | | | 0.00002 |
| Medium Total | | | | | | | | | | | 4.1E-08 | | | | | 0.0007 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 1.6E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 8.0E-08 | 1.0E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0003 |
| | | | | Manganese | 630 | mg/kg | 1.6E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.6E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.0007 |
| | | | Exp. Route Total | | | | | | | | 8.0E-08 | | | | | 0.001 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 8.0E-08 | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | 8.0E-08 | | | | | 0.001 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 2.8E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.4E-09 | 1.8E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000002 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 2.8E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.8E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00006 |
| | | | Exp. Route Total | | | | | | | | 2.4E-09 | | | | | 0.00006 |
| | | Exposure Point Total | | | | | | | | | 2.4E-09 | | | | | 0.00006 |
| | Exposure Medium Total | | | | | | | | | | 2.4E-09 | | | | | 0.00006 |
| Medium Total | | | | | | | | | | | 8.2E-08 | | | | | 0.001 |

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 1.6E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 5.6E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.06 |
| | | | | Barium | 1000 | mg/kg | 1.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.3E-03 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.02 |
| | | | | Chromium | 20.0 | mg/kg | 1.6E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.9E-06 | 8.5E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | 7.9E-06 | | | | | 0.1 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.9E-06 | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | | | | 7.9E-06 | | | | | 0.1 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 1.8E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.4E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.001 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 1.4E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.9E-07 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.0010 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.8E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.5E-07 | 9.7E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00010 |
| | | | Exp. Route Total | | | | | | | | 1.5E-07 | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 1.5E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 1.5E-07 | | | | | 0.002 |
| Medium Total | | | | | | | | | | | 8.1E-06 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 3.2E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.6E-05 | 1.7E-04 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.06 |
| | | | | Manganese | 630 | mg/kg | 7.7E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.7E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.1 |
| | | | Exp. Route Total | | | | | | | | 1.6E-05 | | | | | 0.2 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.6E-05 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | 1.6E-05 | | | | | 0.2 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 3.6E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 3.0E-07 | 1.9E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0002 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 8.8E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.1E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.006 |
| | | | Exp. Route Total | | | | | | | | 3.0E-07 | | | | | 0.006 |
| | | Exposure Point Total | | | | | | | | | 3.0E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | 3.0E-07 | | | | | 0.006 |
| Medium Total | | | | | | | | | | | 1.6E-05 | | | | | 0.2 |

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | SWMU 27 | Ingestion | Aluminum | 13,200 | mg/kg | 6.0E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.0E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | | Barium | 1000 | mg/kg | 4.6E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.6E-04 | (mg/kg/day) | 2.0E-01 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 20.0 | mg/kg | 1.4E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.2E-07 | 9.2E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 7.2E-07 | | | | | 0.01 |
| | | | Dermal | Aluminum | 13,200 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Barium | 1000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.4E-02 | (mg/kg/day) | -- |
| | | | | Chromium | 20.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.2E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 7.2E-07 | | | | | 0.01 |
| | Air | SWMU 27 | Inhalation | Aluminum | 1.0E-5 | $mg/m^3$ | 6.4E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.4E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.001 |
| | | | | Barium | 7.6E-7 | $mg/m^3$ | 4.9E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.9E-07 | $(mg/m^3)$ | 5.0E-04 | $(mg/m^3)$ | 0.0010 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.5E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.3E-07 | 9.7E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00010 |
| | | | Exp. Route Total | | | | | | | | 1.3E-07 | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 1.3E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-07 | | | | | 0.002 |
| Medium Total | | | | | | | | | | | 8.5E-07 | | | | | 0.01 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Ingestion | Chromium | 40.0 | mg/kg | 2.9E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 1.4E-06 | 1.8E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.006 |
| | | | | Manganese | 630 | mg/kg | 2.9E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.9E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 1.4E-06 | | | | | 0.02 |
| | | | Dermal | Chromium | 40.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 630 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 1.4E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Inhalation | Chromium | 3.0E-8 | $mg/m^3$ | 3.1E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.6E-07 | 1.9E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0002 |
| | | | | Manganese | 4.8E-7 | $mg/m^3$ | 3.1E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.1E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.006 |
| | | | Exp. Route Total | | | | | | | | 2.6E-07 | | | | | 0.006 |
| | | Exposure Point Total | | | | | | | | | 2.6E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | 2.6E-07 | | | | | 0.006 |
| Medium Total | | | | | | | | | | | 1.7E-06 | | | | | 0.02 |

TABLE 7.8.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.3E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.007 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.007 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.007 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 0.011 | $mg/m^3$ | 1.1E-05 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.7E-04 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.2 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.2 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.2 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.9.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 8.3E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.5E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.006 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.006 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 2.9E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.3E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.0005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.0005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.0005 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.10.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.6E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.004 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.004 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.004 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 1.9E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 6.8E-08 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.00001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.11.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 3.8E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.8E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0004 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0004 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.0004 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.0004 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 6.8E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 6.8E-08 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.00001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.0004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.12.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 1.8E-03 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 6.4E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.06 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.06 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.06 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.06 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 2.1E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 7.3E-06 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.07 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.13.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,060 | mg/kg | 6.9E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.9E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.007 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.007 |
| | | | Dermal | Aluminum | 15,060 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.007 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 7.3E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.3E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.008 |

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

# RAGS Part D Table 9

## Summary of Receptor Risks and Hazards for COPCs

**LIST OF TABLES**
**RAGS PART D TABLE 9**
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**


**Table No.**

**Reasonable Maximum Exposures**

9.1.RME Investigation Area 1 - Construction Workers - Soil
9.2.RME Investigation Area 1 - Construction Workers - Sump/Pits
9.3.RME Investigation Area 1 - Industrial Workers
9.4.RME Investigation Area 1 - Child Recreational Users
9.5.RME Investigation Area 1 - Adult Recreational Users
9.6.RME Investigation Area 1 - Lifelong Recreational Users
9.7.RME Investigation Area 1 - Child Residents
9.8.RME Investigation Area 1 - Adult Residents
9.9.RME Investigation Area 1 - Lifelong Residents
9.10.RME Investigation Area 2 - Construction Workers
9.11.RME Investigation Area 2 - Industrial Workers
9.12.RME Investigation Area 2 - Child Recreational Users
9.13.RME Investigation Area 2 - Adult Recreational Users
9.14.RME Investigation Area 2 - Child Residents
9.15.RME Investigation Area 2 - Adult Residents

**Central Tendency Exposures**

9.1.CTE Investigation Area 1 - Construction Workers - Soil
9.2.CTE Investigation Area 1 - Construction Workers - Sump/Pits
9.3.CTE Investigation Area 1 - Industrial Workers
9.4.CTE Investigation Area 1 - Child Recreational Users
9.5.CTE Investigation Area 1 - Adult Recreational Users
9.6.CTE Investigation Area 1 - Lifelong Recreational Users
9.7.CTE Investigation Area 1 - Child Residents
9.8.CTE Investigation Area 1 - Adult Residents
9.9.CTE Investigation Area 1 - Lifelong Residents
9.10.CTE Investigation Area 2 - Construction Workers
9.11.CTE Investigation Area 2 - Industrial Workers
9.12.CTE Investigation Area 2 - Child Recreational Users
9.13.CTE Investigation Area 2 - Adult Recreational Users
9.14.CTE Investigation Area 2 - Child Residents
9.15.CTE Investigation Area 2 - Adult Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.010 | -- | -- | 0.010 |
| | | | Chromium | 3E-07 | -- | - - | -- | 3E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | 3E-07 | -- | - - | -- | 3E-07 | | 0.04 | -- | -- | 0.04 |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | 0.04 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.3 | -- | 0.3 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.02 | -- | 0.02 |
| | | | Chromium | -- | 2E-06 | -- | -- | 2E-06 | Respiratory | -- | 0.02 | -- | 0.02 |
| | | | Chemical Total | -- | 2E-06 | -- | -- | 2E-06 | | - - | 0.3 | - - | 0.3 |
| | | Exposure Point Total | | | | | | 2E-06 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | 2E-06 | | | | | 0.3 |
| Medium Total | | | | | | | | 3E-06 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 6E-07 | -- | - - | -- | 6E-07 | None Reported | 0.004 | -- | -- | 0.004 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.05 | -- | -- | 0.05 |
| | | | Chemical Total | 6E-07 | -- | - - | -- | 6E-07 | | 0.05 | -- | -- | 0.05 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.05 |
| | Air | SWMU 27 | Chromium | -- | 5E-06 | -- | -- | 5E-06 | Respiratory | -- | 0.04 | -- | 0.04 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 1 | -- | 1 |
| | | | Chemical Total | -- | 5E-06 | -- | -- | 5E-06 | | - - | 1 | - - | 1 |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | 1 |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | 1 |
| Medium Total | | | | | | | | 5E-06 | | | | | 1 |
| Receptor Total | | | | | | | Receptor Risk Total | 8E-06 | | | | Receptor HI Total | 2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

| | |
|---|---|
| Total CNS HI | 2 |
| Total Fetotoxicity HI | 0.02 |
| Total Kidney HI | 0.010 |
| Total Respiratory HI | 0.06 |
| Total None Reported HI | 0.006 |

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA



Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB029 | 27SB029 | 27SB029 | Ethylbenzene | 3E-08 | -- | -- | -- | 3E-08 | Liver, Kidney | 0.002 | -- | -- | 0.002 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 0.001 | -- | -- | 0.001 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.007 | -- | 0.0008 | 0.008 |
| | | | Chromium | 1E-06 | -- | -- | -- | 1E-06 | None Reported | 0.007 | -- | -- | 0.007 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.02 | -- | -- | 0.02 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.02 | -- | -- | 0.02 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.009 | -- | -- | 0.009 |
| | | | Chemical Total | 1E-06 | -- | -- | -- | 1E-06 | | 0.06 | -- | 0.0008 | 0.06 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.06 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.06 |
| | Air | 27SB029 | Ethylbenzene | -- | 7E-08 | -- | -- | 7E-08 | Developmental | -- | 0.0002 | -- | 0.0002 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.02 | -- | 0.02 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00002 | -- | 0.00002 |
| | | | Cadmium | -- | 1E-11 | -- | -- | 1E-11 | Kidney, Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Chromium | -- | 9E-09 | -- | -- | 9E-09 | Respiratory | -- | 0.00007 | -- | 0.00007 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.0004 | -- | 0.0004 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-08 | -- | -- | 8E-08 | | -- | 0.02 | -- | 0.02 |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | 0.02 |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.08 |
| 27SB030 | 27SB030 | 27SB030 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.004 | -- | -- | 0.004 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.002 | -- | 0.0002 | 0.002 |
| | | | Chromium | 8E-08 | -- | -- | -- | 8E-08 | None Reported | 0.0005 | -- | -- | 0.0005 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.03 | -- | -- | 0.03 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.009 | -- | -- | 0.009 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.005 | -- | -- | 0.005 |
| | | | Chemical Total | 8E-08 | -- | -- | -- | 8E-08 | | 0.05 | -- | 0.0002 | 0.05 |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | 0.05 |
| | Air | 27SB030 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | -- | -- | -- |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney, Respiratory | -- | -- | -- | -- |
| | | | Chromium | -- | -- | -- | -- | -- | Respiratory | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | -- | | | | | -- |
| | Exposure Medium Total | | | | | | | -- | | | | | -- |
| Medium Total | | | | | | | | 8E-08 | | | | | 0.05 |

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB031 | 27SB031 | 27SB031 | Ethylbenzene | 2E-10 | -- | -- | -- | 2E-10 | Liver, Kidney | 0.00001 | -- | -- | 0.00001 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 0.000005 | -- | -- | 0.000005 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.006 | -- | -- | 0.006 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.008 | -- | 0.0010 | 0.009 |
| | | | Chromium | 2E-07 | -- | -- | -- | 2E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.07 | -- | -- | 0.07 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 3 | -- | -- | 3 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 2E-07 | -- | -- | -- | 2E-07 | | 3 | -- | 0.0010 | 3 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 3 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 3 |
| | Air | 27SB031 | Ethylbenzene | -- | 4E-10 | -- | -- | 4E-10 | Developmental | -- | 0.000001 | -- | 0.000001 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00007 | -- | 0.00007 |
| | | | Cadmium | -- | 1E-11 | -- | -- | 1E-11 | Kidney, Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Chromium | -- | 2E-09 | -- | -- | 2E-09 | Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.07 | -- | 0.07 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | 0.08 | -- | 0.08 |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | 0.08 |
| Medium Total | | | | | | | | 2E-07 | | | | | 3 |
| 27SB032 | 27SB032 | 27SB032 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0009 | -- | -- | 0.0009 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.1 | -- | -- | 0.1 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 5 | -- | -- | 5 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.04 | -- | -- | 0.04 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 5 | -- | -- | 5 |
| | | Exposure Point Total | | | | | | -- | | | | | 5 |
| | Exposure Medium Total | | | | | | | -- | | | | | 5 |
| | Air | 27SB032 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.000009 | -- | 0.000009 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.1 | -- | 0.1 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.1 | -- | 0.1 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.1 |
| Medium Total | | | | | | | | -- | | | | | 5 |

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA



Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB033 | 27SB033 | 27SB033 | Ethylbenzene | 4E-13 | -- | -- | -- | 4E-13 | Liver, Kidney | 0.00000002 | -- | -- | 0.00000002 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 0.00000002 | -- | -- | 0.00000002 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.009 | -- | -- | 0.009 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 3 | -- | -- | 3 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | 4E-13 | -- | -- | -- | 4E-13 | | 3 | -- | -- | 3 |
| | | Exposure Point Total | | | | | | 4E-13 | | | | | 3 |
| | Exposure Medium Total | | | | | | | 4E-13 | | | | | 3 |
| | Air | 27SB033 | Ethylbenzene | -- | 1E-12 | -- | -- | 1E-12 | Developmental | -- | 3E-09 | -- | 3E-09 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.000001 | -- | 0.000001 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00002 | -- | 0.00002 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.08 | -- | 0.08 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-12 | -- | -- | 1E-12 | | -- | 0.08 | -- | 0.08 |
| | | Exposure Point Total | | | | | | 1E-12 | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | 1E-12 | | | | | 0.08 |
| Medium Total | | | | | | | | 4E-13 | | | | | 3 |
| 27SB034 | 27SB034 | 27SB034 | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 0.00000002 | -- | -- | 0.00000002 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.006 | -- | -- | 0.006 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.004 | -- | 0.0005 | 0.005 |
| | | | Chromium | 2E-07 | -- | -- | -- | 2E-07 | None Reported | 0.001 | -- | -- | 0.001 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.010 | -- | -- | 0.010 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.06 | -- | -- | 0.06 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.004 | -- | -- | 0.004 |
| | | | Chemical Total | 2E-07 | -- | -- | -- | 2E-07 | | 0.08 | -- | 0.0005 | 0.08 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 0.08 |
| | Air | 27SB034 | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.000001 | -- | 0.000001 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00007 | -- | 0.00007 |
| | | | Cadmium | -- | 6E-12 | -- | -- | 6E-12 | Kidney, Respiratory | -- | 0.00001 | -- | 0.00001 |
| | | | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.00001 | -- | 0.00001 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.001 | -- | 0.001 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | -- | 0.002 | -- | 0.002 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.002 |
| Medium Total | | | | | | | | 2E-07 | | | | | 0.08 |

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA



Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB035 | 27SB035 | 27SB035 | Ethylbenzene | 2E-13 | -- | -- | -- | 2E-13 | Liver, Kidney | 0.00000001 | -- | -- | 0.00000001 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 7.65749E-09 | -- | -- | 8E-09 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.004 | -- | -- | 0.004 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.01 | -- | 0.001 | 0.01 |
| | | | Chromium | 6E-08 | -- | -- | -- | 6E-08 | None Reported | 0.0004 | -- | -- | 0.0004 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.004 | -- | -- | 0.004 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.006 | -- | -- | 0.006 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | 6E-08 | -- | -- | -- | 6E-08 | | 0.03 | -- | 0.001 | 0.03 |
| | | Exposure Point Total | | | | | | 6E-08 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 6E-08 | | | | | 0.03 |
| | Air | 27SB035 | Ethylbenzene | -- | 4E-13 | -- | -- | 4E-13 | Developmental | -- | 1E-09 | -- | 1E-09 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.0000003 | -- | 0.0000003 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00004 | -- | 0.00004 |
| | | | Cadmium | -- | 2E-11 | -- | -- | 2E-11 | Kidney, Respiratory | -- | 0.00003 | -- | 0.00003 |
| | | | Chromium | -- | 5E-10 | -- | -- | 5E-10 | Respiratory | -- | 0.000004 | -- | 0.000004 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 5E-10 | -- | -- | 5E-10 | | -- | 0.0002 | -- | 0.0002 |
| | | Exposure Point Total | | | | | | 5E-10 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 5E-10 | | | | | 0.0002 |
| Medium Total | | | | | | | | 6E-08 | | | | | 0.03 |
| 27SB056 | 27SB056 | 27SB056 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.004 | -- | -- | 0.004 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.005 | -- | 0.0006 | 0.005 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.01 | -- | -- | 0.01 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 2 | -- | -- | 2 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 2 | -- | 0.0006 | 2 |
| | | Exposure Point Total | | | | | | -- | | | | | 2 |
| | Exposure Medium Total | | | | | | | -- | | | | | 2 |
| | Air | 27SB056 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Cadmium | -- | 6E-12 | -- | -- | 6E-12 | Kidney, Respiratory | -- | 0.00001 | -- | 0.00001 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.04 | -- | 0.04 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 6E-12 | -- | -- | 6E-12 | | -- | 0.04 | -- | 0.04 |
| | | Exposure Point Total | | | | | | 6E-12 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 6E-12 | | | | | 0.04 |
| Medium Total | | | | | | | | 6E-12 | | | | | 2 |

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB057 | 27SB057 | 27SB057 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.003 | -- | -- | 0.003 |
| | | | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.006 | -- | 0.0007 | 0.007 |
| | | | Copper | - - | -- | - - | -- | - - | GS | 0.03 | -- | -- | 0.03 |
| | | | Lead | - - | -- | - - | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 7 | -- | -- | 7 |
| | | | Zinc | - - | -- | - - | -- | - - | Blood | 0.006 | -- | -- | 0.006 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 7 | -- | 0.0007 | 7 |
| | | Exposure Point Total | | | | | | - - | | | | | 7 |
| | Exposure Medium Total | | | | | | | - - | | | | | 7 |
| | Air | 27SB057 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00004 | -- | 0.00004 |
| | | | Cadmium | -- | 8E-12 | -- | -- | 8E-12 | Kidney, Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Copper | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Lead | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.2 | -- | 0.2 |
| | | | Zinc | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-12 | -- | -- | 8E-12 | | - - | 0.2 | - - | 0.2 |
| | | Exposure Point Total | | | | | | 8E-12 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 8E-12 | | | | | 0.2 |
| Medium Total | | | | | | | | 8E-12 | | | | | 7 |
| 27SB066 | 27SB066 | 27SB066 | Total Xylenes | - - | -- | - - | -- | - - | Body Weight | 0.00000007 | -- | -- | 0.00000007 |
| | | | Aluminum | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.08 | -- | 0.010 | 0.09 |
| | | | Chromium | 3E-06 | -- | - - | -- | 3E-06 | None Reported | 0.02 | -- | -- | 0.02 |
| | | | Copper | - - | -- | - - | -- | - - | GS | 0.04 | -- | -- | 0.04 |
| | | | Lead | - - | -- | - - | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.001 | -- | -- | 0.001 |
| | | | Zinc | - - | -- | - - | -- | - - | Blood | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 3E-06 | -- | - - | -- | 3E-06 | | 0.2 | -- | 0.010 | 0.2 |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | 0.2 |
| | Air | 27SB066 | Total Xylenes | -- | - - | -- | -- | - - | CNS | -- | 0.000003 | -- | 0.000003 |
| | | | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.0001 | -- | 0.0001 |
| | | | Cadmium | -- | 1E-10 | -- | -- | 1E-10 | Kidney, Respiratory | -- | 0.0002 | -- | 0.0002 |
| | | | Chromium | -- | 2E-08 | -- | -- | 2E-08 | Respiratory | -- | 0.0002 | -- | 0.0002 |
| | | | Copper | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Lead | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.00003 | -- | 0.00003 |
| | | | Zinc | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | - - | 0.0006 | - - | 0.0006 |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | 0.0006 |
| Medium Total | | | | | | | | 3E-06 | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.01 | -- | -- | 0.01 |
| | | | Barium | -- | -- | -- | -- | -- | Kidney | 0.005 | -- | -- | 0.005 |
| | | | Chromium | 3E-06 | -- | -- | -- | 3E-06 | None Reported | 0.007 | -- | -- | 0.007 |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.0005 | -- | 0.0005 |
| | | | Barium | -- | -- | -- | -- | -- | Fetotoxicity | -- | 0.0003 | -- | 0.0003 |
| | | | Chromium | -- | 1E-07 | -- | -- | 1E-07 | Respiratory | -- | 0.00003 | -- | 0.00003 |
| | | | Chemical Total | -- | 1E-07 | -- | -- | 1E-07 | | -- | 0.0008 | -- | 0.0008 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.0008 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.0008 |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.03 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 7E-06 | -- | -- | -- | 7E-06 | None Reported | 0.01 | -- | -- | 0.01 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | 7E-06 | -- | -- | -- | 7E-06 | | 0.04 | -- | -- | 0.04 |
| | | Exposure Point Total | | | | | | 7E-06 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 7E-06 | | | | | 0.04 |
| | Air | SWMU 27 | Chromium | -- | 2E-07 | -- | -- | 2E-07 | Respiratory | -- | 0.00007 | -- | 0.00007 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | -- | 0.002 | -- | 0.002 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 0.002 |
| Medium Total | | | | | | | | 7E-06 | | | | | 0.04 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.005 | -- | -- | 0.005 |
| | | | Chromium | 4E-06 | -- | - - | -- | 4E-06 | None Reported | 0.006 | -- | -- | 0.006 |
| | | | Chemical Total | 4E-06 | -- | - - | -- | 4E-06 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.00004 | -- | 0.00004 |
| | | | Chromium | -- | 1E-08 | -- | -- | 1E-08 | Respiratory | -- | 0.000004 | -- | 0.000004 |
| | | | Chemical Total | -- | 1E-08 | -- | -- | 1E-08 | | - - | 0.00009 | - - | 0.00009 |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | 0.00009 |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | 0.00009 |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 9E-06 | -- | - - | -- | 9E-06 | None Reported | 0.01 | -- | -- | 0.01 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | 9E-06 | -- | - - | -- | 9E-06 | | 0.04 | -- | -- | 0.04 |
| | | Exposure Point Total | | | | | | 9E-06 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 9E-06 | | | | | 0.04 |
| | Air | SWMU 27 | Chromium | -- | 3E-08 | -- | -- | 3E-08 | Respiratory | -- | 0.000007 | -- | 0.000007 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | - - | 0.0002 | - - | 0.0002 |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | 9E-06 | | | | | 0.04 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.001 | -- | -- | 0.001 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.0005 | -- | -- | 0.0005 |
| | | | Chromium | 6E-07 | -- | - - | -- | 6E-07 | None Reported | 0.0007 | -- | -- | 0.0007 |
| | | | Chemical Total | 6E-07 | -- | - - | -- | 6E-07 | | 0.003 | -- | -- | 0.003 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.003 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.003 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.00004 | -- | 0.00004 |
| | | | Chromium | -- | 2E-08 | -- | -- | 2E-08 | Respiratory | -- | 0.000004 | -- | 0.000004 |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | - - | 0.00009 | - - | 0.00009 |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | 0.00009 |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | 0.00009 |
| Medium Total | | | | | | | | 7E-07 | | | | | 0.003 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-06 | -- | - - | -- | 1E-06 | None Reported | 0.001 | -- | -- | 0.001 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.003 | -- | -- | 0.003 |
| | | | Chemical Total | 1E-06 | -- | - - | -- | 1E-06 | | 0.004 | -- | -- | 0.004 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.004 |
| | Air | SWMU 27 | Chromium | -- | 4E-08 | -- | -- | 4E-08 | Respiratory | -- | 0.000007 | -- | 0.000007 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Chemical Total | -- | 4E-08 | -- | -- | 4E-08 | | - - | 0.0002 | - - | 0.0002 |
| | | Exposure Point Total | | | | | | 4E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 4E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Barium | - - | -- | - - | -- | - - | | | | | |
| | | | Chromium | 5E-06 | -- | - - | -- | 5E-06 | | | | | |
| | | | Chemical Total | 5E-06 | -- | - - | -- | 5E-06 | | | | | |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | | | | | |
| | | | Barium | -- | - - | -- | -- | - - | | | | | |
| | | | Chromium | -- | 3E-08 | -- | -- | 3E-08 | | | | | |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | | | | |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | |
| Medium Total | | | | | | | | 5E-06 | | | | | |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-05 | -- | - - | -- | 1E-05 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 1E-05 | -- | - - | -- | 1E-05 | | | | | |
| | | Exposure Point Total | | | | | | 1E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-05 | | | | | |
| | Air | SWMU 27 | Chromium | -- | 7E-08 | -- | -- | 7E-08 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 7E-08 | -- | -- | 7E-08 | | | | | |
| | | Exposure Point Total | | | | | | 7E-08 | | | | | |
| | Exposure Medium Total | | | | | | | 7E-08 | | | | | |
| Medium Total | | | | | | | | 1E-05 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.2 | -- | -- | 0.2 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.06 | -- | -- | 0.06 |
| | | | Chromium | 6E-05 | -- | - - | -- | 6E-05 | None Reported | 0.09 | -- | -- | 0.09 |
| | | | Chemical Total | 6E-05 | -- | - - | -- | 6E-05 | | 0.3 | -- | -- | 0.3 |
| | | Exposure Point Total | | | | | | 6E-05 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | 6E-05 | | | | | 0.3 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.001 | -- | 0.001 |
| | | | Chromium | -- | 6E-07 | -- | -- | 6E-07 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Chemical Total | -- | 6E-07 | -- | -- | 6E-07 | | - - | 0.004 | - - | 0.004 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | 6E-05 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-04 | -- | - - | -- | 1E-04 | None Reported | 0.2 | -- | -- | 0.2 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.3 | -- | -- | 0.3 |
| | | | Chemical Total | 1E-04 | -- | - - | -- | 1E-04 | | 0.5 | -- | -- | 0.5 |
| | | Exposure Point Total | | | | | | 1E-04 | | | | | 0.5 |
| | Exposure Medium Total | | | | | | | 1E-04 | | | | | 0.5 |
| | Air | SWMU 27 | Chromium | -- | 1E-06 | -- | -- | 1E-06 | Respiratory | -- | 0.0003 | -- | 0.0003 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.009 | -- | 0.009 |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | - - | 0.009 | - - | 0.009 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.009 |
| Medium Total | | | | | | | | 1E-04 | | | | | 0.5 |

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

| | |
|---|---|
| Total CNS HI | 0.5 |
| Total Fetotoxicity HI | 0.001 |
| Total Kidney HI | 0.06 |
| Total Respiratory HI | 0.0004 |
| Total None Reported HI | 0.3 |

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.02 | -- | -- | 0.02 |
| | | | Barium | -- | -- | -- | -- | -- | Kidney | 0.007 | -- | -- | 0.007 |
| | | | Chromium | 9E-06 | -- | -- | -- | 9E-06 | None Reported | 0.009 | -- | -- | 0.009 |
| | | | Chemical Total | 9E-06 | -- | -- | -- | 9E-06 | | 0.03 | -- | -- | 0.03 |
| | | Exposure Point Total | | | | | | 9E-06 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 9E-06 | | | | | 0.03 |
| | Air | SWMU 27 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.002 | -- | 0.002 |
| | | | Barium | -- | -- | -- | -- | -- | Fetotoxicity | -- | 0.001 | -- | 0.001 |
| | | | Chromium | -- | 8E-07 | -- | -- | 8E-07 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Chemical Total | -- | 8E-07 | -- | -- | 8E-07 | | -- | 0.004 | -- | 0.004 |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | 9E-06 | | | | | 0.04 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 2E-05 | -- | -- | -- | 2E-05 | None Reported | 0.02 | -- | -- | 0.02 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.04 | -- | -- | 0.04 |
| | | | Chemical Total | 2E-05 | -- | -- | -- | 2E-05 | | 0.05 | -- | -- | 0.05 |
| | | Exposure Point Total | | | | | | 2E-05 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | 2E-05 | | | | | 0.05 |
| | Air | SWMU 27 | Chromium | -- | 2E-06 | -- | -- | 2E-06 | Respiratory | -- | 0.0003 | -- | 0.0003 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.009 | -- | 0.009 |
| | | | Chemical Total | -- | 2E-06 | -- | -- | 2E-06 | | -- | 0.009 | -- | 0.009 |
| | | Exposure Point Total | | | | | | 2E-06 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 2E-06 | | | | | 0.009 |
| Medium Total | | | | | | | | 2E-05 | | | | | 0.06 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong( Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Barium | -- | -- | -- | -- | -- | | | | | |
| | | | Chromium | 7E-05 | -- | -- | -- | 7E-05 | | | | | |
| | | | Chemical Total | 7E-05 | -- | -- | -- | 7E-05 | | | | | |
| | | Exposure Point Total | | | | | | 7E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 7E-05 | | | | | |
| | Air | SWMU 27 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Barium | -- | -- | -- | -- | -- | | | | | |
| | | | Chromium | -- | 1E-06 | -- | -- | 1E-06 | | | | | |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | | | | |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | |
| Medium Total | | | | | | | | 7E-05 | | | | | |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-04 | -- | -- | -- | 1E-04 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | 1E-04 | -- | -- | -- | 1E-04 | | | | | |
| | | Exposure Point Total | | | | | | 1E-04 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-04 | | | | | |
| | Air | SWMU 27 | Chromium | -- | 3E-06 | -- | -- | 3E-06 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-06 | -- | -- | 3E-06 | | | | | |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | |
| Medium Total | | | | | | | | 1E-04 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.03 | -- | -- | 0.03 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.03 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.3 | -- | 0.3 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.3 | - - | 0.3 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.3 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.01 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.0005 | -- | 0.0005 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.0005 | -- | 0.0005 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.0005 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.0005 |
| Medium Total | | | | | | | | -- | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.00005 | - - | 0.00005 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | - - | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.13.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.002 | -- | -- | 0.002 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.002 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.00005 | - - | 0.00005 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | - - | | | | | 0.002 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.14.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.2 | -- | -- | 0.2 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.2 | -- | -- | 0.2 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.2 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | - - | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.15.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.02 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | - - | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.002 | -- | -- | 0.002 |
| | | | Chromium | 7E-08 | -- | - - | -- | 7E-08 | None Reported | 0.0005 | -- | -- | 0.0005 |
| | | | Chemical Total | 7E-08 | -- | - - | -- | 7E-08 | | 0.009 | -- | -- | 0.009 |
| | | Exposure Point Total | | | | | | 7E-08 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 7E-08 | | | | | 0.009 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.1 | -- | 0.1 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.01 | -- | 0.01 |
| | | | Chromium | -- | 1E-06 | -- | -- | 1E-06 | Respiratory | -- | 0.01 | -- | 0.01 |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | - - | 0.2 | - - | 0.2 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.2 |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.2 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-07 | -- | - - | -- | 1E-07 | None Reported | 0.0010 | -- | -- | 0.0010 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 1E-07 | -- | - - | -- | 1E-07 | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.01 |
| | Air | SWMU 27 | Chromium | -- | 2E-06 | -- | -- | 2E-06 | Respiratory | -- | 0.02 | -- | 0.02 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.6 | -- | 0.6 |
| | | | Chemical Total | -- | 2E-06 | -- | -- | 2E-06 | | - - | 0.7 | - - | 0.7 |
| | | Exposure Point Total | | | | | | 2E-06 | | | | | 0.7 |
| | Exposure Medium Total | | | | | | | 2E-06 | | | | | 0.7 |
| Medium Total | | | | | | | | 3E-06 | | | | | 0.7 |
| Receptor Total | | | | | | | Receptor Risk Total | 4E-06 | | | | Receptor HI Total | 0.8 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB029 | 27SB029 | 27SB029 | Ethylbenzene | 7E-09 | -- | -- | -- | 7E-09 | Liver, Kidney | 0.0004 | -- | -- | 0.0004 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 0.0003 | -- | -- | 0.0003 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0005 | -- | -- | 0.0005 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.002 | -- | 0.0001 | 0.002 |
| | | | Chromium | 3E-07 | -- | -- | -- | 3E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.004 | -- | -- | 0.004 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.004 | -- | -- | 0.004 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | 3E-07 | -- | -- | -- | 3E-07 | | 0.02 | -- | 0.0001 | 0.02 |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | 0.02 |
| | Air | 27SB029 | Ethylbenzene | -- | 4E-08 | -- | -- | 4E-08 | Developmental | -- | 0.0001 | -- | 0.0001 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.009 | -- | 0.009 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Cadmium | -- | 5E-12 | -- | -- | 5E-12 | Kidney, Respiratory | -- | 0.000009 | -- | 0.000009 |
| | | | Chromium | -- | 5E-09 | -- | -- | 5E-09 | Respiratory | -- | 0.00004 | -- | 0.00004 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-08 | -- | -- | 4E-08 | | -- | 0.009 | -- | 0.009 |
| | | Exposure Point Total | | | | | | 4E-08 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 4E-08 | | | | | 0.009 |
| Medium Total | | | | | | | | 3E-07 | | | | | 0.02 |
| 27SB030 | 27SB030 | 27SB030 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0009 | -- | -- | 0.0009 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.0005 | -- | 0.00004 | 0.0006 |
| | | | Chromium | 2E-08 | -- | -- | -- | 2E-08 | None Reported | 0.0001 | -- | -- | 0.0001 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.007 | -- | -- | 0.007 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.001 | -- | -- | 0.001 |
| | | | Chemical Total | 2E-08 | -- | -- | -- | 2E-08 | | 0.01 | -- | 0.00004 | 0.01 |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | 0.01 |
| | Air | 27SB030 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | -- | -- | -- |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney, Respiratory | -- | -- | -- | -- |
| | | | Chromium | -- | -- | -- | -- | -- | Respiratory | -- | -- | -- | -- |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | -- | -- | -- |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | -- | -- | -- |
| | | Exposure Point Total | | | | | | -- | | | | | -- |
| | Exposure Medium Total | | | | | | | -- | | | | | -- |
| Medium Total | | | | | | | | 2E-08 | | | | | 0.01 |

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB031 | 27SB031 | 27SB031 | Ethylbenzene | 4E-11 | -- | -- | -- | 4E-11 | Liver, Kidney | 0.000003 | -- | -- | 0.000003 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 0.000001 | -- | -- | 0.000001 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.002 | -- | 0.0002 | 0.002 |
| | | | Chromium | 6E-08 | -- | -- | -- | 6E-08 | None Reported | 0.0004 | -- | -- | 0.0004 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.02 | -- | -- | 0.02 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.7 | -- | -- | 0.7 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.003 | -- | -- | 0.003 |
| | | | Chemical Total | 6E-08 | -- | -- | -- | 6E-08 | | 0.8 | -- | 0.0002 | 0.8 |
| | | Exposure Point Total | | | | | | 6E-08 | | | | | 0.8 |
| | Exposure Medium Total | | | | | | | 6E-08 | | | | | 0.8 |
| | Air | 27SB031 | Ethylbenzene | -- | 2E-10 | -- | -- | 2E-10 | Developmental | -- | 0.0000007 | -- | 0.0000007 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.0001 | -- | 0.0001 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00003 | -- | 0.00003 |
| | | | Cadmium | -- | 6E-12 | -- | -- | 6E-12 | Kidney, Respiratory | -- | 0.00001 | -- | 0.00001 |
| | | | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.000009 | -- | 0.000009 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.04 | -- | 0.04 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | -- | 0.04 | -- | 0.04 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.04 |
| Medium Total | | | | | | | | 6E-08 | | | | | 0.8 |
| 27SB032 | 27SB032 | 27SB032 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0002 | -- | -- | 0.0002 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.04 | -- | -- | 0.04 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 1 | -- | -- | 1 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.009 | -- | -- | 0.009 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 1 | -- | -- | 1 |
| | | Exposure Point Total | | | | | | -- | | | | | 1 |
| | Exposure Medium Total | | | | | | | -- | | | | | 1 |
| | Air | 27SB032 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.000005 | -- | 0.000005 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.07 | -- | 0.07 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.07 | -- | 0.07 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.07 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.07 |
| Medium Total | | | | | | | | -- | | | | | 1 |

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB033 | 27SB033 | 27SB033 | Ethylbenzene | 9E-14 | -- | -- | -- | 9E-14 | Liver, Kidney | 6E-09 | -- | -- | 6E-09 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 6E-09 | -- | -- | 6E-09 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0005 | -- | -- | 0.0005 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.002 | -- | -- | 0.002 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.8 | -- | -- | 0.8 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.006 | -- | -- | 0.006 |
| | | | Chemical Total | 9E-14 | -- | -- | -- | 9E-14 | | 0.8 | -- | -- | 0.8 |
| | | Exposure Point Total | | | | | | 9E-14 | | | | | 0.8 |
| | Exposure Medium Total | | | | | | | 9E-14 | | | | | 0.8 |
| | Air | 27SB033 | Ethylbenzene | -- | 5E-13 | -- | -- | 5E-13 | Developmental | -- | 2E-09 | -- | 2E-09 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.0000006 | -- | 0.0000006 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.04 | -- | 0.04 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 5E-13 | -- | -- | 5E-13 | | -- | 0.04 | -- | 0.04 |
| | | Exposure Point Total | | | | | | 5E-13 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 5E-13 | | | | | 0.04 |
| Medium Total | | | | | | | | 9E-14 | | | | | 0.8 |
| 27SB034 | 27SB034 | 27SB034 | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 6E-09 | -- | -- | 6E-09 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.001 | -- | 0.00009 | 0.001 |
| | | | Chromium | 4E-08 | -- | -- | -- | 4E-08 | None Reported | 0.0003 | -- | -- | 0.0003 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.002 | -- | -- | 0.002 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.01 | -- | -- | 0.01 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.001 | -- | -- | 0.001 |
| | | | Chemical Total | 4E-08 | -- | -- | -- | 4E-08 | | 0.02 | -- | 0.00009 | 0.02 |
| | | Exposure Point Total | | | | | | 4E-08 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 4E-08 | | | | | 0.02 |
| | Air | 27SB034 | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.0000006 | -- | 0.0000006 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00003 | -- | 0.00003 |
| | | | Cadmium | -- | 3E-12 | -- | -- | 3E-12 | Kidney, Respiratory | -- | 0.000006 | -- | 0.000006 |
| | | | Chromium | -- | 8E-10 | -- | -- | 8E-10 | Respiratory | -- | 0.000006 | -- | 0.000006 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.0008 | -- | 0.0008 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 8E-10 | -- | -- | 8E-10 | | -- | 0.0008 | -- | 0.0008 |
| | | Exposure Point Total | | | | | | 8E-10 | | | | | 0.0008 |
| | Exposure Medium Total | | | | | | | 8E-10 | | | | | 0.0008 |
| Medium Total | | | | | | | | 4E-08 | | | | | 0.02 |

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB035 | 27SB035 | 27SB035 | Ethylbenzene | 4E-14 | -- | -- | -- | 4E-14 | Liver, Kidney | 3E-09 | -- | -- | 3E-09 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | Body Weight | 2E-09 | -- | -- | 2E-09 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | 0.001 | -- | -- | 0.001 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.003 | -- | 0.0002 | 0.003 |
| | | | Chromium | 1E-08 | -- | -- | -- | 1E-08 | None Reported | 0.0001 | -- | -- | 0.0001 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.0009 | -- | -- | 0.0009 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.0004 | -- | -- | 0.0004 |
| | | | Chemical Total | 1E-08 | -- | -- | -- | 1E-08 | | 0.007 | -- | 0.0002 | 0.007 |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | 0.007 |
| | Air | 27SB035 | Ethylbenzene | -- | 2E-13 | -- | -- | 2E-13 | Developmental | -- | 7E-10 | -- | 7E-10 |
| | | | Total Xylenes | -- | -- | -- | -- | -- | CNS | -- | 0.0000002 | -- | 0.0000002 |
| | | | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00002 | -- | 0.00002 |
| | | | Cadmium | -- | 8E-12 | -- | -- | 8E-12 | Kidney, Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Chromium | -- | 3E-10 | -- | -- | 3E-10 | Respiratory | -- | 0.000002 | -- | 0.000002 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.00009 | -- | 0.00009 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | -- | 0.0001 | -- | 0.0001 |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | 0.0001 |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | 0.0001 |
| Medium Total | | | | | | | | 1E-08 | | | | | 0.007 |
| 27SB056 | 27SB056 | 27SB056 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.001 | -- | -- | 0.001 |
| | | | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.001 | -- | 0.00009 | 0.001 |
| | | | Copper | -- | -- | -- | -- | -- | GS | 0.003 | -- | -- | 0.003 |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.4 | -- | -- | 0.4 |
| | | | Zinc | -- | -- | -- | -- | -- | Blood | 0.004 | -- | -- | 0.004 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.4 | -- | 0.00009 | 0.4 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.4 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.4 |
| | Air | 27SB056 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00002 | -- | 0.00002 |
| | | | Cadmium | -- | 3E-12 | -- | -- | 3E-12 | Kidney, Respiratory | -- | 0.000006 | -- | 0.000006 |
| | | | Copper | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Lead | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.02 | -- | 0.02 |
| | | | Zinc | -- | -- | -- | -- | -- | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 3E-12 | -- | -- | 3E-12 | | -- | 0.02 | -- | 0.02 |
| | | Exposure Point Total | | | | | | 3E-12 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 3E-12 | | | | | 0.02 |
| Medium Total | | | | | | | | 3E-12 | | | | | 0.5 |

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA


Scenario Timeframe: Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| 27SB057 | 27SB057 | 27SB057 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.0008 | -- | -- | 0.0008 |
| | | | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.002 | -- | 0.0001 | 0.002 |
| | | | Copper | - - | -- | - - | -- | - - | GS | 0.008 | -- | -- | 0.008 |
| | | | Lead | - - | -- | - - | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 2 | -- | -- | 2 |
| | | | Zinc | - - | -- | - - | -- | - - | Blood | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 2 | -- | 0.0001 | 2 |
| | | Exposure Point Total | | | | | | - - | | | | | 2 |
| | Exposure Medium Total | | | | | | | - - | | | | | 2 |
| | Air | 27SB057 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00002 | -- | 0.00002 |
| | | | Cadmium | -- | 4E-12 | -- | -- | 4E-12 | Kidney, Respiratory | -- | 0.000008 | -- | 0.000008 |
| | | | Copper | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Lead | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.09 | -- | 0.09 |
| | | | Zinc | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 4E-12 | -- | -- | 4E-12 | | - - | 0.09 | - - | 0.09 |
| | | Exposure Point Total | | | | | | 4E-12 | | | | | 0.09 |
| | Exposure Medium Total | | | | | | | 4E-12 | | | | | 0.09 |
| Medium Total | | | | | | | | 4E-12 | | | | | 2 |
| 27SB066 | 27SB066 | 27SB066 | Total Xylenes | - - | -- | - - | -- | - - | Body Weight | 0.00000002 | -- | -- | 0.00000002 |
| | | | Aluminum | - - | -- | - - | -- | - - | CNS | 0.003 | -- | -- | 0.003 |
| | | | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.02 | -- | 0.002 | 0.02 |
| | | | Chromium | 7E-07 | -- | - - | -- | 7E-07 | None Reported | 0.005 | -- | -- | 0.005 |
| | | | Copper | - - | -- | - - | -- | - - | GS | 0.01 | -- | -- | 0.01 |
| | | | Lead | - - | -- | - - | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.0003 | -- | -- | 0.0003 |
| | | | Zinc | - - | -- | - - | -- | - - | Blood | 0.003 | -- | -- | 0.003 |
| | | | Chemical Total | 7E-07 | -- | - - | -- | 7E-07 | | 0.04 | -- | 0.002 | 0.04 |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | 0.04 |
| | Air | 27SB066 | Total Xylenes | -- | - - | -- | -- | - - | CNS | -- | 0.000002 | -- | 0.000002 |
| | | | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00006 | -- | 0.00006 |
| | | | Cadmium | -- | 6E-11 | -- | -- | 6E-11 | Kidney, Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Chromium | -- | 1E-08 | -- | -- | 1E-08 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Copper | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Lead | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.00002 | -- | 0.00002 |
| | | | Zinc | -- | - - | -- | -- | - - | NA | -- | -- | -- | -- |
| | | | Chemical Total | -- | 1E-08 | -- | -- | 1E-08 | | - - | 0.0003 | - - | 0.0003 |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | 0.0003 |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | 0.0003 |
| Medium Total | | | | | | | | 7E-07 | | | | | 0.05 |
| Receptor Total | | | | | | | Receptor Risk Total | 1E-06 | | | | Receptor HI Total | 5 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.002 | -- | -- | 0.002 |
| | | | Chromium | 6E-07 | -- | - - | -- | 6E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Chemical Total | 6E-07 | -- | - - | -- | 6E-07 | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.01 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.0004 | -- | 0.0004 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.0003 | -- | 0.0003 |
| | | | Chromium | -- | 3E-08 | -- | -- | 3E-08 | Respiratory | -- | 0.00003 | -- | 0.00003 |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | - - | 0.0007 | - - | 0.0007 |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | 0.0007 |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | 0.0007 |
| Medium Total | | | | | | | | 6E-07 | | | | | 0.01 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-06 | -- | - - | -- | 1E-06 | None Reported | 0.006 | -- | -- | 0.006 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 1E-06 | -- | - - | -- | 1E-06 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Chromium | -- | 7E-08 | -- | -- | 7E-08 | Respiratory | -- | 0.00006 | -- | 0.00006 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | 7E-08 | -- | -- | 7E-08 | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | 7E-08 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 7E-08 | | | | | 0.002 |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.003 | -- | -- | 0.003 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.001 | -- | -- | 0.001 |
| | | | Chromium | 4E-07 | -- | - - | -- | 4E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | 4E-07 | -- | - - | -- | 4E-07 | | 0.006 | -- | -- | 0.006 |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | 0.006 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.000009 | -- | 0.000009 |
| | | | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.0000009 | -- | 0.0000009 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | 0.00002 | - - | 0.00002 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.00002 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.00002 |
| Medium Total | | | | | | | | 4E-07 | | | | | 0.006 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 9E-07 | -- | - - | -- | 9E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Chemical Total | 9E-07 | -- | - - | -- | 9E-07 | | 0.009 | -- | -- | 0.009 |
| | | Exposure Point Total | | | | | | 9E-07 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 9E-07 | | | | | 0.009 |
| | Air | SWMU 27 | Chromium | -- | 3E-09 | -- | -- | 3E-09 | Respiratory | -- | 0.000002 | -- | 0.000002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.00006 | -- | 0.00006 |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | - - | 0.00006 | - - | 0.00006 |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | 0.00006 |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | 0.00006 |
| Medium Total | | | | | | | | 9E-07 | | | | | 0.009 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.0003 | -- | -- | 0.0003 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.0001 | -- | -- | 0.0001 |
| | | | Chromium | 4E-08 | -- | - - | -- | 4E-08 | None Reported | 0.0002 | -- | -- | 0.0002 |
| | | | Chemical Total | 4E-08 | -- | - - | -- | 4E-08 | | 0.0006 | -- | -- | 0.0006 |
| | | Exposure Point Total | | | | | | 4E-08 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | 4E-08 | | | | | 0.0006 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.000009 | -- | 0.000009 |
| | | | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.0000009 | -- | 0.0000009 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | 0.00002 | - - | 0.00002 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.00002 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.00002 |
| Medium Total | | | | | | | | 4E-08 | | | | | 0.0007 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 8E-08 | -- | - - | -- | 8E-08 | None Reported | 0.0003 | -- | -- | 0.0003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.0007 | -- | -- | 0.0007 |
| | | | Chemical Total | 8E-08 | -- | - - | -- | 8E-08 | | 0.001 | -- | -- | 0.001 |
| | | Exposure Point Total | | | | | | 8E-08 | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | 8E-08 | | | | | 0.001 |
| | Air | SWMU 27 | Chromium | -- | 2E-09 | -- | -- | 2E-09 | Respiratory | -- | 0.000002 | -- | 0.000002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.00006 | -- | 0.00006 |
| | | | Chemical Total | -- | 2E-09 | -- | -- | 2E-09 | | - - | 0.00006 | - - | 0.00006 |
| | | Exposure Point Total | | | | | | 2E-09 | | | | | 0.00006 |
| | Exposure Medium Total | | | | | | | 2E-09 | | | | | 0.00006 |
| Medium Total | | | | | | | | 8E-08 | | | | | 0.001 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Barium | - - | -- | - - | -- | - - | | | | | |
| | | | Chromium | 5E-07 | -- | - - | -- | 5E-07 | | | | | |
| | | | Chemical Total | 5E-07 | -- | - - | -- | 5E-07 | | | | | |
| | | Exposure Point Total | | | | | | 5E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 5E-07 | | | | | |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | | | | | |
| | | | Barium | -- | - - | -- | -- | - - | | | | | |
| | | | Chromium | -- | 3E-09 | -- | -- | 3E-09 | | | | | |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | | | | |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | |
| Medium Total | | | | | | | | 5E-07 | | | | | |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-06 | -- | - - | -- | 1E-06 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 1E-06 | -- | - - | -- | 1E-06 | | | | | |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | |
| | Air | SWMU 27 | Chromium | -- | 5E-09 | -- | -- | 5E-09 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 5E-09 | -- | -- | 5E-09 | | | | | |
| | | Exposure Point Total | | | | | | 5E-09 | | | | | |
| | Exposure Medium Total | | | | | | | 5E-09 | | | | | |
| Medium Total | | | | | | | | 1E-06 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.06 | -- | -- | 0.06 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.02 | -- | -- | 0.02 |
| | | | Chromium | 8E-06 | -- | - - | -- | 8E-06 | None Reported | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | 8E-06 | -- | - - | -- | 8E-06 | | 0.1 | -- | -- | 0.1 |
| | | Exposure Point Total | | | | | | 8E-06 | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | 8E-06 | | | | | 0.1 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.0010 | -- | 0.0010 |
| | | | Chromium | -- | 2E-07 | -- | -- | 2E-07 | Respiratory | -- | 0.00010 | -- | 0.00010 |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 0.002 |
| Medium Total | | | | | | | | 8E-06 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 2E-05 | -- | - - | -- | 2E-05 | None Reported | 0.06 | -- | -- | 0.06 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.1 | -- | -- | 0.1 |
| | | | Chemical Total | 2E-05 | -- | - - | -- | 2E-05 | | 0.2 | -- | -- | 0.2 |
| | | Exposure Point Total | | | | | | 2E-05 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 2E-05 | | | | | 0.2 |
| | Air | SWMU 27 | Chromium | -- | 3E-07 | -- | -- | 3E-07 | Respiratory | -- | 0.0002 | -- | 0.0002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.006 | -- | 0.006 |
| | | | Chemical Total | -- | 3E-07 | -- | -- | 3E-07 | | - - | 0.006 | - - | 0.006 |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | 0.006 |
| Medium Total | | | | | | | | 2E-05 | | | | | 0.2 |

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

| | |
|---|---|
| Total CNS HI | 0.2 |
| Total Fetotoxicity HI | 0.0010 |
| Total Kidney HI | 0.02 |
| Total Respiratory HI | 0.0003 |
| Total None Reported HI | 0.09 |

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Barium | - - | -- | - - | -- | - - | Kidney | 0.002 | -- | -- | 0.002 |
| | | | Chromium | 7E-07 | -- | - - | -- | 7E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Chemical Total | 7E-07 | -- | - - | -- | 7E-07 | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | 0.01 |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Barium | -- | - - | -- | -- | - - | Fetotoxicity | -- | 0.0010 | -- | 0.0010 |
| | | | Chromium | -- | 1E-07 | -- | -- | 1E-07 | Respiratory | -- | 0.00010 | -- | 0.00010 |
| | | | Chemical Total | -- | 1E-07 | -- | -- | 1E-07 | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.002 |
| Medium Total | | | | | | | | 8E-07 | | | | | 0.01 |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 1E-06 | -- | - - | -- | 1E-06 | None Reported | 0.006 | -- | -- | 0.006 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 1E-06 | -- | - - | -- | 1E-06 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.02 |
| | Air | SWMU 27 | Chromium | -- | 3E-07 | -- | -- | 3E-07 | Respiratory | -- | 0.0002 | -- | 0.0002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.006 | -- | 0.006 |
| | | | Chemical Total | -- | 3E-07 | -- | -- | 3E-07 | | - - | 0.006 | - - | 0.006 |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | 0.006 |
| Medium Total | | | | | | | | 2E-06 | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | SWMU 27 | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Barium | - - | -- | - - | -- | - - | | | | | |
| | | | Chromium | 9E-06 | -- | - - | -- | 9E-06 | | | | | |
| | | | Chemical Total | 9E-06 | -- | - - | -- | 9E-06 | | | | | |
| | | Exposure Point Total | | | | | | 9E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 9E-06 | | | | | |
| | Air | SWMU 27 | Aluminum | -- | - - | -- | -- | - - | | | | | |
| | | | Barium | -- | - - | -- | -- | - - | | | | | |
| | | | Chromium | -- | 3E-07 | -- | -- | 3E-07 | | | | | |
| | | | Chemical Total | -- | 3E-07 | -- | -- | 3E-07 | | | | | |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | |
| Medium Total | | | | | | | | 9E-06 | | | | | |
| Subsurface Soil | Subsurface Soil | SWMU 27 | Chromium | 2E-05 | -- | - - | -- | 2E-05 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 2E-05 | -- | - - | -- | 2E-05 | | | | | |
| | | Exposure Point Total | | | | | | 2E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 2E-05 | | | | | |
| | Air | SWMU 27 | Chromium | -- | 6E-07 | -- | -- | 6E-07 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 6E-07 | -- | -- | 6E-07 | | | | | |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | |
| Medium Total | | | | | | | | 2E-05 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.10.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.007 | -- | -- | 0.007 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.007 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.2 | -- | 0.2 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.2 | -- | 0.2 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.11.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.006 | -- | -- | 0.006 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.006 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.0005 | -- | 0.0005 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.0005 | - - | 0.0005 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.0005 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.0005 |
| Medium Total | | | | | | | | - - | | | | | 0.007 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.12.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.004 | -- | -- | 0.004 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.004 | -- | -- | 0.004 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.004 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.00001 | - - | 0.00001 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.00001 |
| Medium Total | | | | | | | | - - | | | | | 0.004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

* TABLE 9.13.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0004 | -- | -- | 0.0004 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.0004 | -- | -- | 0.0004 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.0004 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.0004 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.00001 | -- | 0.00001 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.00001 |
| Medium Total | | | | | | | | -- | | | | | 0.0004 |
| Receptor Total | | | | | | | Receptor Risk Total | -- | | | | Receptor HI Total | 0.0004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.14.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.06 | -- | -- | 0.06 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.06 | -- | -- | 0.06 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.06 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.06 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.001 | - - | 0.001 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | - - | | | | | 0.07 |
| Receptor Total | | | | | | | Receptor Risk Total | - - | | | | Receptor HI Total | 0.07 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.15.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.007 | -- | -- | 0.007 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.007 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.001 | - - | 0.001 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | - - | | | | | 0.008 |
| Receptor Total | | | | | | | Receptor Risk Total | - - | | | | Receptor HI Total | 0.008 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

# APPENDIX F.3

# PROUCL OUTPUTS

# Investigation Area 1
# Surface Soil

| | General UCL Statistics for Data Sets with Non-Detects |
|---|---|
| User Selected Options | |
| From File | C:\Work Folders\Projects\Crane\SWMU 27\Revised HHRA\EPCs\ProUCL Data - IA1 - Surface Soil.xls.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

**CADMIUM**

| General Statistics | | | |
|---|---|---|---|
| Number of Valid Data | 21 | Number of Detected Data | 17 |
| Number of Distinct Detected Data | 17 | Number of Non-Detect Data | 4 |
| | | Percent Non-Detects | 19.05% |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum Detected | 0.0786 | Minimum Detected | -2.543 |
| Maximum Detected | 7.655 | Maximum Detected | 2.035 |
| Mean of Detected | 1.14 | Mean of Detected | -0.506 |
| SD of Detected | 1.782 | SD of Detected | 1.112 |
| Minimum Non-Detect | 0.126 | Minimum Non-Detect | -2.071 |
| Maximum Non-Detect | 1.26 | Maximum Non-Detect | 0.231 |
| | | | |
| Note: Data have multiple DLs - Use of KM Method is recommended | | Number treated as Non-Detect | 17 |
| For all methods (except KM, DL/2, and ROS Methods), | | Number treated as Detected | 4 |
| Observations < Largest ND are treated as NDs | | Single DL Non-Detect Percentage | 80.95% |

| UCL Statistics | | | |
|---|---|---|---|
| Normal Distribution Test with Detected Values Only | | Lognormal Distribution Test with Detected Values Only | |
| Shapiro Wilk Test Statistic | 0.545 | Shapiro Wilk Test Statistic | 0.978 |
| 5% Shapiro Wilk Critical Value | 0.892 | 5% Shapiro Wilk Critical Value | 0.892 |
| Data not Normal at 5% Significance Level | | Data appear Lognormal at 5% Significance Level | |
| | | | |
| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
| DL/2 Substitution Method | | DL/2 Substitution Method | |
| Mean | 0.973 | Mean | -0.75 |
| SD | 1.636 | SD | 1.202 |
| 95% DL/2 (t) UCL | 1.588 | 95% H-Stat (DL/2) UCL | 2.095 |
| | | | |
| Maximum Likelihood Estimate(MLE) Method | N/A | Log ROS Method | |
| MLE yields a negative mean | | Mean in Log Scale | -0.752 |
| | | SD in Log Scale | 1.146 |
| | | Mean in Original Scale | 0.959 |
| | | SD in Original Scale | 1.639 |
| | | 95% t UCL | 1.576 |
| | | 95% Percentile Bootstrap UCL | 1.602 |
| | | 95% BCA Bootstrap UCL | 2.001 |
| | | 95% H-UCL | 1.851 |

CADMIUM (Continued)

| Gamma Distribution Test with Detected Values Only | | Data Distribution Test with Detected Values Only | |
|---|---|---|---|
| k star (bias corrected) | 0.794 | Data appear Gamma Distributed at 5% Significance Level | |
| Theta Star | 1.437 | | |
| nu star | 26.98 | | |
| | | | |
| A-D Test Statistic | 0.69 | Nonparametric Statistics | |
| 5% A-D Critical Value | 0.769 | Kaplan-Meier (KM) Method | |
| K-S Test Statistic | 0.769 | Mean | 0.965 |
| 5% K-S Critical Value | 0.216 | SD | 1.599 |
| Data appear Gamma Distributed at 5% Significance Level | | SE of Mean | 0.36 |
| | | 95% KM (t) UCL | 1.586 |
| Assuming Gamma Distribution | | 95% KM (z) UCL | 1.557 |
| Gamma ROS Statistics using Extrapolated Data | | 95% KM (jackknife) UCL | 1.582 |
| Minimum | 0.000001 | 95% KM (bootstrap t) UCL | 2.754 |
| Maximum | 7.655 | 95% KM (BCA) UCL | 1.613 |
| Mean | 0.941 | 95% KM (Percentile Bootstrap) UCL | 1.592 |
| Median | 0.55 | 95% KM (Chebyshev) UCL | 2.535 |
| SD | 1.65 | 97.5% KM (Chebyshev) UCL | 3.214 |
| k star | 0.282 | 99% KM (Chebyshev) UCL | 4.548 |
| Theta star | 3.333 | | |
| Nu star | 11.86 | Potential UCLs to Use | |
| AppChi2 | 5.135 | 95% KM (Chebyshev) UCL | 2.535 |
| 95% Gamma Approximate UCL (Use when n >= 40) | 2.174 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 2.327 | | |

Note: DL/2 is not a recommended method.

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
For additional insight, the user may want to consult a statistician.

| | |
|---|---|
| | General UCL Statistics for Full Data Sets |
| User Selected Options | |
| From File | C:\Work Folders\Projects\Crane\SWMU 27\Revised HHRA\EPCs\ProUCL Data - IA1 - Surface Soil.xls.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

ALUMINUM

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 21 | Number of Distinct Observations | 19 |
| **Raw Statistics** | | **Log-transformed Statistics** | |
| Minimum | 6890 | Minimum of Log Data | 8.838 |
| Maximum | 21400 | Maximum of Log Data | 9.971 |
| Mean | 11662 | Mean of log Data | 9.31 |
| Geometric Mean | 11053 | SD of log Data | 0.334 |
| Median | 10900 | | |
| SD | 4002 | | |
| Std. Error of Mean | 873.2 | | |
| Coefficient of Variation | 0.343 | | |
| Skewness | 0.799 | | |

Relevant UCL Statistics

| | | | |
|---|---|---|---|
| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
| Shapiro Wilk Test Statistic | 0.929 | Shapiro Wilk Test Statistic | 0.956 |
| Shapiro Wilk Critical Value | 0.908 | Shapiro Wilk Critical Value | 0.908 |
| **Data appear Normal at 5% Significance Level** | | **Data appear Lognormal at 5% Significance Level** | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 13168 | 95% H-UCL | 13420 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 15415 |
| 95% Adjusted-CLT UCL (Chen-1995) | 13261 | 97.5% Chebyshev (MVUE) UCL | 17042 |
| 95% Modified-t UCL (Johnson-1978) | 13193 | 99% Chebyshev (MVUE) UCL | 20240 |
| **Gamma Distribution Test** | | **Data Distribution** | |
| k star (bias corrected) | 8.163 | **Data appear Normal at 5% Significance Level** | |
| Theta Star | 1429 | | |
| MLE of Mean | 11662 | | |
| MLE of Standard Deviation | 4082 | | |
| nu star | 342.8 | | |
| Approximate Chi Square Value (.05) | 300.9 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0383 | 95% CLT UCL | 13098 |
| Adjusted Chi Square Value | 297.9 | 95% Jackknife UCL | 13168 |
| | | 95% Standard Bootstrap UCL | 13056 |
| Anderson-Darling Test Statistic | 0.345 | 95% Bootstrap-t UCL | 13480 |
| Anderson-Darling 5% Critical Value | 0.743 | 95% Hall's Bootstrap UCL | 13401 |
| Kolmogorov-Smirnov Test Statistic | 0.144 | 95% Percentile Bootstrap UCL | 13009 |
| Kolmogorov-Smirnov 5% Critical Value | 0.189 | 95% BCA Bootstrap UCL | 13209 |
| **Data appear Gamma Distributed at 5% Significance Level** | | 95% Chebyshev(Mean, Sd) UCL | 15468 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 17115 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 20350 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 13286 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 13420 | | |
| **Potential UCL to Use** | | Use 95% Student's-t UCL | 13168 |

**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**

BARIUM

| General Statistics | | | |
|---|---|---|---|
| Number of Valid Observations | 21 | Number of Distinct Observations | 20 |
| **Raw Statistics** | | **Log-transformed Statistics** | |
| Minimum | 77.5 | Minimum of Log Data | 4.35 |
| Maximum | 2300 | Maximum of Log Data | 7.741 |
| Mean | 388.1 | Mean of log Data | 5.238 |
| Geometric Mean | 188.4 | SD of log Data | 1.054 |
| Median | 112 | | |
| SD | 648.7 | | |
| Std. Error of Mean | 141.6 | | |
| Coefficient of Variation | 1.672 | | |
| Skewness | 2.678 | | |

| Relevant UCL Statistics | | | |
|---|---|---|---|
| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
| Shapiro Wilk Test Statistic | 0.513 | Shapiro Wilk Test Statistic | 0.79 |
| Shapiro Wilk Critical Value | 0.908 | Shapiro Wilk Critical Value | 0.908 |
| **Data not Normal at 5% Significance Level** | | **Data not Lognormal at 5% Significance Level** | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 632.2 | 95% H-UCL | 611.7 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 674.9 |
| 95% Adjusted-CLT UCL (Chen-1995) | 709.3 | 97.5% Chebyshev (MVUE) UCL | 830.2 |
| 95% Modified-t UCL (Johnson-1978) | 646 | 99% Chebyshev (MVUE) UCL | 1135 |
| **Gamma Distribution Test** | | **Data Distribution** | |
| k star (bias corrected) | 0.733 | **Data do not follow a Discernable Distribution (0.05)** | |
| Theta Star | 529.2 | | |
| MLE of Mean | 388.1 | | |
| MLE of Standard Deviation | 453.2 | | |
| nu star | 30.8 | | |
| Approximate Chi Square Value (.05) | 19.12 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0383 | 95% CLT UCL | 620.9 |
| Adjusted Chi Square Value | 18.42 | 95% Jackknife UCL | 632.2 |
| | | 95% Standard Bootstrap UCL | 619.5 |
| Anderson-Darling Test Statistic | 2.537 | 95% Bootstrap-t UCL | 1349 |
| Anderson-Darling 5% Critical Value | 0.779 | 95% Hall's Bootstrap UCL | 1715 |
| Kolmogorov-Smirnov Test Statistic | 0.275 | 95% Percentile Bootstrap UCL | 628 |
| Kolmogorov-Smirnov 5% Critical Value | 0.196 | 95% BCA Bootstrap UCL | 722.8 |
| **Data not Gamma Distributed at 5% Significance Level** | | 95% Chebyshev(Mean, Sd) UCL | 1005 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 1272 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 1797 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 625.1 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 649 | | |
| **Potential UCL to Use** | | Use 95% Chebyshev (Mean, Sd) UCL | 1005 |

**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**

CHROMIUM

| General Statistics | | | |
|---|---|---|---|
| Number of Valid Observations | 21 | Number of Distinct Observations | 20 |
| **Raw Statistics** | | **Log-transformed Statistics** | |
| Minimum | 12 | Minimum of Log Data | 2.485 |
| Maximum | 32.2 | Maximum of Log Data | 3.472 |
| Mean | 17.75 | Mean of log Data | 2.845 |
| Geometric Mean | 17.21 | SD of log Data | 0.251 |
| Median | 17.3 | | |
| SD | 4.788 | | |
| Std. Error of Mean | 1.045 | | |
| Coefficient of Variation | 0.27 | | |
| Skewness | 1.34 | | |

| Relevant UCL Statistics | | | |
|---|---|---|---|
| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
| Shapiro Wilk Test Statistic | 0.891 | Shapiro Wilk Test Statistic | 0.952 |
| Shapiro Wilk Critical Value | 0.908 | Shapiro Wilk Critical Value | 0.908 |
| **Data not Normal at 5% Significance Level** | | **Data appear Lognormal at 5% Significance Level** | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 19.55 | 95% H-UCL | 19.64 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 22 |
| 95% Adjusted-CLT UCL (Chen-1995) | 19.8 | 97.5% Chebyshev (MVUE) UCL | 23.84 |
| 95% Modified-t UCL (Johnson-1978) | 19.6 | 99% Chebyshev (MVUE) UCL | 27.47 |
| **Gamma Distribution Test** | | **Data Distribution** | |
| k star (bias corrected) | 13.95 | **Data appear Gamma Distributed at 5% Significance Level** | |
| Theta Star | 1.273 | | |
| MLE of Mean | 17.75 | | |
| MLE of Standard Deviation | 4.753 | | |
| nu star | 585.8 | | |
| Approximate Chi Square Value (.05) | 530.6 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0383 | 95% CLT UCL | 19.47 |
| Adjusted Chi Square Value | 526.6 | 95% Jackknife UCL | 19.55 |
| | | 95% Standard Bootstrap UCL | 19.43 |
| Anderson-Darling Test Statistic | 0.363 | 95% Bootstrap-t UCL | 20.05 |
| Anderson-Darling 5% Critical Value | 0.743 | 95% Hall's Bootstrap UCL | 20.39 |
| Kolmogorov-Smirnov Test Statistic | 0.101 | 95% Percentile Bootstrap UCL | 19.53 |
| Kolmogorov-Smirnov 5% Critical Value | 0.189 | 95% BCA Bootstrap UCL | 19.78 |
| **Data appear Gamma Distributed at 5% Significance Level** | | 95% Chebyshev(Mean, Sd) UCL | 22.3 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 24.28 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 28.15 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 19.59 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 19.74 | | |
| **Potential UCL to Use** | | Use 95% Approximate Gamma UCL | 19.59 |

**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**

MANGANESE

| General Statistics | | | |
|---|---|---|---|
| Number of Valid Observations | 21 | Number of Distinct Observations | 20 |
| **Raw Statistics** | | **Log-transformed Statistics** | |
| Minimum | 256 | Minimum of Log Data | 5.545 |
| Maximum | 5550 | Maximum of Log Data | 8.622 |
| Mean | 714.9 | Mean of log Data | 6.197 |
| Geometric Mean | 491.1 | SD of log Data | 0.68 |
| Median | 385 | | |
| SD | 1129 | | |
| Std. Error of Mean | 246.3 | | |
| Coefficient of Variation | 1.579 | | |
| Skewness | 4.32 | | |

| Relevant UCL Statistics | | | |
|---|---|---|---|
| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
| Shapiro Wilk Test Statistic | 0.375 | Shapiro Wilk Test Statistic | 0.746 |
| Shapiro Wilk Critical Value | 0.908 | Shapiro Wilk Critical Value | 0.908 |
| **Data not Normal at 5% Significance Level** | | **Data not Lognormal at 5% Significance Level** | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 1140 | 95% H-UCL | 860.2 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 1031 |
| 95% Adjusted-CLT UCL (Chen-1995) | 1368 | 97.5% Chebyshev (MVUE) UCL | 1213 |
| 95% Modified-t UCL (Johnson-1978) | 1178 | 99% Chebyshev (MVUE) UCL | 1571 |
| **Gamma Distribution Test** | | **Data Distribution** | |
| k star (bias corrected) | 1.297 | **Data do not follow a Discernable Distribution (0.05)** | |
| Theta Star | 551.2 | | |
| MLE of Mean | 714.9 | | |
| MLE of Standard Deviation | 627.7 | | |
| nu star | 54.48 | | |
| Approximate Chi Square Value (.05) | 38.52 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0383 | 95% CLT UCL | 1120 |
| Adjusted Chi Square Value | 37.49 | 95% Jackknife UCL | 1140 |
| | | 95% Standard Bootstrap UCL | 1118 |
| Anderson-Darling Test Statistic | 2.826 | 95% Bootstrap-t UCL | 2717 |
| Anderson-Darling 5% Critical Value | 0.759 | 95% Hall's Bootstrap UCL | 2492 |
| Kolmogorov-Smirnov Test Statistic | 0.267 | 95% Percentile Bootstrap UCL | 1179 |
| Kolmogorov-Smirnov 5% Critical Value | 0.193 | 95% BCA Bootstrap UCL | 1489 |
| **Data not Gamma Distributed at 5% Significance Level** | | 95% Chebyshev(Mean, Sd) UCL | 1788 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 2253 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 3165 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 1011 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 1039 | | |
| **Potential UCL to Use** | | Use 95% Chebyshev (Mean, Sd) UCL | 1788 |

**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**

# Investigation Area 1
# Subsurface Soil

PROUCL OUTPUT - INVESTIGATION AREA 1 SUBSURFACE SOIL

| | |
|---|---|
| | General UCL Statistics for Full Data Sets |
| User Selected Options | |
| From File | C:\Work Folders\Projects\Crane\SWMU 27\Revised HHRA\EPCs\ProUCL Data - IA1 Subsurface Soil.xls.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

ALUMINUM

| General Statistics | | | |
|---|---|---|---|
| Number of Valid Observations | 8 | Number of Distinct Observations | 8 |
| **Raw Statistics** | | **Log-transformed Statistics** | |
| Minimum | 2960 | Minimum of Log Data | 7.993 |
| Maximum | 18650 | Maximum of Log Data | 9.834 |
| Mean | 11171 | Mean of log Data | 9.174 |
| Geometric Mean | 9641 | SD of log Data | 0.643 |
| Median | 11450 | | |
| SD | 5399 | | |
| Std. Error of Mean | 1909 | | |
| Coefficient of Variation | 0.483 | | |
| Skewness | -0.316 | | |

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

| Relevant UCL Statistics | | | |
|---|---|---|---|
| **Normal Distribution Test** | | **Lognormal Distribution Test** | |
| Shapiro Wilk Test Statistic | 0.944 | Shapiro Wilk Test Statistic | 0.857 |
| Shapiro Wilk Critical Value | 0.818 | Shapiro Wilk Critical Value | 0.818 |
| Data appear Normal at 5% Significance Level | | Data appear Lognormal at 5% Significance Level | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 14787 | 95% H-UCL | 22392 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 23082 |
| 95% Adjusted-CLT UCL (Chen-1995) | 14083 | 97.5% Chebyshev (MVUE) UCL | 28089 |
| 95% Modified-t UCL (Johnson-1978) | 14752 | 99% Chebyshev (MVUE) UCL | 37924 |
| **Gamma Distribution Test** | | **Data Distribution** | |
| k star (bias corrected) | 2.303 | Data appear Normal at 5% Significance Level | |
| Theta Star | 4851 | | |
| MLE of Mean | 11171 | | |
| MLE of Standard Deviation | 7362 | | |
| nu star | 36.84 | | |
| Approximate Chi Square Value (.05) | 23.95 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0195 | 95% CLT UCL | 14311 |
| Adjusted Chi Square Value | 21.36 | 95% Jackknife UCL | 14787 |
| | | 95% Standard Bootstrap UCL | 14186 |
| Anderson-Darling Test Statistic | 0.49 | 95% Bootstrap-t UCL | 14539 |
| Anderson-Darling 5% Critical Value | 0.72 | 95% Hall's Bootstrap UCL | 14217 |
| Kolmogorov-Smirnov Test Statistic | 0.282 | 95% Percentile Bootstrap UCL | 13989 |
| Kolmogorov-Smirnov 5% Critical Value | 0.296 | 95% BCA Bootstrap UCL | 13856 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 19491 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 23091 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 30162 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 17186 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 19273 | | |
| **Potential UCL to Use** | | Use 95% Student's-t UCL | 14787 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.
Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

CHROMIUM

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 8 | Number of Distinct Observations | 8 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 7.72 | Minimum of Log Data | 2.044 |
| Maximum | 62.6 | Maximum of Log Data | 4.137 |
| Mean | 23.53 | Mean of log Data | 2.967 |
| Geometric Mean | 19.44 | SD of log Data | 0.629 |
| Median | 16.75 | | |
| SD | 17.66 | | |
| Std. Error of Mean | 6.242 | | |
| Coefficient of Variation | 0.75 | | |
| Skewness | 1.92 | | |

Warning: There are only 8 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.751 | Shapiro Wilk Test Statistic | 0.908 |
| Shapiro Wilk Critical Value | 0.818 | Shapiro Wilk Critical Value | 0.818 |
| Data not Normal at 5% Significance Level | | Data appear Lognormal at 5% Significance Level | |
| | | | |
| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
| 95% Student's-t UCL | 35.35 | 95% H-UCL | 43.85 |
| 95% UCLs (Adjusted for Skewness) | | 95% Chebyshev (MVUE) UCL | 45.69 |
| 95% Adjusted-CLT UCL (Chen-1995) | 38.32 | 97.5% Chebyshev (MVUE) UCL | 55.49 |
| 95% Modified-t UCL (Johnson-1978) | 36.06 | 99% Chebyshev (MVUE) UCL | 74.74 |
| | | | |
| Gamma Distribution Test | | Data Distribution | |
| k star (bias corrected) | 1.818 | Data Follow Appr. Gamma Distribution at 5% Significance Level | |
| Theta Star | 12.94 | | |
| MLE of Mean | 23.53 | | |
| MLE of Standard Deviation | 17.45 | | |
| nu star | 29.09 | | |
| Approximate Chi Square Value (.05) | 17.78 | Nonparametric Statistics | |
| Adjusted Level of Significance | 0.0195 | 95% CLT UCL | 33.8 |
| Adjusted Chi Square Value | 15.58 | 95% Jackknife UCL | 35.35 |
| | | 95% Standard Bootstrap UCL | 33.17 |
| Anderson-Darling Test Statistic | 0.656 | 95% Bootstrap-t UCL | 66.94 |
| Anderson-Darling 5% Critical Value | 0.722 | 95% Hall's Bootstrap UCL | 108 |
| Kolmogorov-Smirnov Test Statistic | 0.318 | 95% Percentile Bootstrap UCL | 34.17 |
| Kolmogorov-Smirnov 5% Critical Value | 0.297 | 95% BCA Bootstrap UCL | 37.48 |
| Data follow Appr. Gamma Distribution at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 50.74 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 62.51 |
| Assuming Gamma Distribution | | 99% Chebyshev(Mean, Sd) UCL | 85.64 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 38.5 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 43.92 | | |
| | | | |
| Potential UCL to Use | | Use 95% Approximate Gamma UCL | 38.5 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

MANGANESE

| General Statistics | | | |
|---|---|---|---|
| Number of Valid Observations | 8 | Number of Distinct Observations | 8 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 122 | Minimum of Log Data | 4.804 |
| Maximum | 900 | Maximum of Log Data | 6.802 |
| Mean | 439.9 | Mean of log Data | 5.882 |
| Geometric Mean | 358.5 | SD of log Data | 0.714 |
| Median | 416.5 | | |
| SD | 280.7 | | |
| Std. Error of Mean | 99.25 | | |
| Coefficient of Variation | 0.638 | | |
| Skewness | 0.581 | | |

Warning: There are only 8 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.928 | Shapiro Wilk Test Statistic | 0.951 |
| Shapiro Wilk Critical Value | 0.818 | Shapiro Wilk Critical Value | 0.818 |
| Data appear Normal at 5% Significance Level | | Data appear Lognormal at 5% Significance Level | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 627.9 | 95% H-UCL | 975.4 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 944.2 |
| 95% Adjusted-CLT UCL (Chen-1995) | 624.9 | 97.5% Chebyshev (MVUE) UCL | 1160 |
| 95% Modified-t UCL (Johnson-1978) | 631.3 | 99% Chebyshev (MVUE) UCL | 1584 |

| Gamma Distribution Test | | Data Distribution | |
|---|---|---|---|
| k star (bias corrected) | 1.707 | Data appear Normal at 5% Significance Level | |
| Theta Star | 257.8 | | |
| MLE of Mean | 439.9 | | |
| MLE of Standard Deviation | 336.7 | | |
| nu star | 27.3 | | |
| Approximate Chi Square Value (.05) | 16.39 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0195 | 95% CLT UCL | 603.1 |
| Adjusted Chi Square Value | 14.29 | 95% Jackknife UCL | 627.9 |
| | | 95% Standard Bootstrap UCL | 590 |
| Anderson-Darling Test Statistic | 0.239 | 95% Bootstrap-t UCL | 685.5 |
| Anderson-Darling 5% Critical Value | 0.722 | 95% Hall's Bootstrap UCL | 678.3 |
| Kolmogorov-Smirnov Test Statistic | 0.18 | 95% Percentile Bootstrap UCL | 592.9 |
| Kolmogorov-Smirnov 5% Critical Value | 0.297 | 95% BCA Bootstrap UCL | 622.8 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 872.5 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 1060 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 1427 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 732.9 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 840.4 | | |

| Potential UCL to Use | | Use 95% Student's-t UCL | 627.9 |
|---|---|---|---|

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

# Investigation Area 2
# Surface Soil

PROUCL OUTPUT - INVESTIGATION AREA 2 SURFACE SOIL

| | |
|---|---|
| | General UCL Statistics for Full Data Sets |
| User Selected Options | |
| From File | C:\Work Folders\Projects\Crane\SWMU 27\Revised HHRA\EPCs\ProUCL Data - IA2 Surface Soil.xls.wst |
| Full Precision | OFF |
| Confidence Coefficient | 95% |
| Number of Bootstrap Operations | 2000 |

ALUMINUM

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 9 | Number of Distinct Observations | 9 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 1510 | Minimum of Log Data | 7.32 |
| Maximum | 17900 | Maximum of Log Data | 9.793 |
| Mean | 11583 | Mean of log Data | 9.172 |
| Geometric Mean | 9620 | SD of log Data | 0.776 |
| Median | 12300 | | |
| SD | 5611 | | |
| Std. Error of Mean | 1870 | | |
| Coefficient of Variation | 0.484 | | |
| Skewness | -0.479 | | |

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.928 | Shapiro Wilk Test Statistic | 0.779 |
| Shapiro Wilk Critical Value | 0.829 | Shapiro Wilk Critical Value | 0.829 |
| Data appear Normal at 5% Significance Level | | Data not Lognormal at 5% Significance Level | |
| Assuming Normal Distribution | | Assuming Lognormal Distribution | |
| 95% Student's-t UCL | 15062 | 95% H-UCL | 27772 |
| 95% UCLs (Adjusted for Skewness) | | 95% Chebyshev (MVUE) UCL | 26966 |
| 95% Adjusted-CLT UCL (Chen-1995) | 14341 | 97.5% Chebyshev (MVUE) UCL | 33230 |
| 95% Modified-t UCL (Johnson-1978) | 15012 | 99% Chebyshev (MVUE) UCL | 45535 |

| Gamma Distribution Test | | Data Distribution | |
|---|---|---|---|
| k star (bias corrected) | 1.973 | Data appear Normal at 5% Significance Level | |
| Theta Star | 5872 | | |
| MLE of Mean | 11583 | | |
| MLE of Standard Deviation | 8247 | | |
| nu star | 35.51 | | |
| Approximate Chi Square Value (.05) | 22.87 | Nonparametric Statistics | |
| Adjusted Level of Significance | 0.0231 | 95% CLT UCL | 14660 |
| Adjusted Chi Square Value | 20.76 | 95% Jackknife UCL | 15062 |
| | | 95% Standard Bootstrap UCL | 14495 |
| Anderson-Darling Test Statistic | 0.546 | 95% Bootstrap-t UCL | 14776 |
| Anderson-Darling 5% Critical Value | 0.727 | 95% Hall's Bootstrap UCL | 14282 |
| Kolmogorov-Smirnov Test Statistic | 0.192 | 95% Percentile Bootstrap UCL | 14372 |
| Kolmogorov-Smirnov 5% Critical Value | 0.282 | 95% BCA Bootstrap UCL | 14168 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 19737 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 23265 |
| Assuming Gamma Distribution | | 99% Chebyshev(Mean, Sd) UCL | 30194 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 17982 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 19813 | | |
| Potential UCL to Use | | Use 95% Student's-t UCL | 15062 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.
Note: For highly negative-skewed data, confidence limits
(e.g., Chen, Johnson, Lognormal, and Gamma) may not be
reliable. Chen's and Johnson's methods provide
adjustments for positvely skewed data sets.

CHROMIUM

**General Statistics**

| | | | |
|---|---|---|---|
| Number of Valid Observations | 9 | Number of Distinct Observations | 9 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 5.74 | Minimum of Log Data | 1.747 |
| Maximum | 20.4 | Maximum of Log Data | 3.016 |
| Mean | 15.17 | Mean of log Data | 2.661 |
| Geometric Mean | 14.31 | SD of log Data | 0.396 |
| Median | 16.2 | | |
| SD | 4.706 | | |
| Std. Error of Mean | 1.569 | | |
| Coefficient of Variation | 0.31 | | |
| Skewness | -0.915 | | |

**Warning: There are only 9 Values in this data**
**Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions**

**The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.**

**Relevant UCL Statistics**

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.924 | Shapiro Wilk Test Statistic | 0.826 |
| Shapiro Wilk Critical Value | 0.829 | Shapiro Wilk Critical Value | 0.829 |
| **Data appear Normal at 5% Significance Level** | | **Data not Lognormal at 5% Significance Level** | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 18.09 | 95% H-UCL | 20.84 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 24.23 |
| 95% Adjusted-CLT UCL (Chen-1995) | 17.24 | 97.5% Chebyshev (MVUE) UCL | 28.08 |
| 95% Modified-t UCL (Johnson-1978) | 18.01 | 99% Chebyshev (MVUE) UCL | 35.65 |

| Gamma Distribution Test | | Data Distribution | |
|---|---|---|---|
| k star (bias corrected) | 5.891 | **Data appear Normal at 5% Significance Level** | |
| Theta Star | 2.575 | | |
| MLE of Mean | 15.17 | | |
| MLE of Standard Deviation | 6.251 | | |
| nu star | 106 | | |
| Approximate Chi Square Value (.05) | 83.27 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0231 | 95% CLT UCL | 17.75 |
| Adjusted Chi Square Value | 79.03 | 95% Jackknife UCL | 18.09 |
| | | 95% Standard Bootstrap UCL | 17.6 |
| Anderson-Darling Test Statistic | 0.499 | 95% Bootstrap-t UCL | 17.71 |
| Anderson-Darling 5% Critical Value | 0.722 | 95% Hall's Bootstrap UCL | 17.32 |
| Kolmogorov-Smirnov Test Statistic | 0.177 | 95% Percentile Bootstrap UCL | 17.43 |
| Kolmogorov-Smirnov 5% Critical Value | 0.279 | 95% BCA Bootstrap UCL | 17.19 |
| **Data appear Gamma Distributed at 5% Significance Level** | | 95% Chebyshev(Mean, Sd) UCL | 22.01 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 24.97 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 30.78 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 19.32 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 20.36 | | |
| **Potential UCL to Use** | | Use 95% Student's-t UCL | 18.09 |

**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**
**These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.**
**Note: For highly negative-skewed data, confidence limits (e.g., Chen, Johnson, Lognormal, and Gamma) may not be reliable. Chen's and Johnson's methods provide adjustments for positvely skewed data sets.**

MANGANESE

General Statistics

| | | | |
|---|---|---|---|
| Number of Valid Observations | 9 | Number of Distinct Observations | 9 |

| Raw Statistics | | Log-transformed Statistics | |
|---|---|---|---|
| Minimum | 53.1 | Minimum of Log Data | 3.972 |
| Maximum | 849 | Maximum of Log Data | 6.744 |
| Mean | 295.4 | Mean of log Data | 5.387 |
| Geometric Mean | 218.5 | SD of log Data | 0.866 |
| Median | 297 | | |
| SD | 240.8 | | |
| Std. Error of Mean | 80.26 | | |
| Coefficient of Variation | 0.815 | | |
| Skewness | 1.634 | | |

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

| Normal Distribution Test | | Lognormal Distribution Test | |
|---|---|---|---|
| Shapiro Wilk Test Statistic | 0.839 | Shapiro Wilk Test Statistic | 0.951 |
| Shapiro Wilk Critical Value | 0.829 | Shapiro Wilk Critical Value | 0.829 |
| Data appear Normal at 5% Significance Level | | Data appear Lognormal at 5% Significance Level | |
| **Assuming Normal Distribution** | | **Assuming Lognormal Distribution** | |
| 95% Student's-t UCL | 444.6 | 95% H-UCL | 784.7 |
| **95% UCLs (Adjusted for Skewness)** | | 95% Chebyshev (MVUE) UCL | 693.7 |
| 95% Adjusted-CLT UCL (Chen-1995) | 474.1 | 97.5% Chebyshev (MVUE) UCL | 863.3 |
| 95% Modified-t UCL (Johnson-1978) | 451.9 | 99% Chebyshev (MVUE) UCL | 1196 |

| Gamma Distribution Test | | Data Distribution | |
|---|---|---|---|
| k star (bias corrected) | 1.278 | Data appear Normal at 5% Significance Level | |
| Theta Star | 231 | | |
| MLE of Mean | 295.4 | | |
| MLE of Standard Deviation | 261.2 | | |
| nu star | 23.01 | | |
| Approximate Chi Square Value (.05) | 13.1 | **Nonparametric Statistics** | |
| Adjusted Level of Significance | 0.0231 | 95% CLT UCL | 427.4 |
| Adjusted Chi Square Value | 11.55 | 95% Jackknife UCL | 444.6 |
| | | 95% Standard Bootstrap UCL | 424.2 |
| Anderson-Darling Test Statistic | 0.296 | 95% Bootstrap-t UCL | 532 |
| Anderson-Darling 5% Critical Value | 0.732 | 95% Hall's Bootstrap UCL | 1114 |
| Kolmogorov-Smirnov Test Statistic | 0.164 | 95% Percentile Bootstrap UCL | 428.4 |
| Kolmogorov-Smirnov 5% Critical Value | 0.283 | 95% BCA Bootstrap UCL | 475.4 |
| Data appear Gamma Distributed at 5% Significance Level | | 95% Chebyshev(Mean, Sd) UCL | 645.2 |
| | | 97.5% Chebyshev(Mean, Sd) UCL | 796.6 |
| **Assuming Gamma Distribution** | | 99% Chebyshev(Mean, Sd) UCL | 1094 |
| 95% Approximate Gamma UCL (Use when n >= 40) | 518.9 | | |
| 95% Adjusted Gamma UCL (Use when n < 40) | 588.3 | | |
| | | | |
| **Potential UCL to Use** | | Use 95% Student's-t UCL | 444.6 |

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.

# APPENDIX F.4

# SAMPLE CALCULATIONS

**CALCULATION WORKSHEET** 

| | | |
|---|---|---|
| **CLIENT:**<br>NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:**<br>112G02126 |
| **SUBJECT:**<br>CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL<br>INDUSTRIAL WORKERS | | |
| **BASED ON:**<br>USEPA, DECEMBER 1989 | | |
| **BY:**<br>R. JUPIN | **CHECKED BY:**<br>L. Ciofani | **DATE:**<br>7/30/2012 |

**PURPOSE:** To estimate intake, carcinogenic and noncarcinogenic risks from incidental ingestion of surface soil at Investigation Area 1.

**EQUATION:**

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT}$$

Where:

| | | |
|---|---|---|
| IEX | = | estimated exposure intake (mg/kg/day) |
| Cs | = | exposure point concentration in soil (mg/kg) |
| IR | = | incidental ingestion rate (mg/day) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (years) |
| FI | = | fraction ingested from contaminated source (unitless) |
| CF | = | conversion factor (1E-06 kg/mg) |
| BW | = | body weight (kg) |
| AT | = | averaging time (days) |
| CSFo | = | oral carcinogenic slope factor ($(mg/kg/day)^{-1}$) |
| RfDo | = | oral noncarcinogenic reference dose (mg/kg/day) |

**RISKS:**

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1
HQ (Noncarcinogens) = Intake (mg/kg/day) / RFDo (mg/kg/day)

**ASSUMPTIONS:**

| | | | | |
|---|---|---|---|---|
| Cs | = | 20 | mg/kg | Chemical: Chromium |
| IR | = | 100 | mg/day | |
| EF | = | 250 | days/year | |
| ED | = | 25 | years | |
| FI | = | 1 | | |
| CF | = | 1E-06 | kg/mg | |
| BW | = | 70 | kg | |
| ATc | = | 25,550 | days | |
| ATnc | = | 9125 | days | |
| CSFo | = | 5.0E-01 | $(mg/kg/day)^{-1}$ | |
| RfDo | = | 3.0E-03 | (mg/kg/day) | |

| | | |
|---|---|---|
| **CLIENT:**<br>NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:**<br>112G02126 |
| **SUBJECT:**<br>CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL<br>INDUSTRIAL WORKERS | | |
| **BASED ON:**<br>USEPA, DECEMBER 1989 | | |
| **BY:**<br>R. JUPIN | **CHECKED BY:** L. Cifani | **DATE:**<br>7/30/2012 |

**EXAMPLE CARCINOGENIC CALCULATION**

$$IEXc = \frac{20\ mg/kg \times 100\ mg/day \times 250\ days/year \times 25\ years \times 1 \times 1E\text{-}06\ kg/mg}{70\ kg \times 25550\ days}$$

IEXc = 6.99E-06 mg/kg/day

ILCR = 6.99E-06 mg/kg/day x 5.00E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

**ILCR = 3.5E-06**

**EXAMPLE NONCARCINOGENIC CALCULATION**

$$IEXnc = \frac{20\ mg/kg \times 100\ mg/day \times 250\ days/year \times 25\ years \times 1 \times 1E\text{-}06\ kg/mg}{70\ kg \times 9125\ days}$$

IEXnc = 1.96E-05 mg/kg/day

HQ = 1.96E-05 mg/kg/day / 3.00E-03 (mg/kg/day) = Hazard Quotient

**HQ = 6.5E-03**

**CALCULATION WORKSHEET**



| | | |
|---|---|---|
| **CLIENT:**<br>NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:**<br>112G02126 |
| **SUBJECT:**<br>CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS<br>INDUSTRIAL WORKERS | | |
| **BASED ON:**<br>USEPA, JANUARY 2009 | | |
| **BY:**<br>R. JUPIN | **CHECKED BY:**<br>L. Cufar | **DATE:**<br>7/30/2012 |

**PURPOSE:** To estimate intake, carcinogenic and noncarcinogenic risks from inhalation of fugitive dust emissions from surface soil at Investigation Area 1.

**EQUATION:**

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24 \text{ hours/day}}$$

Where:

| | | |
|---|---|---|
| EC | = | exposure concentration (mg/m3) |
| Ca | = | exposure point concentration in air (mg/m3) |
| | = | Cs x 1/PEF |
| Cs | = | exposure point concentration in soil (mg/kg) |
| PEF | = | particulate emission factor (m3/kg) |
| ET | = | exposure time (hrs/day) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (years) |
| AT | = | averaging time (days) |
| IUR | = | inhalation unit risk ($(ug/m3)^{-1}$) |
| RfC | = | inhalation reference concentration (mg/m3) |

**RISKS:**

ILCR (Carcinogens) = Exposure Concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg
HQ (Noncarcinogens) = Exposure Concentration (mg/m3) / RFCi (mg/m3)

**ASSUMPTIONS:**

| | | | | |
|---|---|---|---|---|
| Cs | = | 20 | mg/kg | Chemical: Chromium |
| PEF | = | 1.32E+09 | m3/kg | |
| Ca | = | 1.52E-08 | mg/m3 | |
| ET | = | 8 | hours/day | |
| EF | = | 250 | days/year | |
| ED | = | 25 | years | |
| ATc | = | 25,550 | days | |
| ATnc | = | 9,125 | days | |
| IUR | = | 8.4E-02 | $(ug/m3)^{-1}$ | |
| RfC | = | 1.0E-04 | (mg/m3) | |

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS INDUSTRIAL WORKERS | | |
| **BASED ON:** USEPA, JANUARY 2009 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Ciofani | **DATE:** 7/30/2012 |

**EXAMPLE CARCINOGENIC CALCULATION**

$$IEXc = \frac{1.52E\text{-}08 \text{ mg/m3} \times 8 \text{ hours/day} \times 250 \text{ days/year} \times 25 \text{ years}}{25550 \text{ days} \times 24 \text{ hours/day}}$$

IEXc = 1.24E-09 mg/m3

ILCR = 1.24E-09 mg/m3 x 8.40E-02 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

**ILCR = 1.0E-07**

**EXAMPLE NONCARCINOGENIC CALCULATION**

$$IEXnc = \frac{1.52E\text{-}08 \text{ mg/m3} \times 8 \text{ hours/day} \times 250 \text{ days/year} \times 25 \text{ years}}{9125 \text{ days} \times 24 \text{ hours/day}}$$

IEXnc = 3.47E-09 mg/m3

HQ = 3.47E-09 mg/m3 / 1.00E-04 (mg/m3) = Hazard Quotient

HQ **3.5E-05**

| CLIENT: | JOB NUMBER: |
|---|---|
| NSA CRANE, CRANE, INDIANA | 112G02126 |

**SUBJECT:**
CALCULATION OF PARTICULATE EMISSION FACTOR FOR CONSTRUCTION WORKERS

**BASED ON:**
Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002)

| BY: | CHECKED BY: | DATE: |
|---|---|---|
| R. JUPIN | L. Crofen | 7/30/2012 |

**Equation 5-5**
**Derivation of the Particulate Emission Factor**
**Construction Scenario - Construction Worker**

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[ \frac{T \times A_R}{556 \times (W/3)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times \Sigma VKT} \right]$$

| Parameter/Definition (units) | Default |
|---|---|
| $PEF_{sc}$/subchronic road particulate emission factor ($m^3$/kg) | site-specific |
| $Q/C_{sr}$/ inverse of the ratio of the 1-h geometric mean air concentration to the emission flux along a straight road segment bisecting a square site (g/$m^2$-s per kg/$m^3$) | 23.02[a] (Equation 5-6) |
| $F_D$/dispersion correction factor (unitless) | 0.185 (Appendix E) |
| T/total time over which construction occurs (s) | site-specific |
| $A_R$/surface area of contaminated road segment ($m^2$) $L_R$/length of road segment (ft) $W_R$/width of road segment (ft) | 274.213 ($A_R = L_R \times W_R \times 0.092903 m^2/ft^2$) |
| W/mean vehicle weight (tons) | site-specific |
| p/number of days with at least 0.01 inches of precipitation (days/year) | site-specific (Exhibit 5-2) |
| ΣVKT/sum of fleet vehicle kilometers traveled during the exposure duration (km) | site-specific |

[a] Assumes a 0.5 acre site

## Calculation of PEF for Construction Workers

| | | | |
|---|---|---|---|
| Q/C | 23.02 | (g/$m^2$-s per kg/$m^3$) | |
| Fd | 0.185 | dispersion correction factor (unitless) | |
| T | 4.32E+06 | sec | 3600 sec/hr x 8hr/day x 150 days/yr |
| $A_R$ | 274.213 | $m^2$ | |
| W | 8 | tons | |
| p | 125 | day/year | |
| VKT | 202.5 | km | 30 vehicles x 0.045 km/day x 150 days |

**PEF = 1.34E+06 $m^3$/kg**

**CALCULATION WORKSHEET** 

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Ciofani | **DATE:** 7/30/2012 |

**PURPOSE:** To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion surface soil at Investigation Area 1.

**EQUATION:**

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

| | | |
|---|---|---|
| IEX | = | estimated exposure intake (mg/kg/day) |
| Cs | = | exposure point concentration in soil (mg/kg) |
| IR | = | incidental ingestion rate (mg/day) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (years) |
| FI | = | fraction ingested from contaminated source (unitless) |
| CF | = | conversion factor (1.0E-6 kg/mg) |
| BW | = | body weight (kg) |
| AT | = | averaging time (days) |
| ADAF | = | age-dependent adjustment factor |
| CSFo | = | oral carcinogenic slope factor ($(mg/kg/day)^{-1}$) |

**RISKS:**

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

**ASSUMPTIONS:**

| | | | | |
|---|---|---|---|---|
| Cs | = | 20 | mg/kg | Chemical: Chromium |
| IR | = | 200 | mg/day | |
| EF | = | 350 | days/year | |
| $ED_1$ | = | 2 | years | |
| $ED_2$ | = | 4 | years | |
| FI | = | 1 | | |
| CF | = | 1.0E-06 | kg/mg | |
| BW | = | 15 | kg | |
| AT | = | 25,550 | days | |
| CSFo | = | 5.0E-01 | $(mg/kg/day)^{-1}$ | |
| $ADAF_1$ | = | 10 | | |
| $ADAF_2$ | = | 3 | | |

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Ciofani | **DATE:** 7/30/2012 |

**EXAMPLE CARCINOGENIC CALCULATION**

$$IEX_1 = \frac{20\ mg/kg \times 200\ mg/day \times 350\ days/year \times 2\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{15\ kg \times 25550\ days} \times 10$$

$IEX_1$ = 7.31E-05 mg/kg/day

$$IEX_2 = \frac{20\ mg/kg \times 200\ mg/day \times 350\ days/year \times 4\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{15\ kg \times 25550\ days} \times 3$$

$IEX_2$ = 4.38E-05 mg/kg/day

ILCR = (7.31E-05 mg/kg/day + 4.38E-05 mg/kg/day) x 5.00E-01 (mg/kg/day)-1

**ILCR = 5.8E-05**

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Cofani | **DATE:** 7/30/2012 |

**PURPOSE:** To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of fugitive dust emissions from surface soil at Investigation Area 1.

**EQUATION:**

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24\ hours/day} \times ADAF$$

Where:

| | | |
|---|---|---|
| EC | = | estimated exposure concentration (mg/m3) |
| Ca | = | exposure point concentration in air (mg/m3) |
| | = | Cs x 1/PEF |
| Cs | = | exposure point concentration in soil (mg/kg) |
| PEF | = | particulate emission factor (m3/kg) |
| ET | = | exposure time (hrs/day) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (years) |
| AT | = | averaging time (hours) |
| ADAF | = | age-dependent adjustment factor |
| IUR | = | inhalation unit risk($(ug/mg)^{-1}$) |

**RISKS:**

ILCR = Exposure concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg

**ASSUMPTIONS:**

| | | | | |
|---|---|---|---|---|
| Cs | = | 20 | mg/kg | Chemical: Chromium |
| PEF | = | 1.32E+09 | m3/kg | |
| Ca | = | 1.52E-08 | mg/m3 | |
| ET | = | 24 | hr/day | |
| EF | = | 350 | days/year | |
| $ED_1$ | = | 2 | years | |
| $ED_2$ | = | 4 | years | |
| ATc | = | 25,550 | days | |
| IUR | = | 8.4E-02 | $(ug/m3)^{-1}$ | |
| $ADAF_1$ | = | 10 | | |
| $ADAF_2$ | = | 3 | | |

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Ciofani | **DATE:** 7/30/2012 |

**EXAMPLE CARCINOGENIC CALCULATION**

$$EC = \frac{1.52E\text{-}08\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 2\ years}{25550\ days \times 24\ hours/day} \times 10$$

EC = 4.16E-09 mg/m3

$$EC = \frac{1.52E\text{-}08\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 4\ years}{25550\ days \times 24\ hours/day} \times 3$$

EC = 2.50E-09 mg/m3

ILCR = (4.16E-09 mg/m3 + 2.50E-09 mg/m3) x 8.40E-02 (ug/m3)-1 x 1000 ug/mg

**ILCR = 5.6E-07**

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Cufani | **DATE:** 7/30/2012 |

**PURPOSE:** To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion surface soil at Investigation Area 1.

**EQUATION:**

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

Where:

| | | |
|---|---|---|
| IEX | = | estimated exposure intake (mg/kg/day) |
| Cs | = | exposure point concentration in soil (mg/kg) |
| IR | = | incidental ingestion rate (mg/day) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (years) |
| FI | = | fraction ingested from contaminated source (unitless) |
| CF | = | conversion factor (1.0E-6 kg/mg) |
| BW | = | body weight (kg) |
| AT | = | averaging time (days) |
| ADAF | = | age-dependent adjustment factor |
| CSFo | = | oral carcinogenic slope factor ($(mg/kg/day)^{-1}$) |

**RISKS:**

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFo (mg/kg/day)-1

**ASSUMPTIONS:**

| | | | | |
|---|---|---|---|---|
| Cs | = | 20 | mg/kg | Chemical: Chromium |
| IR | = | 100 | mg/day | |
| EF | = | 350 | days/year | |
| $ED_1$ | = | 10 | years | |
| $ED_2$ | = | 14 | years | |
| FI | = | 1 | | |
| CF | = | 1.0E-06 | kg/mg | |
| BW | = | 70 | kg | |
| AT | = | 25,550 | days | |
| CSFo | = | 5.0E-01 | $(mg/kg/day)^{-1}$ | |
| $ADAF_1$ | = | 3 | | |
| $ADAF_2$ | = | 1 | | |

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Crafani | **DATE:** 7/30/2012 |

**EXAMPLE CARCINOGENIC CALCULATION**

$$IEX_1 = \frac{20 \text{ mg/kg} \times 100 \text{ mg/day} \times 350 \text{ days/year} \times 10 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 3$$

$IEX_1$ = 1.17E-05 mg/kg/day

$$IEX_2 = \frac{20 \text{ mg/kg} \times 100 \text{ mg/day} \times 350 \text{ days/year} \times 14 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{70 \text{ kg} \times 25550 \text{ days}} \times 1$$

$IEX_2$ = 5.48E-06 mg/kg/day

ILCR = (1.17E-05 mg/kg/day + 5.48E-06 mg/kg/day) x 5.00E-01 (mg/kg/day)-1

**ILCR = 8.6E-06**

**CALCULATION WORKSHEET** 

| | | |
|---|---|---|
| **CLIENT:**<br>NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:**<br>112G02126 |
| **SUBJECT:**<br>CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS | | |
| **BASED ON:**<br>USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:**<br>R. JUPIN | **CHECKED BY:**<br>L. Cerfani | **DATE:**<br>7/30/2012 |

**PURPOSE:** To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of fugitive dust emissions from surface soil at Investigation Area 1.

**EQUATION:**

$$EC = \frac{Ca \times ET \times EF \times ED}{AT \times 24\ hours/day} \times ADAF$$

Where:

| | | |
|---|---|---|
| EC | = | estimated exposure intake (mg/kg/day) |
| Ca | = | exposure point concentration in air (mg/m3) |
| | = | Cs x 1/PEF |
| Cs | = | exposure point concentration in soil (mg/kg) |
| PEF | = | particulate emission factor (m3/kg) |
| ET | = | exposure time (hrs/day) |
| EF | = | exposure frequency (days/year) |
| ED | = | exposure duration (years) |
| BW | = | body weight (kg) |
| AT | = | averaging time (hours) |
| ADAF | = | age-dependent adjustment factor |
| IURi | = | inhalation unit risk($(ug/mg)^{-1}$) |

**RISKS:**

ILCR = Exposure concentration (mg/m3) x IUR (ug/m3)-1 x 1000 ug/mg

**ASSUMPTIONS:**

| | | | | |
|---|---|---|---|---|
| Cs | = | 20 | mg/kg | Chemical: Chromium |
| PEF | = | 1.32E+09 | m3/kg | |
| Ca | = | 1.52E-08 | mg/m3 | |
| ET | = | 24 | hr/day | |
| EF | = | 350 | days/year | |
| $ED_1$ | = | 10 | years | |
| $ED_2$ | = | 14 | years | |
| ATc | = | 25,550 | days | |
| IUR | = | 8.4E-02 | $(ug/m3)^{-1}$ | |
| $ADAF_1$ | = | 3 | | |
| $ADAF_2$ | = | 1 | | |

| **CLIENT:** NSA CRANE, CRANE, INDIANA | | **JOB NUMBER:** 112G02126 |
|---|---|---|
| **SUBJECT:** CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL ADULT RESIDENTS | | |
| **BASED ON:** USEPA, DECEMBER 1989, MARCH 2005 | | |
| **BY:** R. JUPIN | **CHECKED BY:** L. Cifani | **DATE:** 7/30/2012 |

**EXAMPLE CARCINOGENIC CALCULATION**

$$EC = \frac{1.52E\text{-}08\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 10\ years}{25550\ days \times 24\ hours/day} \times 3$$

EC = 6.25E-09 mg/m3

$$EC = \frac{1.52E\text{-}08\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 14\ years}{25550\ days \times 24\ hours/day} \times 1$$

EC = 2.91E-09 mg/m3

ILCR = (6.25E-09 mg/m3 + 2.91E-09 mg/m3) x 8.40E-02 (ug/m3)-1 x 1000 ug/mg

**ILCR = 7.7E-07**

# APPENDIX F.5

# LEAD MODELING RESULTS

# ADULT LEAD MODEL

**SITE NAME:** NSA CRANE, CRANE INDIANA
**LOCATION:** SWMU 27 ILLUMINANT BUILDING 126
**RECEPTOR:** EXCAVATION WORKERS
**MEDIA:** SUMPS/PIT - LOCATION 27SB032
**DATE:** AUGUST 1, 2012

## Calculations of Blood Lead Concentrations (PbBs)

**U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee**
**Version date 6/21/09**

| Variable | Description of Variable | Units | GSDi and PbBo from Analysis of NHANES 1999-2004 |
|---|---|---|---|
| PbS | Soil lead concentration | ug/g or ppm | 1570 |
| $R_{fetal/maternal}$ | Fetal/maternal PbB ratio | -- | 0.9 |
| BKSF | Biokinetic Slope Factor | ug/dL per ug/day | 0.4 |
| $GSD_i$ | Geometric standard deviation PbB | -- | 1.8 |
| $PbB_0$ | Baseline PbB | ug/dL | 1.0 |
| $IR_S$ | Soil ingestion rate (including soil-derived indoor dust) | g/day | 0.330 |
| $IR_{S+D}$ | Total ingestion rate of outdoor soil and indoor dust | g/day | -- |
| $W_S$ | Weighting factor; fraction of $IR_{S+D}$ ingested as outdoor soil | -- | -- |
| $K_{SD}$ | Mass fraction of soil in dust | -- | -- |
| $AF_{S,D}$ | Absorption fraction (same for soil and dust) | -- | 0.12 |
| $EF_{S,D}$ | Exposure frequency (same for soil and dust) | days/yr | 45 |
| $AT_{S,D}$ | Averaging time (same for soil and dust) | days/yr | 365 |
| **$PbB_{adult}$** | **PbB of adult worker, geometric mean** | **ug/dL** | **4.1** |
| $PbB_{fetal,0.95}$ | 95th percentile PbB among fetuses of adult workers | ug/dL | 9.6 |
| $PbB_t$ | Target PbB level of concern (e.g., 10 ug/dL) | ug/dL | **10.0** |
| **$P(PbB_{fetal} > PbB_t)$** | **Probability that fetal PbB > $PbB_t$, assuming lognormal distribution** | **%** | **4.4%** |

**Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil**

**SITE NAME:** NSA CRANE, CRANE INDIANA
**LOCATION:** SWMU 27 ILLUMINANT BUILDING 126
**RECEPTOR:** EXCAVATION WORKERS
**MEDIA:** SUMPS/PIT - LOCATION 27SB056
**DATE:** AUGUST 1, 2012

## Calculations of Blood Lead Concentrations (PbBs)

**U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee**
**Version date 6/21/09**

| Variable | Description of Variable | Units | GSDi and PbBo from Analysis of NHANES 1999-2004 |
|---|---|---|---|
| PbS | Soil lead concentration | ug/g or ppm | 1270 |
| $R_{fetal/maternal}$ | Fetal/maternal PbB ratio | -- | 0.9 |
| BKSF | Biokinetic Slope Factor | ug/dL per ug/day | 0.4 |
| $GSD_i$ | Geometric standard deviation PbB | -- | 1.8 |
| $PbB_0$ | Baseline PbB | ug/dL | 1.0 |
| $IR_S$ | Soil ingestion rate (including soil-derived indoor dust) | g/day | 0.050 |
| $IR_{S+D}$ | Total ingestion rate of outdoor soil and indoor dust | g/day | -- |
| $W_S$ | Weighting factor; fraction of $IR_{S+D}$ ingested as outdoor soil | -- | -- |
| $K_{SD}$ | Mass fraction of soil in dust | -- | -- |
| $AF_{S,D}$ | Absorption fraction (same for soil and dust) | -- | 0.33 |
| $EF_{S,D}$ | Exposure frequency (same for soil and dust) | days/yr | 45 |
| $AT_{S,D}$ | Averaging time (same for soil and dust) | days/yr | 365 |
| **$PbB_{adult}$** | **PbB of adult worker, geometric mean** | **ug/dL** | **2.0** |
| $PbB_{fetal,0.95}$ | 95th percentile PbB among fetuses of adult workers | ug/dL | 4.8 |
| $PbB_t$ | Target PbB level of concern (e.g., 10 ug/dL) | ug/dL | **10.0** |
| **$P(PbB_{fetal} > PbB_t)$** | **Probability that fetal PbB > $PbB_t$, assuming lognormal distribution** | **%** | **0.2%** |

**Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil**

**SITE NAME:** NSA CRANE, CRANE INDIANA
**LOCATION:** SWMU 27 ILLUMINANT BUILDING 126
**RECEPTOR:** EXCAVATION WORKERS
**MEDIA:** SUMPS/PIT - LOCATION 27SB066
**DATE:** AUGUST 1, 2012

## Calculations of Blood Lead Concentrations (PbBs)

**U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee**
**Version date 6/21/09**

| Variable | Description of Variable | Units | GSDi and PbBo from Analysis of NHANES 1999-2004 |
|---|---|---|---|
| PbS | Soil lead concentration | ug/g or ppm | 6100 |
| $R_{fetal/maternal}$ | Fetal/maternal PbB ratio | -- | 0.9 |
| BKSF | Biokinetic Slope Factor | ug/dL per ug/day | 0.4 |
| $GSD_i$ | Geometric standard deviation PbB | -- | 1.8 |
| $PbB_0$ | Baseline PbB | ug/dL | 1.0 |
| $IR_S$ | Soil ingestion rate (including soil-derived indoor dust) | g/day | 0.330 |
| $IR_{S+D}$ | Total ingestion rate of outdoor soil and indoor dust | g/day | -- |
| $W_S$ | Weighting factor; fraction of $IR_{S+D}$ ingested as outdoor soil | -- | -- |
| $K_{SD}$ | Mass fraction of soil in dust | -- | -- |
| $AF_{S,D}$ | Absorption fraction (same for soil and dust) | -- | 0.12 |
| $EF_{S,D}$ | Exposure frequency (same for soil and dust) | days/yr | 45 |
| $AT_{S,D}$ | Averaging time (same for soil and dust) | days/yr | 365 |
| **$PbB_{adult}$** | **PbB of adult worker, geometric mean** | **ug/dL** | **12.9** |
| $PbB_{fetal,\,0.95}$ | 95th percentile PbB among fetuses of adult workers | ug/dL | 30.6 |
| $PbB_t$ | Target PbB level of concern (e.g., 10 ug/dL) | ug/dL | **10.0** |
| **$P(PbB_{fetal} > PbB_t)$** | **Probability that fetal PbB > $PbB_t$, assuming lognormal distribution** | **%** | **60%** |

**Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil**

# APPENDIX F.6

# RAGS PART D TABLES FOR CHEMICALS PRESENT AT NATURALLY OCCURRING LEVELS

# RAGS Part D Table 3

## Medium-Specific Exposure Point Concentration Summary

## LIST OF TABLES
## RAGS PART D TABLE 3
## MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

**Table No.**


| | |
|---|---|
| 3.1.RME | Investigation Area 1 - Surface Soil |
| 3.2.RME | Investigation Area 2 - Subsurface Soil |
| 3.3.RME | Investigation Area 2 - Surface Soil |
| 3.4.RME | Investigation Area 2 - Subsurface Soil |

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 | Cadmium | mg/kg | 1.01 | 2.5 (G) | 8.41 | 2.5 | mg/kg | 95% Chebyshev (Mean, Sd) UCL | ProUCL 4.1.01 |
| | Manganese | mg/kg | 723 | 1,780 (NP) | 5,550 J | 1,780 | mg/kg | 95% Chebyshev (Mean, Sd) UCL | ProUCL 4.1.01 |

Notes:
G = Gamma
N = Normal
NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 1 | Aluminum | mg/kg | 11,171 | 14800 (N) | 18,900 | 14,800 | mg/kg | 95% Student's-t UCL | ProUCL 4.1.01 |

Notes:
G = Gamma
N = Normal
NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Surface Soil
Exposure Medium: Surface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 2 | Chromium | mg/kg | 15.2 | 18 (N) | 20.4 J | 18 | mg/kg | 95% Student's-t UCL | ProUCL 4.1.01 |
| | Manganese | mg/kg | 295 | 445 (N) | 849 | 445 | mg/kg | 95% Student's-t UCL | ProUCL 4.1.01 |

Notes:
G = Gamma
N = Normal
NP = Non-parametric

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.4.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil

| Exposure Point | Chemical of Potential Concern | Units | Arithmetic Mean | 95% UCL (Distribution) | Maximum Concentration (Qualifier) | Exposure Point Concentration | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Value | Units | Statistic | Rationale |
| Investigation Area 2 | Aluminum | mg/kg | 13,950 | (1) | 15,000 | 15,000 | mg/kg | Maximum Detected Concentration | (1) |
| | Chromium | mg/kg | 18 | (1) | 20.4 | 20.4 | mg/kg | Maximum Detected Concentration | (1) |
| | Manganese | mg/kg | 445 | (1) | 725 J | 725 | mg/kg | Maximum Detected Concentration | (1) |

Notes:
1 - An UCL could not be calculated because there were only four samples, therefore the maximum detected concentration was used as the exposure point concentration.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

# RAGS Part D Table 7

## Calculation of Cancer Risks and Non-Cancer Hazards

## LIST OF TABLES
## RAGS PART D TABLE 7
## CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS


**Table No.**

**Reasonable Maximum Exposures**

| | |
|---|---|
| 7.1.RME | Investigation Area 1 - Construction Workers - Soil |
| 7.2.RME | Investigation Area 1 - Industrial Workers |
| 7.3.RME | Investigation Area 1 - Child Recreational Users |
| 7.4.RME | Investigation Area 1 - Adult Recreational Users |
| 7.5.RME | Investigation Area 1 - Child Residents |
| 7.6.RME | Investigation Area 1 - Adult Residents |
| 7.7.RME | Investigation Area 2 - Construction Workers |
| 7.8.RME | Investigation Area 2 - Industrial Workers |
| 7.9.RME | Investigation Area 2 - Child Recreational Users |
| 7.10.RME | Investigation Area 2 - Adult Recreational Users |
| 7.11.RME | Investigation Area 2 - Child Residents |
| 7.12.RME | Investigation Area 2 - Adult Residents |

**Central Tendency Exposures**

| | |
|---|---|
| 7.1.CTE | Investigation Area 1 - Construction Workers - Soil |
| 7.2.CTE | Investigation Area 1 - Industrial Workers |
| 7.3.CTE | Investigation Area 1 - Child Recreational Users |
| 7.4.CTE | Investigation Area 1 - Adult Recreational Users |
| 7.5.CTE | Investigation Area 1 - Child Residents |
| 7.6.CTE | Investigation Area 1 - Adult Residents |
| 7.7.CTE | Investigation Area 2 - Construction Workers |
| 7.8.CTE | Investigation Area 2 - Industrial Workers |
| 7.9.CTE | Investigation Area 2 - Child Recreational Users |
| 7.10.CTE | Investigation Area 2 - Adult Recreational Users |
| 7.11.CTE | Investigation Area 2 - Child Residents |
| 7.12.CTE | Investigation Area 2 - Adult Residents |

TABLE 7.1.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 6.9E-08 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 4.8E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.005 |
| | | | | Manganese | 1,780 | mg/kg | 4.9E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.4E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.1 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.1 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 2.1E-10 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.5E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0006 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.1 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-6 | mg/m$^3$ | 3.7E-09 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 6.6E-09 | 2.6E-07 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.01 |
| | | | | Manganese | 0.001 | mg/m$^3$ | 2.6E-06 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.8E-04 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 3.6 |
| | | | Exp. Route Total | | | | | | | | 6.6E-09 | | | | | 3.7 |
| | | Exposure Point Total | | | | | | | | | 6.6E-09 | | | | | 3.7 |
| | Exposure Medium Total | | | | | | | | | | 6.6E-09 | | | | | 3.7 |
| Medium Total | | | | | | | | | | | 6.6E-09 | | | | | 3.8 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 4.1E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.9E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.03 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.03 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 0.011 | mg/m$^3$ | 2.2E-05 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.5E-03 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.3 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.3 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.3 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.3 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 8.7E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.4E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Manganese | 1,780 | mg/kg | 6.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.7E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.07 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.08 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 5.8E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.6E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0006 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.08 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | $mg/m^3$ | 1.5E-10 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 2.8E-10 | 4.3E-10 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00002 |
| | | | | Manganese | 1.4E-6 | $mg/m^3$ | 1.1E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.1E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.006 |
| | | | Exp. Route Total | | | | | | | | 2.8E-10 | | | | | 0.006 |
| | | Exposure Point Total | | | | | | | | | 2.8E-10 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-10 | | | | | 0.006 |
| Medium Total | | | | | | | | | | | 2.8E-10 | | | | | 0.08 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 5.2E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.01 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 9.2E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.6E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.0005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.0005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.0005 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 2.0E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.4E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Manganese | 1,780 | mg/kg | 1.4E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.7E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.07 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.07 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 1.3E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.6E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0006 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.07 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.07 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | $mg/m^3$ | 3.9E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 7.0E-12 | 4.5E-11 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.000002 |
| | | | | Manganese | 1.4E-6 | $mg/m^3$ | 2.8E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.2E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0006 |
| | | | Exp. Route Total | | | | | | | | 7.0E-12 | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | 7.0E-12 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | | | | 7.0E-12 | | | | | 0.0006 |
| Medium Total | | | | | | | | | | | 7.0E-12 | | | | | 0.07 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 1.2E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.01 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 2.3E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 8.7E-08 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.5E-07 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.0003 |
| | | | | Manganese | 1,780 | mg/kg | 6.2E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.008 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.008 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 1.1E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.2E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0001 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.008 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.008 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | $mg/m^3$ | 1.5E-11 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 2.8E-11 | 4.5E-11 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.000002 |
| | | | | Manganese | 1.4E-6 | $mg/m^3$ | 1.1E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.2E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0006 |
| | | | Exp. Route Total | | | | | | | | 2.8E-11 | | | | | 0.0006 |
| | | Exposure Point Total | | | | | | | | | 2.8E-11 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-11 | | | | | 0.0006 |
| Medium Total | | | | | | | | | | | 2.8E-11 | | | | | 0.009 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 5.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.5E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 9.2E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.002 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 2.7E-06 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.2E-05 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.03 |
| | | | | Manganese | 1,780 | mg/kg | 2.0E-03 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.3E-02 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.9 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 1.0 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 7.7E-09 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 8.9E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.004 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.004 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 1.0 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 1.0 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | mg/m$^3$ | 1.6E-10 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 2.8E-10 | 1.8E-09 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.00009 |
| | | | | Manganese | 1.4E-6 | mg/m$^3$ | 1.1E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.3E-06 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.03 |
| | | | Exp. Route Total | | | | | | | | 2.8E-10 | | | | | 0.03 |
| | | Exposure Point Total | | | | | | | | | 2.8E-10 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-10 | | | | | 0.03 |
| Medium Total | | | | | | | | | | | 2.8E-10 | | | | | 1.0 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 1.6E-02 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.9E-01 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.2 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.2 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.2 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 9.2E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.1E-05 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 1.2E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.4E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Manganese | 1,780 | mg/kg | 8.4E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.4E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.1 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.1 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 4.7E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0005 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.1 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | $mg/m^3$ | 6.2E-10 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 1.1E-09 | 1.8E-09 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00009 |
| | | | | Manganese | 1.4E-6 | $mg/m^3$ | 4.4E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.3E-06 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.03 |
| | | | Exp. Route Total | | | | | | | | 1.1E-09 | | | | | 0.03 |
| | | Exposure Point Total | | | | | | | | | 1.1E-09 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-09 | | | | | 0.03 |
| Medium Total | | | | | | | | | | | 1.1E-09 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 7.0E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.0E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.02 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.02 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 3.7E-06 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-05 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 5.0E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 2.5E-07 | 3.5E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.002 |
| | | | | Manganese | 445 | mg/kg | 1.2E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 8.6E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.04 |
| | | | Exp. Route Total | | | | | | | | 2.5E-07 | | | | | 0.04 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 2.5E-07 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | 2.5E-07 | | | | | 0.04 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.3E-5 | $mg/m^3$ | 2.6E-08 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.2E-06 | 1.8E-06 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.02 |
| | | | | Manganese | 3.3E-4 | $mg/m^3$ | 6.5E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 4.5E-05 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.9 |
| | | | Exp. Route Total | | | | | | | | 2.2E-06 | | | | | 0.9 |
| | | Exposure Point Total | | | | | | | | | 2.2E-06 | | | | | 0.9 |
| | Exposure Medium Total | | | | | | | | | | 2.2E-06 | | | | | 0.9 |
| Medium Total | | | | | | | | | | | 2.5E-06 | | | | | 1.0 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 4.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.9E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.03 |
| | | | | Chromium | 20.4 | mg/kg | 5.6E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 2.8E-07 | 4.0E-05 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.002 |
| | | | | Manganese | 725 | mg/kg | 2.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.06 |
| | | | Exp. Route Total | | | | | | | | 2.8E-07 | | | | | 0.09 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 2.8E-07 | | | | | 0.09 |
| | Exposure Medium Total | | | | | | | | | | 2.8E-07 | | | | | 0.09 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 0.011 | $mg/m^3$ | 2.2E-05 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.5E-03 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.3 |
| | | | | Chromium | 1.5E-5 | $mg/m^3$ | 3.0E-08 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 2.5E-06 | 2.1E-06 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.02 |
| | | | | Manganese | 5.4E-4 | $mg/m^3$ | 1.1E-06 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.4E-05 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 1.5 |
| | | | Exp. Route Total | | | | | | | | 2.5E-06 | | | | | 1.8 |
| | | Exposure Point Total | | | | | | | | | 2.5E-06 | | | | | 1.8 |
| | Exposure Medium Total | | | | | | | | | | 2.5E-06 | | | | | 1.8 |
| Medium Total | | | | | | | | | | | 2.8E-06 | | | | | 1.9 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.8.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 6.3E-06 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 3.1E-06 | 1.8E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.006 |
| | | | | Manganese | 445 | mg/kg | 1.6E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 4.4E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | 3.1E-06 | | | | | 0.02 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 3.1E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 3.1E-06 | | | | | 0.02 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | mg/m$^3$ | 1.1E-09 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 9.4E-08 | 3.1E-09 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.00003 |
| | | | | Manganese | 3.4E-7 | mg/m$^3$ | 2.8E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 7.7E-08 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 9.4E-08 | | | | | 0.002 |
| | | Exposure Point Total | | | | | | | | | 9.4E-08 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 9.4E-08 | | | | | 0.002 |
| Medium Total | | | | | | | | | | | 3.2E-06 | | | | | 0.03 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 5.2E-03 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.5E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | | Chromium | 20.4 | mg/kg | 7.1E-06 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 3.6E-06 | 2.0E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.007 |
| | | | | Manganese | 725 | mg/kg | 2.5E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 7.1E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | 3.6E-06 | | | | | 0.05 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 3.6E-06 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | | | | 3.6E-06 | | | | | 0.05 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 9.3E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 2.6E-06 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.0005 |
| | | | | Chromium | 1.6E-8 | mg/m$^3$ | 1.3E-09 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 1.1E-07 | 3.5E-09 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.00004 |
| | | | | Manganese | 5.5E-7 | mg/m$^3$ | 4.5E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.3E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 1.1E-07 | | | | | 0.003 |
| | | Exposure Point Total | | | | | | | | | 1.1E-07 | | | | | 0.003 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-07 | | | | | 0.003 |
| Medium Total | | | | | | | | | | | 3.7E-06 | | | | | 0.05 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.9.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 7.8E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 3.9E-06 | 1.7E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.006 |
| | | | | Manganese | 445 | mg/kg | 3.6E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.2E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | 3.9E-06 | | | | | 0.02 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 3.9E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 3.9E-06 | | | | | 0.02 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | $mg/m^3$ | 1.5E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.2E-08 | 3.2E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000003 |
| | | | | Manganese | 3.4E-7 | $mg/m^3$ | 6.9E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.0E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 1.2E-08 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 1.2E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 3.9E-06 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 1.2E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.4E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.01 |
| | | | | Chromium | 20.4 | mg/kg | 8.9E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.4E-06 | 1.9E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.006 |
| | | | | Manganese | 725 | mg/kg | 5.9E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.9E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | 4.4E-06 | | | | | 0.05 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.4E-06 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | | | | 4.4E-06 | | | | | 0.05 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 2.3E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | | Chromium | 1.6E-8 | $mg/m^3$ | 1.7E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.4E-08 | 3.7E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000004 |
| | | | | Manganese | 5.5E-7 | $mg/m^3$ | 1.1E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.3E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0003 |
| | | | Exp. Route Total | | | | | | | | 1.4E-08 | | | | | 0.0003 |
| | | Exposure Point Total | | | | | | | | | 1.4E-08 | | | | | 0.0003 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-08 | | | | | 0.0003 |
| Medium Total | | | | | | | | | | | 4.4E-06 | | | | | 0.05 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.10.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 1.2E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 5.8E-07 | 1.8E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0006 |
| | | | | Manganese | 445 | mg/kg | 1.6E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.5E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 5.8E-07 | | | | | 0.002 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.8E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | 5.8E-07 | | | | | 0.002 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | $mg/m^3$ | 2.0E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.7E-08 | 3.2E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000003 |
| | | | | Manganese | 3.4E-7 | $mg/m^3$ | 2.8E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.0E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 1.7E-08 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 1.7E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 1.7E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 5.9E-07 | | | | | 0.003 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 5.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.5E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.002 |
| | | | | Chromium | 20.4 | mg/kg | 1.3E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 6.5E-07 | 2.1E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0007 |
| | | | | Manganese | 725 | mg/kg | 2.5E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.4E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.003 |
| | | | Exp. Route Total | | | | | | | | 6.5E-07 | | | | | 0.005 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 6.5E-07 | | | | | 0.005 |
| | Exposure Medium Total | | | | | | | | | | 6.5E-07 | | | | | 0.005 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 9.3E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.7E-07 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00005 |
| | | | | Chromium | 1.6E-8 | $mg/m^3$ | 2.3E-10 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.9E-08 | 3.7E-10 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.000004 |
| | | | | Manganese | 5.5E-7 | $mg/m^3$ | 4.5E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.3E-08 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0003 |
| | | | Exp. Route Total | | | | | | | | 1.9E-08 | | | | | 0.0003 |
| | | Exposure Point Total | | | | | | | | | 1.9E-08 | | | | | 0.0003 |
| | Exposure Medium Total | | | | | | | | | | 1.9E-08 | | | | | 0.0003 |
| Medium Total | | | | | | | | | | | 6.7E-07 | | | | | 0.006 |

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.11.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 1.1E-04 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 5.3E-05 | 2.3E-04 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.08 |
| | | | | Manganese | 445 | mg/kg | 4.9E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 5.7E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.2 |
| | | | Exp. Route Total | | | | | | | | 5.3E-05 | | | | | 0.3 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.3E-05 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | | | | 5.3E-05 | | | | | 0.3 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | mg/m$^3$ | 6.0E-09 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 5.0E-07 | 1.3E-08 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.0001 |
| | | | | Manganese | 3.4E-7 | mg/m$^3$ | 2.8E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 3.2E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.006 |
| | | | Exp. Route Total | | | | | | | | 5.0E-07 | | | | | 0.007 |
| | | Exposure Point Total | | | | | | | | | 5.0E-07 | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | 5.0E-07 | | | | | 0.007 |
| Medium Total | | | | | | | | | | | 5.3E-05 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 1.6E-02 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.9E-01 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.2 |
| | | | | Chromium | 20.4 | mg/kg | 1.2E-04 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 6.0E-05 | 2.6E-04 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.09 |
| | | | | Manganese | 725 | mg/kg | 7.9E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 9.3E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.4 |
| | | | Exp. Route Total | | | | | | | | 6.0E-05 | | | | | 0.7 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 6.0E-05 | | | | | 0.7 |
| | Exposure Medium Total | | | | | | | | | | 6.0E-05 | | | | | 0.7 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 9.4E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.1E-05 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.002 |
| | | | | Chromium | 1.6E-8 | mg/m$^3$ | 6.8E-09 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 5.7E-07 | 1.5E-08 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.0001 |
| | | | | Manganese | 5.5E-7 | mg/m$^3$ | 4.5E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 5.3E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 5.7E-07 | | | | | 0.01 |
| | | Exposure Point Total | | | | | | | | | 5.7E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 5.7E-07 | | | | | 0.01 |
| Medium Total | | | | | | | | | | | 6.0E-05 | | | | | 0.7 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.12.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 1.5E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.7E-06 | 2.5E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.008 |
| | | | | Manganese | 445 | mg/kg | 2.1E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.1E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | 7.7E-06 | | | | | 0.03 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.7E-06 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | 7.7E-06 | | | | | 0.03 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | $mg/m^3$ | 8.2E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 6.9E-07 | 1.3E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0001 |
| | | | | Manganese | 3.4E-7 | $mg/m^3$ | 1.1E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.2E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.006 |
| | | | Exp. Route Total | | | | | | | | 6.9E-07 | | | | | 0.007 |
| | | Exposure Point Total | | | | | | | | | 6.9E-07 | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | 6.9E-07 | | | | | 0.007 |
| Medium Total | | | | | | | | | | | 8.4E-06 | | | | | 0.04 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 7.0E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.1E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.02 |
| | | | | Chromium | 20.4 | mg/kg | 1.8E-05 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 8.8E-06 | 2.8E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.009 |
| | | | | Manganese | 725 | mg/kg | 3.4E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 9.9E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.04 |
| | | | Exp. Route Total | | | | | | | | 8.8E-06 | | | | | 0.07 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 8.8E-06 | | | | | 0.07 |
| | Exposure Medium Total | | | | | | | | | | 8.8E-06 | | | | | 0.07 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 3.7E-06 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 1.1E-05 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.002 |
| | | | | Chromium | 1.6E-8 | $mg/m^3$ | 9.3E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 7.8E-07 | 1.5E-08 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0001 |
| | | | | Manganese | 5.5E-7 | $mg/m^3$ | 1.8E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 5.3E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.01 |
| | | | Exp. Route Total | | | | | | | | 7.8E-07 | | | | | 0.01 |
| | | Exposure Point Total | | | | | | | | | 7.8E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 7.8E-07 | | | | | 0.01 |
| Medium Total | | | | | | | | | | | 9.6E-06 | | | | | 0.08 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.1.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 1.7E-08 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.2E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Manganese | 1,780 | mg/kg | 1.2E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 8.6E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.04 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.04 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 3.5E-11 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 2.4E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00010 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00010 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.04 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-6 | mg/m$^3$ | 1.8E-09 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 3.3E-09 | 1.3E-07 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.006 |
| | | | | Manganese | 0.001 | mg/m$^3$ | 1.3E-06 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 9.1E-05 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 1.8 |
| | | | Exp. Route Total | | | | | | | | 3.3E-09 | | | | | 1.8 |
| | | Exposure Point Total | | | | | | | | | 3.3E-09 | | | | | 1.8 |
| | Exposure Medium Total | | | | | | | | | | 3.3E-09 | | | | | 1.8 |
| Medium Total | | | | | | | | | | | 3.3E-09 | | | | | 1.9 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 7.2E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.007 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.007 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.007 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 0.011 | mg/m$^3$ | 1.1E-05 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 7.6E-04 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.2 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.2 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.2 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.2.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 1.4E-07 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.1E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Manganese | 1,780 | mg/kg | 9.8E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 7.6E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.03 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 1.8E-10 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.4E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00006 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00006 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.03 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | mg/m$^3$ | 4.9E-11 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 8.8E-11 | 3.8E-10 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.00002 |
| | | | | Manganese | 1.4E-6 | mg/m$^3$ | 3.5E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 2.7E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.005 |
| | | | Exp. Route Total | | | | | | | | 8.8E-11 | | | | | 0.005 |
| | | Exposure Point Total | | | | | | | | | 8.8E-11 | | | | | 0.005 |
| | Exposure Medium Total | | | | | | | | | | 8.8E-11 | | | | | 0.005 |
| Medium Total | | | | | | | | | | | 8.8E-11 | | | | | 0.04 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 8.2E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 6.3E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.006 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.006 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 2.9E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 2.2E-06 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.0004 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0004 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.0004 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.0004 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.007 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.3.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 1.7E-08 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 5.9E-07 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.0006 |
| | | | | Manganese | 1,780 | mg/kg | 1.2E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 4.2E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.02 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.02 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 4.5E-11 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.6E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00006 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00006 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.02 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | mg/m$^3$ | 3.2E-13 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 5.8E-13 | 1.1E-11 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.0000006 |
| | | | | Manganese | 1.3E-6 | mg/m$^3$ | 2.3E-10 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 8.0E-09 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 5.8E-13 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 5.8E-13 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 5.8E-13 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 5.8E-13 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.5E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.004 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.004 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.004 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 1.9E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 6.7E-08 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.00001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.4.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 6.4E-09 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.4E-08 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.00006 |
| | | | | Manganese | 1,780 | mg/kg | 4.5E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 4.5E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.002 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.002 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 2.3E-11 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.3E-10 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.000009 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.000009 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.002 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | $mg/m^3$ | 1.1E-12 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 2.0E-12 | 1.1E-11 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.0000006 |
| | | | | Manganese | 1.4E-6 | $mg/m^3$ | 8.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.0E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.0002 |
| | | | Exp. Route Total | | | | | | | | 2.0E-12 | | | | | 0.0002 |
| | | Exposure Point Total | | | | | | | | | 2.0E-12 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | | | | 2.0E-12 | | | | | 0.0002 |
| Medium Total | | | | | | | | | | | 2.0E-12 | | | | | 0.002 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 3.8E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.8E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0004 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0004 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.0004 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.0004 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 6.7E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.7E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.00001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.0004 |
| | | | | | | | | | | Total of Receptor Risks Across All Media | 2.0E-12 | | | | Total of Receptor Hazards Across All Media | 0.003 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.5.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 3.1E-07 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-05 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.01 |
| | | | | Manganese | 1,780 | mg/kg | 2.2E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.6E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.3 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.3 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 3.4E-10 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.2E-08 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.0005 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.0005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.3 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | $mg/m^3$ | 3.5E-11 | $(mg/m^3)$ | 1.8E-03 | $(ug/m^3)^{-1}$ | 6.3E-11 | 1.2E-09 | $(mg/m^3)$ | 2.0E-05 | $(mg/m^3)$ | 0.00006 |
| | | | | Manganese | 1.4E-6 | $mg/m^3$ | 2.5E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 8.7E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.02 |
| | | | Exp. Route Total | | | | | | | | 6.3E-11 | | | | | 0.02 |
| | | Exposure Point Total | | | | | | | | | 6.3E-11 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 6.3E-11 | | | | | 0.02 |
| Medium Total | | | | | | | | | | | 6.3E-11 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 1.8E-03 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.3E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.06 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.06 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.06 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.06 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 2.1E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.2E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.06 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.6.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 1 | Ingestion | Cadmium | 2.5 | mg/kg | 1.1E-07 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.1E-06 | (mg/kg/day) | 1.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Manganese | 1,780 | mg/kg | 8.2E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 8.2E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.03 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.04 |
| | | | Dermal | Cadmium | 2.5 | mg/kg | 1.3E-10 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.3E-09 | (mg/kg/day) | 2.5E-05 | (mg/kg/day) | 0.00005 |
| | | | | Manganese | 1,780 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.00005 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.04 |
| | Air | Investigation Area 1 | Inhalation | Cadmium | 1.9E-9 | mg/m$^3$ | 1.2E-10 | (mg/m$^3$) | 1.8E-03 | (ug/m$^3$)$^{-1}$ | 2.2E-10 | 1.2E-09 | (mg/m$^3$) | 2.0E-05 | (mg/m$^3$) | 0.00006 |
| | | | | Manganese | 1.4E-6 | mg/m$^3$ | 8.7E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 8.7E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.02 |
| | | | Exp. Route Total | | | | | | | | 2.2E-10 | | | | | 0.02 |
| | | Exposure Point Total | | | | | | | | | 2.2E-10 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 2.2E-10 | | | | | 0.02 |
| Medium Total | | | | | | | | | | | 2.2E-10 | | | | | 0.05 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Ingestion | Aluminum | 14,800 | mg/kg | 6.8E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 6.8E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.007 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.007 |
| | | | Dermal | Aluminum | 14,800 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.007 |
| | Air | Investigation Area 1 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 7.2E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 7.2E-06 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.001 |
| | | | Exp. Route Total | | | | | | | | - - | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | | | | - - | | | | | 0.008 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.7.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 1.2E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 6.2E-08 | 8.7E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0004 |
| | | | | Manganese | 445 | mg/kg | 3.1E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.2E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.009 |
| | | | Exp. Route Total | | | | | | | | 6.2E-08 | | | | | 0.009 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 6.2E-08 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 6.2E-08 | | | | | 0.009 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.3E-5 | $mg/m^3$ | 1.3E-08 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.1E-06 | 9.2E-07 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.009 |
| | | | | Manganese | 3.3E-4 | $mg/m^3$ | 3.2E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.3E-05 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.5 |
| | | | Exp. Route Total | | | | | | | | 1.1E-06 | | | | | 0.5 |
| | | Exposure Point Total | | | | | | | | | 1.1E-06 | | | | | 0.5 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-06 | | | | | 0.5 |
| Medium Total | | | | | | | | | | | 1.2E-06 | | | | | 0.5 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 7.3E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.007 |
| | | | | Chromium | 20.4 | mg/kg | 1.4E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.1E-08 | 9.9E-06 | (mg/kg/day) | 2.0E-02 | (mg/kg/day) | 0.0005 |
| | | | | Manganese | 725 | mg/kg | 5.0E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.5E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 7.1E-08 | | | | | 0.02 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 5.0E-04 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.1E-08 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 7.1E-08 | | | | | 0.02 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 0.011 | $mg/m^3$ | 1.1E-05 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.7E-04 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.2 |
| | | | | Chromium | 1.5E-5 | $mg/m^3$ | 1.5E-08 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.3E-06 | 1.0E-06 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.01 |
| | | | | Manganese | 5.4E-4 | $mg/m^3$ | 5.3E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.7E-05 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.7 |
| | | | Exp. Route Total | | | | | | | | 1.3E-06 | | | | | 0.9 |
| | | Exposure Point Total | | | | | | | | | 1.3E-06 | | | | | 0.9 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-06 | | | | | 0.9 |
| Medium Total | | | | | | | | | | | 1.3E-06 | | | | | 0.9 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.8.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 9.9E-07 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 5.0E-07 | 7.7E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Manganese | 445 | mg/kg | 2.5E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 1.9E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.008 |
| | | | Exp. Route Total | | | | | | | | 5.0E-07 | | | | | 0.01 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.0E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 5.0E-07 | | | | | 0.01 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | mg/m$^3$ | 3.5E-10 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 3.0E-08 | 2.7E-09 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.00003 |
| | | | | Manganese | 3.4E-7 | mg/m$^3$ | 8.7E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 6.8E-08 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.001 |
| | | | Exp. Route Total | | | | | | | | 3.0E-08 | | | | | 0.001 |
| | | Exposure Point Total | | | | | | | | | 3.0E-08 | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | 3.0E-08 | | | | | 0.001 |
| Medium Total | | | | | | | | | | | 5.3E-07 | | | | | 0.01 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 8.3E-04 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 6.4E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.006 |
| | | | | Chromium | 20.4 | mg/kg | 1.1E-06 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 5.6E-07 | 8.7E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Manganese | 725 | mg/kg | 4.0E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 3.1E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 5.6E-07 | | | | | 0.02 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 5.6E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 5.6E-07 | | | | | 0.02 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 2.9E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 2.3E-06 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.0005 |
| | | | | Chromium | 1.6E-8 | mg/m$^3$ | 4.0E-10 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 3.3E-08 | 3.1E-09 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.00003 |
| | | | | Manganese | 5.5E-7 | mg/m$^3$ | 1.4E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | - - | 1.1E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.002 |
| | | | Exp. Route Total | | | | | | | | 3.3E-08 | | | | | 0.003 |
| | | Exposure Point Total | | | | | | | | | 3.3E-08 | | | | | 0.003 |
| | Exposure Medium Total | | | | | | | | | | 3.3E-08 | | | | | 0.003 |
| Medium Total | | | | | | | | | | | 6.0E-07 | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.9.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 7.9E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.0E-07 | 4.3E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.001 |
| | | | | Manganese | 445 | mg/kg | 3.0E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.004 |
| | | | Exp. Route Total | | | | | | | | 4.0E-07 | | | | | 0.006 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.0E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | | | | 4.0E-07 | | | | | 0.006 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | $mg/m^3$ | 1.5E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.3E-09 | 8.1E-11 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0000008 |
| | | | | Manganese | 3.4E-7 | $mg/m^3$ | 5.7E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.0E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00004 |
| | | | Exp. Route Total | | | | | | | | 1.3E-09 | | | | | 0.00004 |
| | | Exposure Point Total | | | | | | | | | 1.3E-09 | | | | | 0.00004 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-09 | | | | | 0.00004 |
| Medium Total | | | | | | | | | | | 4.0E-07 | | | | | 0.006 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 1.0E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.6E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.004 |
| | | | | Chromium | 20.4 | mg/kg | 9.0E-07 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.5E-07 | 4.8E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.002 |
| | | | | Manganese | 725 | mg/kg | 4.9E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.7E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.007 |
| | | | Exp. Route Total | | | | | | | | 4.5E-07 | | | | | 0.01 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.5E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 4.5E-07 | | | | | 0.01 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 1.9E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.7E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | | Chromium | 1.5E-8 | $mg/m^3$ | 1.7E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.4E-09 | 9.2E-11 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0000009 |
| | | | | Manganese | 5.5E-7 | $mg/m^3$ | 9.3E-11 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.3E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00007 |
| | | | Exp. Route Total | | | | | | | | 1.4E-09 | | | | | 0.00008 |
| | | Exposure Point Total | | | | | | | | | 1.4E-09 | | | | | 0.00008 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-09 | | | | | 0.00008 |
| Medium Total | | | | | | | | | | | 4.5E-07 | | | | | 0.01 |

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.10.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 7.2E-08 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 3.6E-08 | 4.6E-07 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0002 |
| | | | | Manganese | 445 | mg/kg | 1.1E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.1E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.0005 |
| | | | Exp. Route Total | | | | | | | | 3.6E-08 | | | | | 0.0006 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 3.6E-08 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | | | | 3.6E-08 | | | | | 0.0006 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | $mg/m^3$ | 1.3E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.1E-09 | 8.1E-11 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0000008 |
| | | | | Manganese | 3.4E-7 | $mg/m^3$ | 2.0E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.0E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00004 |
| | | | Exp. Route Total | | | | | | | | 1.1E-09 | | | | | 0.00004 |
| | | Exposure Point Total | | | | | | | | | 1.1E-09 | | | | | 0.00004 |
| | Exposure Medium Total | | | | | | | | | | 1.1E-09 | | | | | 0.00004 |
| Medium Total | | | | | | | | | | | 3.7E-08 | | | | | 0.0007 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 3.8E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.8E-04 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.0004 |
| | | | | Chromium | 20.4 | mg/kg | 8.2E-08 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 4.1E-08 | 5.2E-07 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.0002 |
| | | | | Manganese | 725 | mg/kg | 1.8E-06 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 1.8E-05 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.0008 |
| | | | Exp. Route Total | | | | | | | | 4.1E-08 | | | | | 0.001 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 4.1E-08 | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | | | | 4.1E-08 | | | | | 0.001 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 6.8E-09 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 6.8E-08 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.00001 |
| | | | | Chromium | 1.6E-8 | $mg/m^3$ | 1.4E-11 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.2E-09 | 9.2E-11 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.0000009 |
| | | | | Manganese | 5.5E-7 | $mg/m^3$ | 3.3E-10 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.3E-09 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.00007 |
| | | | Exp. Route Total | | | | | | | | 1.2E-09 | | | | | 0.00008 |
| | | Exposure Point Total | | | | | | | | | 1.2E-09 | | | | | 0.00008 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-09 | | | | | 0.00008 |
| Medium Total | | | | | | | | | | | 4.2E-08 | | | | | 0.001 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.11.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 1.4E-05 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 7.1E-06 | 7.7E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.03 |
| | | | | Manganese | 445 | mg/kg | 5.4E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 1.9E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.08 |
| | | | Exp. Route Total | | | | | | | | 7.1E-06 | | | | | 0.1 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.1E-06 | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | | | | 7.1E-06 | | | | | 0.1 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | mg/m$^3$ | 1.6E-09 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 1.4E-07 | 8.8E-09 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.00009 |
| | | | | Manganese | 3.4E-7 | mg/m$^3$ | 6.2E-09 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 2.2E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.004 |
| | | | Exp. Route Total | | | | | | | | 1.4E-07 | | | | | 0.004 |
| | | Exposure Point Total | | | | | | | | | 1.4E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | 1.4E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | | | | 7.3E-06 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 1.8E-03 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 6.4E-02 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.06 |
| | | | | Chromium | 20.4 | mg/kg | 1.6E-05 | (mg/kg/day) | 5.0E-01 | (mg/kg/day)$^{-1}$ | 8.1E-06 | 8.7E-05 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.03 |
| | | | | Manganese | 725 | mg/kg | 8.9E-05 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 3.1E-03 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.1 |
| | | | Exp. Route Total | | | | | | | | 8.1E-06 | | | | | 0.2 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | (mg/kg/day)$^{-1}$ | -- | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | -- | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 8.1E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | | | | 8.1E-06 | | | | | 0.2 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | mg/m$^3$ | 2.1E-07 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 7.3E-06 | (mg/m$^3$) | 5.0E-03 | (mg/m$^3$) | 0.001 |
| | | | | Chromium | 1.6E-8 | mg/m$^3$ | 1.8E-09 | (mg/m$^3$) | 8.4E-02 | (ug/m$^3$)$^{-1}$ | 1.6E-07 | 9.9E-09 | (mg/m$^3$) | 1.0E-04 | (mg/m$^3$) | 0.00010 |
| | | | | Manganese | 5.5E-7 | mg/m$^3$ | 1.0E-08 | (mg/m$^3$) | NA | (ug/m$^3$)$^{-1}$ | -- | 3.5E-07 | (mg/m$^3$) | 5.0E-05 | (mg/m$^3$) | 0.007 |
| | | | Exp. Route Total | | | | | | | | 1.6E-07 | | | | | 0.009 |
| | | Exposure Point Total | | | | | | | | | 1.6E-07 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 1.6E-07 | | | | | 0.009 |
| Medium Total | | | | | | | | | | | 8.3E-06 | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 7.12.CTE
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Exposure Route | Chemical of Potential Concern | EPC | | Cancer Risk Calculations | | | | | Non-Cancer Hazard Calculations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Value | Units | Intake/Exposure Concentration | | CSF/Unit Risk | | Cancer Risk | Intake/Exposure Concentration | | RfD/RfC | | Hazard Quotient |
| | | | | | | | Value | Units | Value | Units | | Value | Units | Value | Units | |
| Surface Soil | Surface Soil | Investigation Area 2 | Ingestion | Chromium | 18.0 | mg/kg | 1.3E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 6.5E-07 | 8.2E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Manganese | 445 | mg/kg | 2.0E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 2.0E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.008 |
| | | | Exp. Route Total | | | | | | | | 6.5E-07 | | | | | 0.01 |
| | | | Dermal | Chromium | 18.0 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 445 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 6.5E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | | | | 6.5E-07 | | | | | 0.01 |
| | Air | Investigation Area 2 | Inhalation | Chromium | 1.4E-8 | $mg/m^3$ | 1.4E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.2E-07 | 8.8E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00009 |
| | | | | Manganese | 3.4E-7 | $mg/m^3$ | 2.2E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 2.2E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.004 |
| | | | Exp. Route Total | | | | | | | | 1.2E-07 | | | | | 0.004 |
| | | Exposure Point Total | | | | | | | | | 1.2E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | | | | 1.2E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | | | | 7.6E-07 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Ingestion | Aluminum | 15,000 | mg/kg | 6.9E-04 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 6.9E-03 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | 0.007 |
| | | | | Chromium | 20.4 | mg/kg | 1.5E-06 | (mg/kg/day) | 5.0E-01 | $(mg/kg/day)^{-1}$ | 7.3E-07 | 9.3E-06 | (mg/kg/day) | 3.0E-03 | (mg/kg/day) | 0.003 |
| | | | | Manganese | 725 | mg/kg | 3.3E-05 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 3.3E-04 | (mg/kg/day) | 2.4E-02 | (mg/kg/day) | 0.01 |
| | | | Exp. Route Total | | | | | | | | 7.3E-07 | | | | | 0.02 |
| | | | Dermal | Aluminum | 15,000 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 1.0E+00 | (mg/kg/day) | -- |
| | | | | Chromium | 20.4 | mg/kg | 0.0E+00 | (mg/kg/day) | 2.0E+01 | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 7.5E-05 | (mg/kg/day) | -- |
| | | | | Manganese | 725 | mg/kg | 0.0E+00 | (mg/kg/day) | NA | $(mg/kg/day)^{-1}$ | - - | 0.0E+00 | (mg/kg/day) | 9.6E-04 | (mg/kg/day) | -- |
| | | | Exp. Route Total | | | | | | | | - - | | | | | -- |
| | | Exposure Point Total | | | | | | | | | 7.3E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | | | | 7.3E-07 | | | | | 0.02 |
| | Air | Investigation Area 2 | Inhalation | Aluminum | 1.1E-5 | $mg/m^3$ | 7.3E-07 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 7.3E-06 | $(mg/m^3)$ | 5.0E-03 | $(mg/m^3)$ | 0.001 |
| | | | | Chromium | 1.6E-8 | $mg/m^3$ | 1.6E-09 | $(mg/m^3)$ | 8.4E-02 | $(ug/m^3)^{-1}$ | 1.3E-07 | 9.9E-09 | $(mg/m^3)$ | 1.0E-04 | $(mg/m^3)$ | 0.00010 |
| | | | | Manganese | 5.5E-7 | $mg/m^3$ | 3.5E-08 | $(mg/m^3)$ | NA | $(ug/m^3)^{-1}$ | - - | 3.5E-07 | $(mg/m^3)$ | 5.0E-05 | $(mg/m^3)$ | 0.007 |
| | | | Exp. Route Total | | | | | | | | 1.3E-07 | | | | | 0.009 |
| | | Exposure Point Total | | | | | | | | | 1.3E-07 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | | | | 1.3E-07 | | | | | 0.009 |
| Medium Total | | | | | | | | | | | 8.7E-07 | | | | | 0.03 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

# RAGS Part D Table 9

## Summary of Receptor Risks and Hazards for COPCs

**LIST OF TABLES**
**RAGS PART D TABLE 9**
**SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs**


**Table No.**

**Reasonable Maximum Exposures**

9.1.RME Investigation Area 1 - Construction Workers - Soil
9.2.RME Investigation Area 1 - Industrial Workers
9.3.RME Investigation Area 1 - Child Recreational Users
9.4.RME Investigation Area 1 - Adult Recreational Users
9.5.RME Investigation Area 1 - Lifelong Recreational Users
9.6.RME Investigation Area 1 - Child Residents
9.7.RME Investigation Area 1 - Adult Residents
9.8.RME Investigation Area 1 - Lifelong Residents
9.9.RME Investigation Area 2 - Construction Workers
9.10.RME Investigation Area 2 - Industrial Workers
9.11.RME Investigation Area 2 - Child Recreational Users
9.12.RME Investigation Area 2 - Adult Recreational Users
9.13.RME Investigation Area 2 - Child Residents
9.14.RME Investigation Area 2 - Child Residents
9.15.RME Investigation Area 2 - Adult Residents
9.16.RME Investigation Area 2 - Lifelong Residents

**Central Tendency Exposures**

9.1.CTE Investigation Area 1 - Construction Workers - Soil
9.2.CTE Investigation Area 1 - Industrial Workers
9.3.CTE Investigation Area 1 - Child Recreational Users
9.4.CTE Investigation Area 1 - Adult Recreational Users
9.5.CTE Investigation Area 1 - Lifelong Recreational Users
9.6.CTE Investigation Area 1 - Child Residents
9.7.CTE Investigation Area 1 - Adult Residents
9.8.CTE Investigation Area 1 - Lifelong Residents
9.9.CTE Investigation Area 2 - Construction Workers
9.10.CTE Investigation Area 2 - Industrial Workers
9.11.CTE Investigation Area 2 - Child Recreational Users
9.12.CTE Investigation Area 2 - Adult Recreational Users
9.13.CTE Investigation Area 2 - Child Residents
9.14.CTE Investigation Area 2 - Child Residents
9.15.CTE Investigation Area 2 - Adult Residents
9.16.CTE Investigation Area 2 - Lifelong Residents

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.005 | -- | 0.0006 | 0.005 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.1 | -- | -- | 0.1 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.1 | -- | 0.0006 | 0.1 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.1 |
| | Air | Investigation Area 1 | Cadmium | -- | 7E-09 | -- | -- | 7E-09 | Kidney, Respiratory | -- | 0.01 | -- | 0.01 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 4 | -- | 4 |
| | | | Chemical Total | -- | 7E-09 | -- | -- | 7E-09 | | - - | 4 | - - | 4 |
| | | Exposure Point Total | | | | | | 7E-09 | | | | | 4 |
| | Exposure Medium Total | | | | | | | 7E-09 | | | | | 4 |
| Medium Total | | | | | | | | 7E-09 | | | | | 4 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.03 | -- | -- | 0.03 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.03 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.3 | -- | 0.3 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.3 | - - | 0.3 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.3 |
| Medium Total | | | | | | | | - - | | | | | 0.3 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.002 | -- | 0.0006 | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.07 | -- | -- | 0.07 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.08 | -- | 0.0006 | 0.08 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.08 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.08 |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-10 | -- | -- | 3E-10 | Kidney, Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.006 | -- | 0.006 |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | - - | 0.006 | - - | 0.006 |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | 0.006 |
| Medium Total | | | | | | | | 3E-10 | | | | | 0.08 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.0005 | -- | 0.0005 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.0005 | - - | 0.0005 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.0005 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.0005 |
| Medium Total | | | | | | | | - - | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.002 | -- | 0.0006 | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.07 | -- | -- | 0.07 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.07 | -- | 0.0006 | 0.07 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.07 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.07 |
| | Air | Investigation Area 1 | Cadmium | -- | 7E-12 | -- | -- | 7E-12 | Kidney, Respiratory | -- | 0.000002 | -- | 0.000002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0006 | -- | 0.0006 |
| | | | Chemical Total | -- | 7E-12 | -- | -- | 7E-12 | | - - | 0.0006 | - - | 0.0006 |
| | | Exposure Point Total | | | | | | 7E-12 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | 7E-12 | | | | | 0.0006 |
| Medium Total | | | | | | | | 7E-12 | | | | | 0.07 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.01 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.00005 | - - | 0.00005 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | - - | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.0003 | -- | 0.0001 | 0.0004 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.008 | -- | -- | 0.008 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.008 | -- | 0.0001 | 0.008 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.008 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.008 |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-11 | -- | -- | 3E-11 | Kidney, Respiratory | -- | 0.000002 | -- | 0.000002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0006 | -- | 0.0006 |
| | | | Chemical Total | -- | 3E-11 | -- | -- | 3E-11 | | - - | 0.0006 | - - | 0.0006 |
| | | Exposure Point Total | | | | | | 3E-11 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | 3E-11 | | | | | 0.0006 |
| Medium Total | | | | | | | | 3E-11 | | | | | 0.009 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.002 | -- | -- | 0.002 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.002 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.00005 | - - | 0.00005 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.00005 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.00005 |
| Medium Total | | | | | | | | - - | | | | | 0.002 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | -- | -- | -- | -- | -- | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-11 | -- | -- | 3E-11 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-11 | -- | -- | 3E-11 | | | | | |
| | | Exposure Point Total | | | | | | 3E-11 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-11 | | | | | |
| Medium Total | | | | | | | | 3E-11 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| | Air | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| Medium Total | | | | | | | | -- | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.03 | -- | 0.004 | 0.04 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.9 | -- | -- | 0.9 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 1.0 | -- | 0.004 | 1.0 |
| | | Exposure Point Total | | | | | | - - | | | | | 1.0 |
| | Exposure Medium Total | | | | | | | - - | | | | | 1.0 |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-10 | -- | -- | 3E-10 | Kidney, Respiratory | -- | 0.00009 | -- | 0.00009 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.03 | -- | 0.03 |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | - - | 0.03 | - - | 0.03 |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | 0.03 |
| Medium Total | | | | | | | | 3E-10 | | | | | 1 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.2 | -- | -- | 0.2 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.2 | -- | -- | 0.2 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.2 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | - - | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.003 | -- | 0.0005 | 0.004 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.1 | -- | -- | 0.1 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.1 | -- | 0.0005 | 0.1 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.1 |
| | Air | Investigation Area 1 | Cadmium | -- | 1E-09 | -- | -- | 1E-09 | Kidney, Respiratory | -- | 0.00009 | -- | 0.00009 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.03 | -- | 0.03 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | - - | 0.03 | - - | 0.03 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.03 |
| Medium Total | | | | | | | | 1E-09 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.02 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.002 | - - | 0.002 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.002 |
| Medium Total | | | | | | | | - - | | | | | 0.02 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | -- | -- | -- | -- | -- | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-10 | -- | -- | 3E-10 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | | | | |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | |
| Medium Total | | | | | | | | 3E-10 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| | Air | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| Medium Total | | | | | | | | -- | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 2E-07 | -- | - - | -- | 2E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.04 | -- | -- | 0.04 |
| | | | Chemical Total | 2E-07 | -- | - - | -- | 2E-07 | | 0.04 | -- | -- | 0.04 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 0.04 |
| | Air | Investigation Area 2 | Chromium | -- | 2E-06 | -- | -- | 2E-06 | Respiratory | -- | 0.02 | -- | 0.02 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.9 | -- | 0.9 |
| | | | Chemical Total | -- | 2E-06 | -- | -- | 2E-06 | | - - | 0.9 | - - | 0.9 |
| | | Exposure Point Total | | | | | | 2E-06 | | | | | 0.9 |
| | Exposure Medium Total | | | | | | | 2E-06 | | | | | 0.9 |
| Medium Total | | | | | | | | 2E-06 | | | | | 1.0 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chromium | 3E-07 | -- | - - | -- | 3E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.06 | -- | -- | 0.06 |
| | | | Chemical Total | 3E-07 | -- | - - | -- | 3E-07 | | 0.09 | -- | -- | 0.09 |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | 0.09 |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | 0.09 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.3 | -- | 0.3 |
| | | | Chromium | -- | 3E-06 | -- | -- | 3E-06 | Respiratory | -- | 0.02 | -- | 0.02 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 1 | -- | 1 |
| | | | Chemical Total | -- | 3E-06 | -- | -- | 3E-06 | | - - | 2 | - - | 2 |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | 2 |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | 2 |
| Medium Total | | | | | | | | 3E-06 | | | | | 2 |

| | Surface Soil |
|---|---|
| Total CNS HI | 0.9 |
| Total Respiratory HI | 0.02 |
| Total None Reported HI | 0.002 |

| | Subsurface Soil |
|---|---|
| Total CNS HI | 2 |
| Total Respiratory HI | 0.02 |
| Total None Reported HI | 0.002 |

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 3E-06 | -- | -- | -- | 3E-06 | None Reported | 0.006 | -- | -- | 0.006 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | 3E-06 | -- | -- | -- | 3E-06 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 3E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 3E-06 | | | | | 0.02 |
| | Air | Investigation Area 2 | Chromium | -- | 9E-08 | -- | -- | 9E-08 | Respiratory | -- | 0.00003 | -- | 0.00003 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | 9E-08 | -- | -- | 9E-08 | | -- | 0.002 | -- | 0.002 |
| | | Exposure Point Total | | | | | | 9E-08 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 9E-08 | | | | | 0.002 |
| Medium Total | | | | | | | | 3E-06 | | | | | 0.03 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chromium | 4E-06 | -- | -- | -- | 4E-06 | None Reported | 0.007 | -- | -- | 0.007 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | 0.05 | -- | -- | 0.05 |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | 0.05 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.0005 | -- | 0.0005 |
| | | | Chromium | -- | 1E-07 | -- | -- | 1E-07 | Respiratory | -- | 0.00004 | -- | 0.00004 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.003 | -- | 0.003 |
| | | | Chemical Total | -- | 1E-07 | -- | -- | 1E-07 | | -- | 0.003 | -- | 0.003 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.003 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.003 |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.05 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 4E-06 | -- | - - | -- | 4E-06 | None Reported | 0.006 | -- | -- | 0.006 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | 4E-06 | -- | - - | -- | 4E-06 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | 0.02 |
| | Air | Investigation Area 2 | Chromium | -- | 1E-08 | -- | -- | 1E-08 | Respiratory | -- | 0.000003 | -- | 0.000003 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Chemical Total | -- | 1E-08 | -- | -- | 1E-08 | | - - | 0.0002 | - - | 0.0002 |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chromium | 4E-06 | -- | - - | -- | 4E-06 | None Reported | 0.006 | -- | -- | 0.006 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | 4E-06 | -- | - - | -- | 4E-06 | | 0.05 | -- | -- | 0.05 |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | 0.05 |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | 0.05 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Chromium | -- | 1E-08 | -- | -- | 1E-08 | Respiratory | -- | 0.000004 | -- | 0.000004 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0003 | -- | 0.0003 |
| | | | Chemical Total | -- | 1E-08 | -- | -- | 1E-08 | | - - | 0.0003 | - - | 0.0003 |
| | | Exposure Point Total | | | | | | 1E-08 | | | | | 0.0003 |
| | Exposure Medium Total | | | | | | | 1E-08 | | | | | 0.0003 |
| Medium Total | | | | | | | | 4E-06 | | | | | 0.05 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.12.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 6E-07 | -- | - - | -- | 6E-07 | None Reported | 0.0006 | -- | -- | 0.0006 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | 6E-07 | -- | - - | -- | 6E-07 | | 0.002 | -- | -- | 0.002 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.002 |
| | Air | Investigation Area 2 | Chromium | -- | 2E-08 | -- | -- | 2E-08 | Respiratory | -- | 0.000003 | -- | 0.000003 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | - - | 0.0002 | - - | 0.0002 |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | 0.0002 |
| Medium Total | | | | | | | | 6E-07 | | | | | 0.003 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.002 | -- | -- | 0.002 |
| | | | Chromium | 7E-07 | -- | - - | -- | 7E-07 | None Reported | 0.0007 | -- | -- | 0.0007 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.003 | -- | -- | 0.003 |
| | | | Chemical Total | 7E-07 | -- | - - | -- | 7E-07 | | 0.005 | -- | -- | 0.005 |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | 0.005 |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | 0.005 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00005 | -- | 0.00005 |
| | | | Chromium | -- | 2E-08 | -- | -- | 2E-08 | Respiratory | -- | 0.000004 | -- | 0.000004 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0003 | -- | 0.0003 |
| | | | Chemical Total | -- | 2E-08 | -- | -- | 2E-08 | | - - | 0.0003 | - - | 0.0003 |
| | | Exposure Point Total | | | | | | 2E-08 | | | | | 0.0003 |
| | Exposure Medium Total | | | | | | | 2E-08 | | | | | 0.0003 |
| Medium Total | | | | | | | | 7E-07 | | | | | 0.006 |
| Receptor Total | | | | | | | Receptor Risk Total | 1E-06 | | | | Receptor HI Total | 0.008 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.13.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 4E-06 | -- | -- | -- | 4E-06 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | 4E-06 | -- | -- | -- | 4E-06 | | | | | |
| | | Exposure Point Total | | | | | | 4E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 4E-06 | | | | | |
| | Air | Investigation Area 2 | Chromium | -- | 3E-08 | -- | -- | 3E-08 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | | | | |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | |
| Medium Total | | | | | | | | 5E-06 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chromium | 5E-06 | -- | -- | -- | 5E-06 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | 5E-06 | -- | -- | -- | 5E-06 | | | | | |
| | | Exposure Point Total | | | | | | 5E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 5E-06 | | | | | |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chromium | -- | 3E-08 | -- | -- | 3E-08 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | | | | |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | |
| Medium Total | | | | | | | | 5E-06 | | | | | |
| Receptor Total | | | | | | | Receptor Risk Total | 1E-05 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.14.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 5E-05 | -- | -- | -- | 5E-05 | None Reported | 0.08 | -- | -- | 0.08 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.2 | -- | -- | 0.2 |
| | | | Chemical Total | 5E-05 | -- | -- | -- | 5E-05 | | 0.3 | -- | -- | 0.3 |
| | | Exposure Point Total | | | | | | 5E-05 | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | 5E-05 | | | | | 0.3 |
| | Air | Investigation Area 2 | Chromium | -- | 5E-07 | -- | -- | 5E-07 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.006 | -- | 0.006 |
| | | | Chemical Total | -- | 5E-07 | -- | -- | 5E-07 | | -- | 0.007 | -- | 0.007 |
| | | Exposure Point Total | | | | | | 5E-07 | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | 5E-07 | | | | | 0.007 |
| Medium Total | | | | | | | | 5E-05 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.2 | -- | -- | 0.2 |
| | | | Chromium | 6E-05 | -- | -- | -- | 6E-05 | None Reported | 0.09 | -- | -- | 0.09 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.4 | -- | -- | 0.4 |
| | | | Chemical Total | 6E-05 | -- | -- | -- | 6E-05 | | 0.7 | -- | -- | 0.7 |
| | | Exposure Point Total | | | | | | 6E-05 | | | | | 0.7 |
| | Exposure Medium Total | | | | | | | 6E-05 | | | | | 0.7 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chromium | -- | 6E-07 | -- | -- | 6E-07 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.01 | -- | 0.01 |
| | | | Chemical Total | -- | 6E-07 | -- | -- | 6E-07 | | -- | 0.01 | -- | 0.01 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.01 |
| Medium Total | | | | | | | | 6E-05 | | | | | 0.7 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.15.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 8E-06 | -- | -- | -- | 8E-06 | None Reported | 0.008 | -- | -- | 0.008 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | 8E-06 | -- | -- | -- | 8E-06 | | 0.03 | -- | -- | 0.03 |
| | | Exposure Point Total | | | | | | 8E-06 | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | 8E-06 | | | | | 0.03 |
| | Air | Investigation Area 2 | Chromium | -- | 7E-07 | -- | -- | 7E-07 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.006 | -- | 0.006 |
| | | | Chemical Total | -- | 7E-07 | -- | -- | 7E-07 | | -- | 0.007 | -- | 0.007 |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | 0.007 |
| Medium Total | | | | | | | | 8E-06 | | | | | 0.04 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chromium | 9E-06 | -- | -- | -- | 9E-06 | None Reported | 0.009 | -- | -- | 0.009 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.04 | -- | -- | 0.04 |
| | | | Chemical Total | 9E-06 | -- | -- | -- | 9E-06 | | 0.07 | -- | -- | 0.07 |
| | | Exposure Point Total | | | | | | 9E-06 | | | | | 0.07 |
| | Exposure Medium Total | | | | | | | 9E-06 | | | | | 0.07 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chromium | -- | 8E-07 | -- | -- | 8E-07 | Respiratory | -- | 0.0001 | -- | 0.0001 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.01 | -- | 0.01 |
| | | | Chemical Total | -- | 8E-07 | -- | -- | 8E-07 | | -- | 0.01 | -- | 0.01 |
| | | Exposure Point Total | | | | | | 8E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 8E-07 | | | | | 0.01 |
| Medium Total | | | | | | | | 1E-05 | | | | | 0.08 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.16.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 6E-05 | -- | - - | -- | 6E-05 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 6E-05 | -- | - - | -- | 6E-05 | | | | | |
| | | Exposure Point Total | | | | | | 6E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 6E-05 | | | | | |
| | Air | Investigation Area 2 | Chromium | -- | 1E-06 | -- | -- | 1E-06 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | | | | |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | |
| Medium Total | | | | | | | | 6E-05 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Chromium | 7E-05 | -- | - - | -- | 7E-05 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 7E-05 | -- | - - | -- | 7E-05 | | | | | |
| | | Exposure Point Total | | | | | | 7E-05 | | | | | |
| | Exposure Medium Total | | | | | | | 7E-05 | | | | | |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | | | | | |
| | | | Chromium | -- | 1E-06 | -- | -- | 1E-06 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | | | | |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | |
| Medium Total | | | | | | | | 7E-05 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.001 | -- | 0.00010 | 0.001 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.04 | -- | -- | 0.04 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.04 | -- | 0.00010 | 0.04 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.04 |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-09 | -- | -- | 3E-09 | Kidney, Respiratory | -- | 0.006 | -- | 0.006 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 2 | -- | 2 |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | -- | 2 | -- | 2 |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | 2 |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | 2 |
| Medium Total | | | | | | | | 3E-09 | | | | | 2 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.007 | -- | -- | 0.007 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.007 |
| | Air | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.2 | -- | 0.2 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.2 | -- | 0.2 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.2 |
| Medium Total | | | | | | | | -- | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.001 | -- | 0.00006 | 0.001 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.03 | -- | 0.00006 | 0.03 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.03 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.03 |
| | Air | Investigation Area 1 | Cadmium | -- | 9E-11 | -- | -- | 9E-11 | Kidney, Respiratory | -- | 0.00002 | -- | 0.00002 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.005 | -- | 0.005 |
| | | | Chemical Total | -- | 9E-11 | -- | -- | 9E-11 | | - - | 0.005 | - - | 0.005 |
| | | Exposure Point Total | | | | | | 9E-11 | | | | | 0.005 |
| | Exposure Medium Total | | | | | | | 9E-11 | | | | | 0.005 |
| Medium Total | | | | | | | | 9E-11 | | | | | 0.04 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.006 | -- | -- | 0.006 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.006 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.0004 | -- | 0.0004 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.0004 | - - | 0.0004 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.0004 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.0004 |
| Medium Total | | | | | | | | - - | | | | | 0.007 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.0006 | -- | 0.00006 | 0.0007 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.02 | -- | -- | 0.02 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.02 | -- | 0.00006 | 0.02 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.02 |
| | Air | Investigation Area 1 | Cadmium | -- | 6E-13 | -- | -- | 6E-13 | Kidney, Respiratory | -- | 0.0000006 | -- | 0.0000006 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Chemical Total | -- | 6E-13 | -- | -- | 6E-13 | | - - | 0.0002 | - - | 0.0002 |
| | | Exposure Point Total | | | | | | 6E-13 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 6E-13 | | | | | 0.0002 |
| Medium Total | | | | | | | | 6E-13 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.004 | -- | -- | 0.004 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.004 | -- | -- | 0.004 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.004 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.00001 | - - | 0.00001 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.00001 |
| Medium Total | | | | | | | | - - | | | | | 0.004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.00006 | -- | 0.000009 | 0.00007 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.002 | -- | -- | 0.002 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.002 | -- | 0.000009 | 0.002 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.002 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.002 |
| | Air | Investigation Area 1 | Cadmium | -- | 2E-12 | -- | -- | 2E-12 | Kidney, Respiratory | -- | 0.0000006 | -- | 0.0000006 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.0002 | -- | 0.0002 |
| | | | Chemical Total | -- | 2E-12 | -- | -- | 2E-12 | | -- | 0.0002 | -- | 0.0002 |
| | | Exposure Point Total | | | | | | 2E-12 | | | | | 0.0002 |
| | Exposure Medium Total | | | | | | | 2E-12 | | | | | 0.0002 |
| Medium Total | | | | | | | | 2E-12 | | | | | 0.002 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0004 | -- | -- | 0.0004 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.0004 | -- | -- | 0.0004 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.0004 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.0004 |
| | Air | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.00001 | -- | 0.00001 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.00001 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.00001 |
| Medium Total | | | | | | | | -- | | | | | 0.0004 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | -- | -- | -- | -- | -- | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-12 | -- | -- | 3E-12 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-12 | -- | -- | 3E-12 | | | | | |
| | | Exposure Point Total | | | | | | 3E-12 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-12 | | | | | |
| Medium Total | | | | | | | | 3E-12 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| | Air | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | -- | -- | -- | -- | | | | | |
| | | Exposure Point Total | | | | | | -- | | | | | |
| | Exposure Medium Total | | | | | | | -- | | | | | |
| Medium Total | | | | | | | | -- | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | -- | -- | -- | -- | -- | Kidney | 0.01 | -- | 0.0005 | 0.01 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.3 | -- | -- | 0.3 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.3 | -- | 0.0005 | 0.3 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.3 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.3 |
| | Air | Investigation Area 1 | Cadmium | -- | 6E-11 | -- | -- | 6E-11 | Kidney, Respiratory | -- | 0.00006 | -- | 0.00006 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.02 | -- | 0.02 |
| | | | Chemical Total | -- | 6E-11 | -- | -- | 6E-11 | | -- | 0.02 | -- | 0.02 |
| | | Exposure Point Total | | | | | | 6E-11 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 6E-11 | | | | | 0.02 |
| Medium Total | | | | | | | | 6E-11 | | | | | 0.3 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.06 | -- | -- | 0.06 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | 0.06 | -- | -- | 0.06 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.06 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.06 |
| | Air | Investigation Area 1 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chemical Total | -- | -- | -- | -- | -- | | -- | 0.001 | -- | 0.001 |
| | | Exposure Point Total | | | | | | -- | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | -- | | | | | 0.001 |
| Medium Total | | | | | | | | -- | | | | | 0.06 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.7.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | Kidney | 0.001 | -- | 0.00005 | 0.001 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.03 | -- | -- | 0.03 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.04 | -- | 0.00005 | 0.04 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.04 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.04 |
| | Air | Investigation Area 1 | Cadmium | -- | 2E-10 | -- | -- | 2E-10 | Kidney, Respiratory | -- | 0.00006 | -- | 0.00006 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.02 | -- | 0.02 |
| | | | Chemical Total | -- | 2E-10 | -- | -- | 2E-10 | | - - | 0.02 | - - | 0.02 |
| | | Exposure Point Total | | | | | | 2E-10 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 2E-10 | | | | | 0.02 |
| Medium Total | | | | | | | | 2E-10 | | | | | 0.05 |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chemical Total | - - | -- | - - | -- | - - | | 0.007 | -- | -- | 0.007 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.007 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.007 |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chemical Total | -- | - - | -- | -- | - - | | - - | 0.001 | - - | 0.001 |
| | | Exposure Point Total | | | | | | - - | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | - - | | | | | 0.001 |
| Medium Total | | | | | | | | - - | | | | | 0.008 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.8.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 1 | Cadmium | - - | -- | - - | -- | - - | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | - - | -- | - - | -- | - - | | | | | |
| | | Exposure Point Total | | | | | | - - | | | | | |
| | Exposure Medium Total | | | | | | | - - | | | | | |
| | Air | Investigation Area 1 | Cadmium | -- | 3E-10 | -- | -- | 3E-10 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 3E-10 | -- | -- | 3E-10 | | | | | |
| | | Exposure Point Total | | | | | | 3E-10 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-10 | | | | | |
| Medium Total | | | | | | | | 3E-10 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 1 | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | - - | -- | - - | -- | - - | | | | | |
| | | Exposure Point Total | | | | | | - - | | | | | |
| | Exposure Medium Total | | | | | | | - - | | | | | |
| | Air | Investigation Area 1 | Aluminum | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | - - | -- | -- | - - | | | | | |
| | | Exposure Point Total | | | | | | - - | | | | | |
| | Exposure Medium Total | | | | | | | - - | | | | | |
| Medium Total | | | | | | | | - - | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.9.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Construction Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 6E-08 | -- | -- | -- | 6E-08 | None Reported | 0.0004 | -- | -- | 0.0004 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.009 | -- | -- | 0.009 |
| | | | Chemical Total | 6E-08 | -- | -- | -- | 6E-08 | | 0.009 | -- | -- | 0.009 |
| | | Exposure Point Total | | | | | | 6E-08 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 6E-08 | | | | | 0.009 |
| | Air | Investigation Area 2 | Chromium | -- | 1E-06 | -- | -- | 1E-06 | Respiratory | -- | 0.009 | -- | 0.009 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.5 | -- | 0.5 |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | -- | 0.5 | -- | 0.5 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.5 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.5 |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.5 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chromium | 7E-08 | -- | -- | -- | 7E-08 | None Reported | 0.0005 | -- | -- | 0.0005 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 7E-08 | -- | -- | -- | 7E-08 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 7E-08 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 7E-08 | | | | | 0.02 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.2 | -- | 0.2 |
| | | | Chromium | -- | 1E-06 | -- | -- | 1E-06 | Respiratory | -- | 0.01 | -- | 0.01 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.7 | -- | 0.7 |
| | | | Chemical Total | -- | 1E-06 | -- | -- | 1E-06 | | -- | 0.9 | -- | 0.9 |
| | | Exposure Point Total | | | | | | 1E-06 | | | | | 0.9 |
| | Exposure Medium Total | | | | | | | 1E-06 | | | | | 0.9 |
| Medium Total | | | | | | | | 1E-06 | | | | | 0.9 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.10.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Current/Future
Receptor Population: Industrial Workers
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 5E-07 | -- | - - | -- | 5E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.008 | -- | -- | 0.008 |
| | | | Chemical Total | 5E-07 | -- | - - | -- | 5E-07 | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | 5E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 5E-07 | | | | | 0.01 |
| | Air | Investigation Area 2 | Chromium | -- | 3E-08 | -- | -- | 3E-08 | Respiratory | -- | 0.00003 | -- | 0.00003 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | - - | 0.001 | - - | 0.001 |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | 0.001 |
| Medium Total | | | | | | | | 5E-07 | | | | | 0.01 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.006 | -- | -- | 0.006 |
| | | | Chromium | 6E-07 | -- | - - | -- | 6E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 6E-07 | -- | - - | -- | 6E-07 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.02 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.0005 | -- | 0.0005 |
| | | | Chromium | -- | 3E-08 | -- | -- | 3E-08 | Respiratory | -- | 0.00003 | -- | 0.00003 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.002 | -- | 0.002 |
| | | | Chemical Total | -- | 3E-08 | -- | -- | 3E-08 | | - - | 0.003 | - - | 0.003 |
| | | Exposure Point Total | | | | | | 3E-08 | | | | | 0.003 |
| | Exposure Medium Total | | | | | | | 3E-08 | | | | | 0.003 |
| Medium Total | | | | | | | | 6E-07 | | | | | 0.02 |

TABLE 9.11.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 4E-07 | -- | -- | -- | 4E-07 | None Reported | 0.001 | -- | -- | 0.001 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.004 | -- | -- | 0.004 |
| | | | Chemical Total | 4E-07 | -- | -- | -- | 4E-07 | | 0.006 | -- | -- | 0.006 |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | 0.006 |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | 0.006 |
| | Air | Investigation Area 2 | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.0000008 | -- | 0.0000008 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.00004 | -- | 0.00004 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | -- | 0.00004 | -- | 0.00004 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.00004 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.00004 |
| Medium Total | | | | | | | | 4E-07 | | | | | 0.006 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.004 | -- | -- | 0.004 |
| | | | Chromium | 4E-07 | -- | -- | -- | 4E-07 | None Reported | 0.002 | -- | -- | 0.002 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chemical Total | 4E-07 | -- | -- | -- | 4E-07 | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | 0.01 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.0000009 | -- | 0.0000009 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.00007 | -- | 0.00007 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | -- | 0.00008 | -- | 0.00008 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.00008 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.00008 |
| Medium Total | | | | | | | | 5E-07 | | | | | 0.01 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.12.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 4E-08 | -- | -- | -- | 4E-08 | None Reported | 0.0002 | -- | -- | 0.0002 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.0005 | -- | -- | 0.0005 |
| | | | Chemical Total | 4E-08 | -- | -- | -- | 4E-08 | | 0.0006 | -- | -- | 0.0006 |
| | | Exposure Point Total | | | | | | 4E-08 | | | | | 0.0006 |
| | Exposure Medium Total | | | | | | | 4E-08 | | | | | 0.0006 |
| | Air | Investigation Area 2 | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.0000008 | -- | 0.0000008 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.00004 | -- | 0.00004 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | -- | 0.00004 | -- | 0.00004 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.00004 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.00004 |
| Medium Total | | | | | | | | 4E-08 | | | | | 0.0007 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | 0.0004 | -- | -- | 0.0004 |
| | | | Chromium | 4E-08 | -- | -- | -- | 4E-08 | None Reported | 0.0002 | -- | -- | 0.0002 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | 0.0008 | -- | -- | 0.0008 |
| | | | Chemical Total | 4E-08 | -- | -- | -- | 4E-08 | | 0.001 | -- | -- | 0.001 |
| | | Exposure Point Total | | | | | | 4E-08 | | | | | 0.001 |
| | Exposure Medium Total | | | | | | | 4E-08 | | | | | 0.001 |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | CNS | -- | 0.00001 | -- | 0.00001 |
| | | | Chromium | -- | 1E-09 | -- | -- | 1E-09 | Respiratory | -- | 0.0000009 | -- | 0.0000009 |
| | | | Manganese | -- | -- | -- | -- | -- | CNS | -- | 0.00007 | -- | 0.00007 |
| | | | Chemical Total | -- | 1E-09 | -- | -- | 1E-09 | | -- | 0.00008 | -- | 0.00008 |
| | | Exposure Point Total | | | | | | 1E-09 | | | | | 0.00008 |
| | Exposure Medium Total | | | | | | | 1E-09 | | | | | 0.00008 |
| Medium Total | | | | | | | | 4E-08 | | | | | 0.001 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.13.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Future
Receptor Population: Recreational Users
Receptor Age: Lifelong (Child and Adult)

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 4E-07 | -- | -- | -- | 4E-07 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | 4E-07 | -- | -- | -- | 4E-07 | | | | | |
| | | Exposure Point Total | | | | | | 4E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 4E-07 | | | | | |
| | Air | Investigation Area 2 | Chromium | -- | 2E-09 | -- | -- | 2E-09 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 2E-09 | -- | -- | 2E-09 | | | | | |
| | | Exposure Point Total | | | | | | 2E-09 | | | | | |
| | Exposure Medium Total | | | | | | | 2E-09 | | | | | |
| Medium Total | | | | | | | | 4E-07 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chromium | 5E-07 | -- | -- | -- | 5E-07 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | 5E-07 | -- | -- | -- | 5E-07 | | | | | |
| | | Exposure Point Total | | | | | | 5E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 5E-07 | | | | | |
| | Air | Investigation Area 2 | Aluminum | -- | -- | -- | -- | -- | | | | | |
| | | | Chromium | -- | 3E-09 | -- | -- | 3E-09 | | | | | |
| | | | Manganese | -- | -- | -- | -- | -- | | | | | |
| | | | Chemical Total | -- | 3E-09 | -- | -- | 3E-09 | | | | | |
| | | Exposure Point Total | | | | | | 3E-09 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-09 | | | | | |
| Medium Total | | | | | | | | 5E-07 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.14.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Child

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 7E-06 | -- | - - | -- | 7E-06 | None Reported | 0.03 | -- | -- | 0.03 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.08 | -- | -- | 0.08 |
| | | | Chemical Total | 7E-06 | -- | - - | -- | 7E-06 | | 0.1 | -- | -- | 0.1 |
| | | Exposure Point Total | | | | | | 7E-06 | | | | | 0.1 |
| | Exposure Medium Total | | | | | | | 7E-06 | | | | | 0.1 |
| | Air | Investigation Area 2 | Chromium | -- | 1E-07 | -- | -- | 1E-07 | Respiratory | -- | 0.00009 | -- | 0.00009 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.004 | -- | 0.004 |
| | | | Chemical Total | -- | 1E-07 | -- | -- | 1E-07 | | - - | 0.004 | - - | 0.004 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | 7E-06 | | | | | 0.1 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.06 | -- | -- | 0.06 |
| | | | Chromium | 8E-06 | -- | - - | -- | 8E-06 | None Reported | 0.03 | -- | -- | 0.03 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.1 | -- | -- | 0.1 |
| | | | Chemical Total | 8E-06 | -- | - - | -- | 8E-06 | | 0.2 | -- | -- | 0.2 |
| | | Exposure Point Total | | | | | | 8E-06 | | | | | 0.2 |
| | Exposure Medium Total | | | | | | | 8E-06 | | | | | 0.2 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chromium | -- | 2E-07 | -- | -- | 2E-07 | Respiratory | -- | 0.00010 | -- | 0.00010 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.007 | -- | 0.007 |
| | | | Chemical Total | -- | 2E-07 | -- | -- | 2E-07 | | - - | 0.009 | - - | 0.009 |
| | | Exposure Point Total | | | | | | 2E-07 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 2E-07 | | | | | 0.009 |
| Medium Total | | | | | | | | 8E-06 | | | | | 0.2 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.15.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 6E-07 | -- | - - | -- | 6E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.008 | -- | -- | 0.008 |
| | | | Chemical Total | 6E-07 | -- | - - | -- | 6E-07 | | 0.01 | -- | -- | 0.01 |
| | | Exposure Point Total | | | | | | 6E-07 | | | | | 0.01 |
| | Exposure Medium Total | | | | | | | 6E-07 | | | | | 0.01 |
| | Air | Investigation Area 2 | Chromium | -- | 1E-07 | -- | -- | 1E-07 | Respiratory | -- | 0.00009 | -- | 0.00009 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.004 | -- | 0.004 |
| | | | Chemical Total | -- | 1E-07 | -- | -- | 1E-07 | | - - | 0.004 | - - | 0.004 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.004 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.004 |
| Medium Total | | | | | | | | 8E-07 | | | | | 0.02 |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | CNS | 0.007 | -- | -- | 0.007 |
| | | | Chromium | 7E-07 | -- | - - | -- | 7E-07 | None Reported | 0.003 | -- | -- | 0.003 |
| | | | Manganese | - - | -- | - - | -- | - - | CNS | 0.01 | -- | -- | 0.01 |
| | | | Chemical Total | 7E-07 | -- | - - | -- | 7E-07 | | 0.02 | -- | -- | 0.02 |
| | | Exposure Point Total | | | | | | 7E-07 | | | | | 0.02 |
| | Exposure Medium Total | | | | | | | 7E-07 | | | | | 0.02 |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | CNS | -- | 0.001 | -- | 0.001 |
| | | | Chromium | -- | 1E-07 | -- | -- | 1E-07 | Respiratory | -- | 0.00010 | -- | 0.00010 |
| | | | Manganese | -- | - - | -- | -- | - - | CNS | -- | 0.007 | -- | 0.007 |
| | | | Chemical Total | -- | 1E-07 | -- | -- | 1E-07 | | - - | 0.009 | - - | 0.009 |
| | | Exposure Point Total | | | | | | 1E-07 | | | | | 0.009 |
| | Exposure Medium Total | | | | | | | 1E-07 | | | | | 0.009 |
| Medium Total | | | | | | | | 9E-07 | | | | | 0.03 |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.16.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
NSA CRANE, CRANE, INDIANA

Scenario Timeframe: Hypothetical
Receptor Population: Residents
Receptor Age: Adult

| Medium | Exposure Medium | Exposure Point | Chemical of Potential Concern | Carcinogenic Risk | | | | | Non-Carcinogenic Hazard Quotient | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Ingestion | Inhalation | Dermal | External (Radiation) | Exposure Routes Total | Primary Target Organ(s) | Ingestion | Inhalation | Dermal | Exposure Routes Total |
| Surface Soil | Surface Soil | Investigation Area 2 | Chromium | 8E-06 | -- | - - | -- | 8E-06 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 8E-06 | -- | - - | -- | 8E-06 | | | | | |
| | | Exposure Point Total | | | | | | 8E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 8E-06 | | | | | |
| | Air | Investigation Area 2 | Chromium | -- | 3E-07 | -- | -- | 3E-07 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 3E-07 | -- | -- | 3E-07 | | | | | |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | |
| Medium Total | | | | | | | | 8E-06 | | | | | |
| Subsurface Soil | Subsurface Soil | Investigation Area 2 | Aluminum | - - | -- | - - | -- | - - | | | | | |
| | | | Chromium | 9E-06 | -- | - - | -- | 9E-06 | | | | | |
| | | | Manganese | - - | -- | - - | -- | - - | | | | | |
| | | | Chemical Total | 9E-06 | -- | - - | -- | 9E-06 | | | | | |
| | | Exposure Point Total | | | | | | 9E-06 | | | | | |
| | Exposure Medium Total | | | | | | | 9E-06 | | | | | |
| | Air | Investigation Area 2 | Aluminum | -- | - - | -- | -- | - - | | | | | |
| | | | Chromium | -- | 3E-07 | -- | -- | 3E-07 | | | | | |
| | | | Manganese | -- | - - | -- | -- | - - | | | | | |
| | | | Chemical Total | -- | 3E-07 | -- | -- | 3E-07 | | | | | |
| | | Exposure Point Total | | | | | | 3E-07 | | | | | |
| | Exposure Medium Total | | | | | | | 3E-07 | | | | | |
| Medium Total | | | | | | | | 9E-06 | | | | | |

Notes:
1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

# APPENDIX G

# SUPPORTING DOCUMENTATION FOR THE ECOLOGICAL RISK ASSESSMENT

This appendix presents a discussion of the different chemical classes detected at the sites, including toxicity information, potential food chain and trophic transfer, and bioaccumulation potential.

## Volatile Organic Compounds

VOCs are usually very mobile in the environment because they are poorly adsorbed to soil and sediment particles. Also, because they are very volatile, they typically are only detected in surface water, surface soil, and sediment at low concentrations.

Most VOCs have very little potential to bioaccumulate in ecological receptors; therefore, biomagnification through the food chain does not appear to be significant. VOCs are not expected to biomagnify in plants and are typically only toxic to ecological receptors at relatively high concentrations.

## Metals

Many metals occur naturally at various concentrations in the surface water and sediment primarily to chemical weathering of rocks and fallout from volcanoes. Most metals are toxic to aquatic (i.e., fish, invertebrates) and terrestrial (i.e., plants, invertebrates, vertebrates) ecological receptors above certain concentrations, with some metals being more toxic at lower concentrations than others. Also, different chemical forms of the metals may be more toxic than others. For example, hexavalent chromium is typically more toxic than trivalent chromium, and methylmercury is more toxic than inorganic mercury. In addition, the toxicity of several metals (cadmium, chromium, copper, lead, nickel, silver, and zinc) to aquatic receptors in freshwater systems decreases with increasing water hardness.

Many factors (e.g., pH, Eh, clay content, organic matter content) influence the bioavailability of metals to invertebrates in sediment. One way to estimate the bioavailable portion of certain divalent metals (cadmium, copper, lead, nickel, and zinc) in sediment is to measure the amount of acid volatile sulfides (AVS) and simultaneously extracted metals (SEM) in a sediment sample. If the molar concentration of AVS is higher than the molar concentration of SEM, than the SEM metals are expected to be unavailable to aquatic invertebrates and, therefore, nontoxic. AVS plays little or no role in determining interstitial water concentrations of metals in aerobic systems or those with low productivity (i.e., where the absence of organic carbon limits sulfate reduction)

(Ankley et al., 1995), or when ingestion of sediments is the primary exposure route (Lee et al., 2000).

**Miscellaneous**

Perchlorates are mainly used in explosives, fireworks, road flares, and rocket motors as they can be very reactive (ATSDR, 2008). Based on animal studies, the thyroid gland is the main target of perchlorate toxicity as perchlorate affects the ability of the thyroid gland to take up iodine (ATSDR, 2008). Few adverse effects have been observed from perchlorate exposure (US Army CHPPM, 2007). Perchlorate salts are highly soluble in soil and water (US Army CHPPM, 2007). Most perchlorates will be found in groundwater (ATSDR, 2008).

**References:**

Ankley, Gerald T., D.M. Di Toro, D.J. Hansen, and W.J. Berry. 1995. Technical Basis and Proposal for Deriving Sediment Quality Criteria for Metals. Environmental Toxicology and Chemistry. Vol. 15(12), pp. 2056-2066.

ATSDR (Agency for Toxic Substances and Disease Registry). 2008. Toxicological Profile for Perchlorates. U.S. Public Health Service, Atlanta, Georgia. September.

Lee, Byeong-Gweon, Sarah B. Griscom, Jung-Suk Lee, Heesun J. Choi, Chul-Hwan Koh, Samuel N Lucoma, and Nicvholas S. Fisher. 2000. Influences of Dietary Uptake and Reactive Sulfides on Metal Bioavailability from Aquatic Sediments. Science, Volume 287, pp. 282-284. January 14.

US Army CHPPM, 2007. Wildlife Toxicity Assessment for Perchlorate, Document Number 87-MA02T6-05D, Aberdeen Proving Ground, Maryland, February.

**APPENDIX G**

**RECEPTOR PROFILES**
**SWMU 27**
**NSA CRANE, CRANE, INDIANA**


The following sections present the receptor profiles for the representative herbivorous and invertivorous, receptors chosen for food chain modeling at SWMU 27. The majority of the information for the profiles was obtained from the Wildlife Exposure Factors Handbook (U.S. EPA, 1993). The data for the incidental soil ingestion rates were obtained from the U.S. EPA Ecological Soil Screening Guidance (U.S. EPA, 2005).

The food and water ingestion rates are listed in g/g (of body weight)-day on a wet weight basis but were converted to dry weight for the ERA using the exposure factors presented below. The home ranges are presented in hectares in U.S. EPA (1993) but were converted to acres by multiplying the number of hectares by 2.471. Also note that the estimated percent of soil in the diets are listed in dry weight.

**Short-Tailed Shrew (*Blarina brevicauda*)**

Shrews inhabit a wide variety of habitats and are common in areas with abundant vegetative cover. They need cool, moist habitats because of their high metabolic and water-loss rates. The short-tailed shrew is primarily carnivorous, eating insects and other invertebrates such as earthworms, slugs, and snails.

The adult body weight for the short-tailed shrew in various habitats ranged from 0.015 to 0.01921 kg with an average of 0.0169 kg. The listed food ingestion rates for shrews are between 0.43 and 0.96 g/g-day (wet-weight). The food ingestion rate in kg/day was calculated as shown on Table I.2. The food ingestion rate was then multiplied by 0.16 in the food chain model, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (3% for conservative food chain model and 0.9% for the average food chain model) from U. S. EPA (2005). 3% is the 90$^{th}$ percentile value and 0.9% is the 50$^{th}$ percentile value from U. S. EPA (2005). The only available home range for the shrew (0. 9699 acres) was calculated using data from a tamarack bog in Manitoba (only value available).

**American Woodcock (*Scolopax minor*)**

Woodcocks inhabit both woodlands and abandoned fields, particularly those with rich and moderately to poorly drained loamy soils, which tend to support abundant earthworm populations. They feed primarily on invertebrates found in moist upland soils by probing the soil with their long prehensile-tipped bill. Earthworms are their preferred diet, but seeds and other plant matter may also be consumed.

The adult body weight for the woodcock ranges from 0.166 to 0.213 kg with an average of 0.190 kg. The

listed food ingestion rates for the woodcock are between 0.73 and 1.0 g/g-day (wet-weight). The food ingestion rate in kg/day was calculated as shown in Table I.2. The food ingestion rate was then multiplied by 0.16 in the food chain model, which is the percent solids of worms (Sample et al., 1997) to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 16.4% for conservative food chain model and 6.4% for the average food chain model) from U. S. EPA (2005). 16.4% is the 90$^{th}$ percentile value and 6.4% is the 50$^{th}$ percentile value from U. S. EPA (2005).

The range of home range sizes for the woodcock is 7.66 to 182 acres with an average home range of 61 acres.

**Meadow Vole (*Microtus pennsylvanicus*)**

Meadow voles inhabit grassy fields, marshes, and bogs; however, they prefer fields with more grass, more cover, and fewer woody plants. They typically consume green succulent vegetation, sedges, seeds, roots, bark, fungi, insects, and animal matter. However, green succulent vegetation makes up the majority of their diet.

The adult body weight for the vole ranges from 0.0329 to 0.0391 kg with an average of 0.0366 kg. The only listed food ingestion rates for voles range from 0.30 to 0.35 g/g-day (wet-weight), with an average of 0.325 g/g-day. The food ingestion rate in kg/day was calculated as shown in Table I.6. The food ingestion rate was then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (U.S. EPA, 2005), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 3.2% for conservative food chain model and 1.2% for the average food chain model) from U. S. EPA (2005). 3.2% is the 90$^{th}$ percentile value and 1.2% is the 50$^{th}$ percentile value from U. S. EPA (2005).

The range of home range sizes for the meadow vole is 0.0297 to 1.06 acres with an average home range of 0.16 acres.

**Northern Bobwhite Quail (*Colinus virginianus*)**

Quails inhabit grasslands, idle fields, pastures, and large clumps of grasses. Bobwhite quails forage in areas with open vegetation, some bare ground, and light litter. Seeds from weeds, woody plants, and

grasses comprise the majority of an adult's diet, although green vegetation has been found to dominate the diet of this species in winter in the southern areas of the United States.

The adult body weight for the bobwhite quail ranges from 0.162 to 0.186 kg with an average of 0.177 kg. The listed food ingestion rates for quails range from 0.067 to 0.093 g/g-day (wet-weight), with an average of 0.082 g/g-day. The food ingestion rate in kg/day was calculated as shown on Table I.2. The food ingestion rate was then multiplied by 0.15 in the food chain model, which is the percent solids of plant foliage (U.S. EPA, 2005), to convert the ingestion rate from a wet-weight value to a dry-weight value. The incidental soil ingestion rate was calculated by multiplying the ingestion rate by the percentage of soil that is incidentally ingested (assumed 13.9% for conservative food chain model and 6.1% for the average food chain model) from U. S. EPA (2005). 13.9% is the 90$^{th}$ percentile value and 6.1% is the 50$^{th}$ percentile value for the mourning dove from U. S. EPA (2005).

The home range for the quail ranges from 16 to 41 acres with an average home range of 29 acres.

**References:**

Sample, B.E., M.S. Aplin, R.A. Efroymson, G.W., Suter II, and C.J.E. Welsh. 1997. Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants. Oak Ridge National Laboratory. October. ORNL/TM-13391.

U.S. EPA (U.S. Environmental Protection Agency), 1993. Wildlife Exposure Factors Handbook. U.S. Environmental Protection Agency. Office of Research and Development. Washington, D.C. December 1993. EPA/600/R-93/187a.

U.S. EPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level Guidance, Office of Emergency and Remedial Response. February

TABLE G.1

EXPOSURE PARAMETERS FOR THE TERRESTRIAL WILDLIFE MODEL
NSA CRANE, INDIANA

| Species/Exposure Inputs | Conservative Inputs | | Average Inputs | | Source |
|---|---|---|---|---|---|
| | Values | Units | Values | Units | |
| ***Meadow Vole*** | | | | | |
| Body Weight = BW | 3.290E-02 | kg | 3.663E-02 | kg | USEPA, 1993 |
| Food Ingestion Rate = If | 1.920E-03 | kg/day | 1.785E-03 | kg/day | USEPA, 1993 |
| Water Ingestion Rate = Iw | 7.700E-03 | L/day | 6.400E-03 | L/day | USEPA, 1993 |
| Soil Ingestion Rate - Is | 6.144E-05 | kg/day | 2.142E-05 | kg/day | Beyer, 1993 |
| Home Range = HR | Assume 100% on site | | 1.640E-01 | acres | USEPA, 1993 |
| ***Short-Tailed Shrew*** | | | | | |
| Body Weight = BW | 1.525E-02 | kg | 1.687E-02 | kg | USEPA, 1993 |
| Food Ingestion Rate = If | 2.592E-03 | kg/day | 1.648E-03 | kg/day | USEPA, 1993 |
| Water Ingestion Rate = Iw | 4.300E-03 | L/day | 3.800E-03 | L/day | USEPA, 1993 |
| Soil Ingestion Rate - Is | 7.776E-05 | kg/day | 1.483E-05 | kg/day | Beyer, 1993 |
| Home Range = HR | Assume 100% on site | | 9.700E-01 | acres | USEPA, 1993 |
| ***American Woodcock*** | | | | | |
| Body Weight = BW | 1.660E-01 | kg | 1.895E-01 | kg | USEPA, 1993 |
| Food Ingestion Rate = If | 3.032E-02 | kg/day | 2.526E-02 | kg/day | USEPA, 1993 |
| Water Ingestion Rate = Iw | 1.900E-02 | L/day | 1.900E-02 | L/day | USEPA, 1993 |
| Soil Ingestion Rate - Is | 4.972E-03 | kg/day | 1.617E-03 | kg/day | Beyer, 1993 |
| Home Range = HR | Assume 100% on site | | 6.133E+01 | acres | USEPA, 1993 |
| ***Bobwhite Quail*** | | | | | |
| Body Weight = BW | 1.620E-01 | kg | 1.770E-01 | kg | USEPA, 1993 |
| Food Ingestion Rate = If | 1.640E-02 | kg/day | 1.440E-02 | kg/day | USEPA, 1993 |
| Water Ingestion Rate = Iw | 2.310E-02 | L/day | 1.840E-02 | L/day | USEPA, 1993 |
| Soil Ingestion Rate - Is | 2.280E-03 | kg/day | 8.784E-04 | kg/day | Beyer, 1993 |
| Home Range = HR | Assume 100% on site | | 2.860E+01 | acres | USEPA, 1993 |

The exposure factors were derived as presented in Appendix G Table G.2.

The soil ingestion rates were calculated by multiplying the food ingestion rates by the following incidental soil ingestion rates:

| Receptor | Conservative | Average | Source |
|---|---|---|---|
| Bobwhite quail | 13.9% | 6.1% | 1, 2 |
| Meadow Vole | 3.2% | 1.2% | 1 |
| American woodcock | 16.4% | 6.4% | 1 |
| Short-tailed Shrew | 3% | 0.9% | 1 |

1 - USEPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level Guidance, Office of Emergency and Remedial Response. February.
2 - Based on the mourning dove.

TABLE G.2

CALCULATION OF EXPOSURE PARAMETERS FOR SURROGATE WILDLIFE RECEPTORS
SWMU 27
NSA CRANE
CRANE, INDIANA

| Exposure Parameters | Meadow Vole | | Short-Tailed Shrew | | American Woodcock | Bobwhite Quail | |
|---|---|---|---|---|---|---|---|
| Body Weights (g) | 32.9 | | 17.61 | 16.87 | 168 | 180 | 181 |
| | 39.1 | | 17.33 | 15.58 | 209 | 168 | 183 |
| | 35.5 | | 19.21 | 15.7 | 166 | 162 | 179 |
| | 39 | | 17.4 | 15.25 | 212 | 175 | 175 |
| | | | | | 169 | 178 | 183.2 |
| | | | | | 213 | 179 | 185.5 |
| | | | | | | 180 | 173 |
| | | | | | | 162.8 | 180.4 |
| ***Minimum*** | ***32.9*** | | ***15.25*** | | ***166*** | ***162*** | |
| ***Maximum*** | ***39.1*** | | ***19.21*** | | ***213*** | ***186*** | |
| ***Average*** | ***36.6*** | | ***16.87*** | | ***190*** | ***177*** | |
| Food Ingestion Rate (g/g-day) (1) | 0.3 | | 0.49 | 0.77 | 1.0 | 0.067 | 0.079 |
| | 0.35 | | 0.62 | 0.55 | 0.77 | 0.072 | 0.093 |
| | | | 0.43 | 0.96 | 0.73 | 0.09 | 0.089 |
| | | | 0.52 | 0.54 | | | |
| ***Minimum*** | ***0.3*** | | ***0.43*** | | ***0.73*** | ***0.067*** | |
| ***Maximum*** | ***0.35*** | | ***0.96*** | | ***1.0*** | ***0.093*** | |
| ***Average*** | ***0.325*** | | ***0.61*** | | ***0.8*** | ***0.082*** | |
| Food Ingestion Rate (kg/day) | | | | | | | |
| **Conservative** | ***1.28E-02*** | | ***1.62E-02*** | | ***1.90E-01*** | ***1.64E-02*** | |
| ***Average*** | ***1.19E-02*** | | ***1.03E-02*** | | ***1.58E-01*** | ***1.44E-02*** | |
| ***Conversion from wet weight to dry weight*** | ***0.15 (2)*** | | ***0.16 (3)*** | | ***0.16 (3)*** | ***None (4)*** | |
| Water Ingestion Rate (g/g-day) (1) | 0.14 | 0.21 | 0.223 | | 0.1 | 0.115 | 0.1 |
| | | | | | 0.1 | 0.106 | 0.131 |
| | | | | | | 0.093 | 0.101 |
| | | | | | | 0.086 | 0.102 |
| | | | | | | 0.11 | 0.1 |
| ***Minimum*** | ***0.14*** | | ***0.223*** | | ***0.1*** | ***0.086*** | |
| ***Maximum*** | ***0.21*** | | ***0.223*** | | ***0.1*** | ***0.131*** | |
| ***Average*** | ***0.175*** | | ***0.223*** | | ***0.1*** | ***0.104*** | |
| Water Ingestion Rate (L/day) | | | | | | | |
| **Conservative** | ***7.69E-03*** | | ***4.28E-03*** | | ***2.13E-02*** | ***2.31E-02*** | |
| ***Average*** | ***6.41E-03*** | | ***3.76E-03*** | | ***1.90E-02*** | ***1.84E-02*** | |
| Home Range (Ha) | 0.43 | 0.1 | 0.3925 | | 4.5 | 7.6 | |
| | 0.02 | 0.04 | | | 32.4 | 16.7 | |
| | 0.01 | 0.03 | | | 3.1 | 6.4 | |
| | 0.01 | 0.01 | | | 73.6 | 15.6 | |
| | 0.04 | 0.06 | | | 10.5 | | |
| | 0.02 | 0.03 | | | | | |
| | 0.05 | 0.08 | | | | | |
| | 0.06 | 0.06 | | | | | |
| ***Minimum (acres)*** | ***0.0297*** | | ***0.97*** | | ***7.7*** | ***16*** | |
| ***Maximum (acres)*** | ***1.06*** | | ***0.97*** | | ***182*** | ***41*** | |
| ***Average (acres)*** | ***0.16*** | | ***0.97*** | | ***61*** | ***29*** | |

***Notes:***
Source of data is U.S. EPA (1993). If values from several studies are available, they are given. The minimum, maximum, and average values are derived from these studies.

**Footnotes:**
(1) - Ingestion Rates (kg/day or L/day) (if more than 1 ingestion rate is available)
- Conservative value = Max Ingestion Rate (g/g-day) * Avg. Body Weight
- Average value = Avg. Ingestion Rate (g/g-day) * Avg. Body Weight

Ingestion Rates (L/day) (if only 1 ingestion rate is available)
- Conservative value = Ingestion Rate (g/g-day) * Max. Body Weight
- Average value = Ingestion Rate (g/g-day) * Avg. Body Weight

(2) - Percent solids in vegetation
(3) - Percent solids in earthworms
(4) - Food items on dry weight basis

# APPENDIX G

## BIOACCUMULATION FACTORS

This attachment presents the bioaccumulation factors (BAFs) that were used in the food chain models. The following sources of BAFs were used in the ecological risk assessment for most of the chemicals:

- Plant and Soil Invertebrate BAFs: EPA Guidance for Developing Ecological Soil Screening Levels, Attachment 4-1 (USEPA, 2007).

- Plant BAFs (organic chemicals): Toxicity and Chemical-Specific Factors Database (ORNL, 2011).

- Plant BAFs (metals): Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants (ORNL, 1998).

- Soil Invertebrate BAFs: Development and Validation of Bioaccumulation Models for Earthworms (Sample et al., 1998).

Table G.3 presents the BAFs that were used in the food-chain models for the individual constituents that were detected at SWMU 27. Note that dry weight BAFs were used for this ERA. A default value of 1.0 was used for the BAF if chemical-specific data were not available.

The EPA Guidance for Developing Ecological Soil Screening Levels (Eco SSLs) was the source of the BAFs for some of the chemicals. The majority of these BAFs are actually regression or BAF equations that are used to calculate the tissue concentration from the soil concentration.

### References

ORNL (Oak Ridge National Laboratory). 1998. Empirical Model for the Uptake of Inorganic Chemicals from Soil by Plants. BJC/OR-133. September.

ORNL. 2011. Toxicity and Chemical-Specific Factors Database. Oak Ridge National Laboratory Web Page, http://rais.ornl.gov/cgi-bin/tools/TOX_search?select=chem_spef

Sample, B.E., J.J. Beauchamp, R.A. Efroymson, G.W., Suter II, and T.L. Ashwood. 1998. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory. June. ES/ER/TM-220.

USEPA, 2007. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

TABLE G.3

TERRESTRIAL FOOD CHAIN MODEL - BAF VALUES
SWMU 27
NSA CRANE
CRANE, INDIANA

| Chemical | Plant Bioaccumulation Factors | | | Earthworm Bioaccumulation Factors | | |
|---|---|---|---|---|---|---|
| | Conservative | Average | | Conservative | Average | |
| **Metals** | | | | | | |
| BARIUM | 1.56E-01 | 1.56E-01 | (1) | 9.10E-02 | 9.10E-02 | (1) |
| CADMIUM | Regression equation from Eco SSL | | (1) | Regression equation from Eco SSL | | (1) |
| CHROMIUM | 4.10E-02 | 4.10E-02 | (1) | 3.06E-01 | 3.06E-01 | (1) |
| LEAD | Regression equation from Eco SSL | | (1) | Regression equation from Eco SSL | | (1) |
| MANGANESE | 7.90E-02 | 7.90E-02 | (1) | Regression equation from Eco SSL | | (1) |
| ZINC | Regression equation from Eco SSL | | (1) | Regression equation from Eco SSL | | (1) |

**Footnotes:**

1 - USEPA (2007). Where "Regression equation from Eco-SSL" is given, tissue concentration will be calculated using regression equations from USEPA (2007), Attachment 4-1, Tables 4a (for inorganics).

**Sources:**

U. S. EPA, 2007. Guidance for Developing Ecological Soil Screening Level, Attachment 4-1, Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. Office of Solid Waste and Emergency and Response. OSWER Directive 9285.7-55. April.

TABLE G.4

TOXICITY REFERENCE VALUES
SWMU 27
NSA CRANE
CRANE, INDIANA

| PARAMETER | Mammal | | Bird | |
|---|---|---|---|---|
| | NOAEL | LOAEL | NOAEL | LOAEL |
| **INORGANICS** | | | | |
| Barium | 51.8 | 82.7 | 20.8 | 41.7 |
| Cadmium | 0.77 | 6.9 | 1.47 | 6.35 |
| Chromium | 2.40 | 58.17 | 2.66 | 15.63 |
| Lead | 4.7 | 30.2 | 1.63 | 9.70 |
| Manganese | 51.5 | 145.67 | 179 | 376.6 |
| Zinc | 75.4 | 297.58 | 66.1 | 171.44 |

Notes:
The sources of these NOAELS and LOAELS are presented in the table titled "Sources and Endpoints for NOAELS and LOAELS for Terrestrial Wildlife" in this appendix.

The NOAELS and LOAELS in the source table were divided by 10 if a subchronic study was the basis for the value. Also, if only a NOAEL was available, the value was multiplied by 10 to estimate the LOAEL. If only a LOAEL was available, the value was divided by 10 to estimate the NOAEL.

TABLE G.5

SOURCES AND ENDPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE
SWMU 27
NSA CRANE
CRANE, INDIANA

| Parameters | Concentration (mg/kg-day) | Endpoint | Effect | Chronic/ Subchronic | Species | Primary Reference | Source of Reference |
|---|---|---|---|---|---|---|---|
| **Inorganics** | | | | | | | |
| Barium | 82.7 | LOAEL | reproduction & growth | chronic | mammals | USEPA, 2005 | |
| Barium | 416.53 | LOAEL | Survival | subchronic | chicks | Johnson et al., 1960 | Sample et.al., 1996 |
| Barium | 51.8 | NOAEL | reproduction & growth | chronic | mammals | USEPA, 2005 | |
| Barium | 208.26 | NOAEL | Survival | subchronic | chicks | Johnson et al., 1960 | Sample et.al., 1996 |
| Cadmium | 6.35 | LOAEL | reproduction & growth | chronic | birds | USEPA, 2005 | |
| Cadmium | 6.9 | LOAEL | reproduction & growth | chronic | mammals | USEPA, 2005 | |
| Cadmium | 1.47 | NOAEL | reproduction & growth | chronic | birds | USEPA, 2005 | |
| Cadmium | 0.77 | NOAEL | reproduction & growth | chronic | rat | USEPA, 2005 | |
| Chromium(III) | 15.63 | LOAEL | reproduction & growth | chronic | birds | USEPA, 2008 | |
| Chromium(III) | 58.17 | LOAEL | reproduction & growth | chronic | mammals | USEPA, 2008 | |
| Chromium(III) | 2.66 | NOAEL | reproduction & growth | chronic | birds | USEPA, 2008 | |
| Chromium(III) | 2.4 | NOAEL | reproduction & growth | chronic | mammals | USEPA, 2008 | |
| Lead | 9.7 | LOAEL | reproduction & growth | chronic | birds | Spec Pro, Inc and Exponent, Inc., 2009 | |
| Lead | 30.2 | LOAEL | reproduction & growth | chronic | mammals | Spec Pro, Inc and Exponent, Inc., 2009 | |
| Lead | 1.63 | NOAEL | reproduction & growth | chronic | chicken | USEPA, 2005 | |
| Lead | 4.7 | NOAEL | reproduction & growth | chronic | rat | USEPA, 2005 | |
| Manganese | 376.6 | LOAEL | reproduction & growth | chronic | birds | USEPA, 2007 | |
| Manganese | 145.67 | LOAEL | reproduction & growth | chronic | mammals | USEPA, 2007 | |
| Manganese | 179 | NOAEL | reproduction & growth | chronic | birds | USEPA, 2007 | |
| Manganese | 51.5 | NOAEL | reproduction & growth | chronic | mammals | USEPA, 2007 | |
| Zinc | 297.58 | LOAEL | reproduction & growth | chronic | mammals | USEPA, 2007 | |
| Zinc | 171.44 | LOAEL | reproduction & growth | chronic | birds | USEPA, 2007 | |
| Zinc | 75.4 | NOAEL | reproduction & growth | chronic | mammals | USEPA, 2007 | |
| Zinc | 66.1 | NOAEL | reproduction & growth | chronic | birds | USEPA, 2007 | |

Notes:
NOAEL = No Observed Adverse Effects Level
LOAEL = Lowest Observed Adverse Effects Level
The LOAELs used for several metals were calculated as the geometric mean of growth and reproduction data from the Ecological Soil Screening Levels (U.S. EPA, 2005, 2007, 2008).
References for the NOAELS and LOAELs are presented in this Attachment and Titled "TRV Source and Endpoint References".

**SOURCES AND ENPOINTS FOR NOAELS AND LOAELS FOR TERRESTRIAL WILDLIFE**

Johnson, D., Jr., A. L. Mehring, Jr., and H. W. Titus. 1960. Tolerance of chickens for barium. *Proc. Soc. Exp. Biol. Med*. 104: 436-438.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. June. ES/ER/TM-86/R3.

Spec Pro, Inc. and Exponent, Inc. 2009. Baseline Ecological Assessment Settling Ponds and Spoils Disposal Areas Site, Badger Army Ammunition Plant, Baraboo, Wisconsin. Appendix E3 – Selection of Toxicity Reference Values. October.

USEPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level for Barium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-63. February.

USEPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level for Cadmium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-65. March.

USEPA (U.S. Environmental Protection Agency), 2005. Ecological Soil Screening Level for Lead, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-70. March.

U.S. EPA, 2007. Ecological Soil Screening Level for Manganese, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-71. April.

U.S. EPA, 2007. Ecological Soil Screening Level for Zinc, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-73. June.

USEPA (U.S. Environmental Protection Agency), 2008. Ecological Soil Screening Level for Chromium, Interim Final. Office of Emergency and Remedial Response. OSWER Directive 9285.7-66. April.

APPENDIX G

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE
SWMU 27 - IA 1
NSA CRANE
CRANE, INDIANA

| Chemical | Surface Soil Concentrations (mg/kg) | | | | Earthworm Bioaccumulation Factors | | Earthworm Concentrations (mg/kg) | | Plant Bioaccumulation Factors | | Plant Concentrations (mg/kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum Detection | Average of All Results | Average of Positive Results | Average [1] | Conservative | Average | Maximum Detection | Average | Conservative | Average | Maximum Detection | Average |
| **INORGANICS** | | | | | | | | | | | | |
| BARIUM | 1.92E+02 | 1.32E+02 | 1.32E+02 | 1.32E+02 | 9.10E-02 | 9.10E-02 | 1.75E+01 | 1.20E+01 | 1.56E-01 | 1.56E-01 | 3.00E+01 | 2.06E+01 |
| CADMIUM | 7.83E-01 | 5.75E-01 | 5.48E-01 | 5.75E-01 | Regression equation from Eco SSL | | 6.82E+00 | 5.33E+00 | Regression equation from Eco SSL | | 5.44E-01 | 4.60E-01 |
| CHROMIUM | 3.22E+01 | 2.46E+01 | 2.46E+01 | 2.46E+01 | 3.06E-01 | 3.06E-01 | 9.85E+00 | 7.53E+00 | 4.10E-02 | 4.10E-02 | 1.32E+00 | 1.01E+00 |
| MANGANESE | 5.55E+03 | 2.12E+03 | 2.12E+03 | 2.12E+03 | Regression equation from Eco SSL | | 1.59E+02 | 8.28E+01 | 7.90E-02 | 7.90E-02 | 4.38E+02 | 1.68E+02 |
| LEAD | 3.20E+01 | 2.62E+01 | 2.62E+01 | 2.62E+01 | Regression equation from Eco SSL | | 1.32E+01 | 1.12E+01 | Regression equation from Eco SSL | | 1.85E+00 | 1.65E+00 |
| ZINC | 7.37E+01 | 6.25E+01 | 6.25E+01 | 6.25E+01 | Regression equation from Eco SSL | | 3.51E+02 | 3.32E+02 | Regression equation from Eco SSL | | 5.23E+01 | 4.77E+01 |

1 - If the average of all value is the greater than the maximum detection, the average of the positive detections was used as the average value.

**APPENDIX G**

**MEADOW VOLE - TIER 1 INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Max Soil Conc. (mg/kg) | Vegetation Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Veget. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| BARIUM | 1.92E+02 | 3.00E+01 | 3.59E-01 | 1.75E+00 | 2.11E+00 | 5.18E+01 | 8.27E+01 | 4.07E-02 | 2.55E-02 |
| CADMIUM | 7.83E-01 | 5.44E-01 | 1.46E-03 | 3.18E-02 | 3.32E-02 | 7.70E-01 | 6.90E+00 | 4.31E-02 | 4.81E-03 |
| CHROMIUM | 3.22E+01 | 1.32E+00 | 6.01E-02 | 7.70E-02 | 1.37E-01 | 2.40E+00 | 5.82E+01 | 5.71E-02 | 2.36E-03 |
| MANGANESE | 5.55E+03 | 4.38E+02 | 1.04E+01 | 2.56E+01 | 3.60E+01 | 5.15E+01 | 1.46E+02 | 6.98E-01 | 2.47E-01 |
| LEAD | 3.20E+01 | 1.85E+00 | 5.98E-02 | 1.08E-01 | 1.68E-01 | 4.70E+00 | 3.02E+01 | 3.57E-02 | 5.56E-03 |
| ZINC | 7.37E+01 | 5.23E+01 | 1.38E-01 | 3.05E+00 | 3.19E+00 | 7.54E+01 | 2.98E+02 | 4.23E-02 | 1.07E-02 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 3.29E-02 | kg |
| Food Ingestion Rate = (If) | 1.92E-03 | kg/day |
| Water Ingestion Rate = (Iw) | 7.70E-03 | L/day |
| Soil Ingestion Rate = (Is) | 6.14E-05 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX G

BOBWHITE QUAIL - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 27 -IA 1
NSA CRANE
CRANE, INDIANA

| Chemical | Max Soil Conc. (mg/kg) | Vegetation Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Veget. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| INORGANICS | | | | | | | | | |
| BARIUM | 1.92E+02 | 3.00E+01 | 2.70E+00 | 3.03E+00 | 5.73E+00 | 2.08E+01 | 4.17E+01 | 2.8E-01 | 1.4E-01 |
| CADMIUM | 7.83E-01 | 5.44E-01 | 1.10E-02 | 5.51E-02 | 6.61E-02 | 1.47E+00 | 6.35E+00 | 4.5E-02 | 1.0E-02 |
| CHROMIUM | 3.22E+01 | 1.32E+00 | 4.53E-01 | 1.34E-01 | 5.87E-01 | 2.66E+00 | 1.56E+01 | 2.2E-01 | 3.8E-02 |
| MANGANESE | 5.55E+03 | 4.38E+02 | 7.81E+01 | 4.44E+01 | 1.22E+02 | 1.79E+02 | 3.77E+02 | 6.8E-01 | 3.3E-01 |
| LEAD | 3.20E+01 | 1.85E+00 | 4.50E-01 | 1.87E-01 | 6.38E-01 | 1.63E+00 | 9.70E+00 | 3.9E-01 | 6.6E-02 |
| ZINC | 7.37E+01 | 5.23E+01 | 1.04E+00 | 5.30E+00 | 6.33E+00 | 6.61E+01 | 1.71E+02 | 9.6E-02 | 3.7E-02 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.62E-01 | kg |
| Food Ingestion Rate = (If) | 1.64E-02 | kg/day |
| Water Ingestion Rate = (Iw) | 2.31E-02 | L/day |
| Soil Ingestion Rate = (Is) | 2.28E-03 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX G

SHORT-TAILED SHREW - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 27 -IA 1
NSA CRANE
CRANE, INDIANA

| Chemical | Max Soil Conc. (mg/kg) | Invertebrate Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Invert. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| BARIUM | 1.92E+02 | 1.75E+01 | 9.79E-01 | 2.97E+00 | 3.95E+00 | 5.18E+01 | 8.27E+01 | 7.6E-02 | 4.8E-02 |
| CADMIUM | 7.83E-01 | 6.82E+00 | 3.99E-03 | 1.16E+00 | 1.16E+00 | 7.70E-01 | 6.90E+00 | 1.5E+00 | 1.7E-01 |
| CHROMIUM | 3.22E+01 | 9.85E+00 | 1.64E-01 | 1.67E+00 | 1.84E+00 | 2.40E+00 | 5.82E+01 | 7.7E-01 | 3.2E-02 |
| MANGANESE | 5.55E+03 | 1.59E+02 | 2.83E+01 | 2.71E+01 | 5.54E+01 | 5.15E+01 | 1.46E+02 | 1.1E+00 | 3.8E-01 |
| LEAD | 3.20E+01 | 1.32E+01 | 1.63E-01 | 2.24E+00 | 2.40E+00 | 4.70E+00 | 3.02E+01 | 5.1E-01 | 8.0E-02 |
| ZINC | 7.37E+01 | 3.51E+02 | 3.76E-01 | 5.96E+01 | 6.00E+01 | 7.54E+01 | 2.98E+02 | 8.0E-01 | 2.0E-01 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.53E-02 | kg |
| Food Ingestion Rate = (If) | 2.59E-03 | kg/day |
| Water Ingestion Rate = (Iw) | 4.30E-03 | L/day |
| Soil Ingestion Rate = (Is) | 7.78E-05 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**AMERICAN WOODCOCK - TIER 1 INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Max Soil Conc. (mg/kg) | Invertebrate Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Invert. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| BARIUM | 1.92E+02 | 1.75E+01 | 5.75E+00 | 3.19E+00 | 8.94E+00 | 2.08E+01 | 4.17E+01 | 4.3E-01 | 2.1E-01 |
| CADMIUM | 7.83E-01 | 6.82E+00 | 2.35E-02 | 1.25E+00 | 1.27E+00 | 1.47E+00 | 6.35E+00 | 8.6E-01 | 2.0E-01 |
| CHROMIUM | 3.22E+01 | 9.85E+00 | 9.65E-01 | 1.80E+00 | 2.76E+00 | 2.66E+00 | 1.56E+01 | 1.0E+00 | 1.8E-01 |
| MANGANESE | 5.55E+03 | 1.59E+02 | 1.66E+02 | 2.91E+01 | 1.95E+02 | 1.79E+02 | 3.77E+02 | 1.1E+00 | 5.2E-01 |
| LEAD | 3.20E+01 | 1.32E+01 | 9.59E-01 | 2.41E+00 | 3.37E+00 | 1.63E+00 | 9.70E+00 | 2.1E+00 | 3.5E-01 |
| ZINC | 7.37E+01 | 3.51E+02 | 2.21E+00 | 6.40E+01 | 6.62E+01 | 6.61E+01 | 1.71E+02 | 1.0E+00 | 3.9E-01 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.66E-01 | kg |
| Food Ingestion Rate = (If) | 3.03E-02 | kg/day |
| Water Ingestion Rate = (Iw) | 1.90E-02 | L/day |
| Soil Ingestion Rate = (Is) | 4.97E-03 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**MEADOW VOLE - TIER 2, STEP 3A INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Average Soil Conc. (mg/kg) | Vegetation Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Veget. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| MANGANESE | 2.12E+03 | 1.68E+02 | 1.24E+00 | 8.18E+00 | 9.42E+00 | 5.15E+01 | 1.46E+02 | 1.83E-01 | 6.47E-02 |
| LEAD | 2.62E+01 | 1.65E+00 | 1.53E-02 | 8.06E-02 | 9.59E-02 | 4.70E+00 | 3.02E+01 | 2.04E-02 | 3.18E-03 |

| | | |
|---|---|---|
| Body Weight = (BW) | 3.66E-02 | kg |
| Food Ingestion Rate = (If) | 1.79E-03 | kg/day |
| Water Ingestion Rate = (Iw) | 6.40E-03 | L/day |
| Soil Ingestion Rate = (Is) | 2.14E-05 | kg/day |
| Home Range = (HR) | 1.64E-01 | acres |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**BOBWHITE QUAIL - TIER 2, STEP 3A INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Average Soil Conc. (mg/kg) | Vegetation Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Veget. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| MANGANESE | 2.12E+03 | 1.68E+02 | 1.05E+01 | 1.37E+01 | 2.42E+01 | 1.79E+02 | 3.77E+02 | 1.4E-01 | 6.4E-02 |
| LEAD | 2.62E+01 | 1.65E+00 | 1.30E-01 | 1.35E-01 | 2.64E-01 | 1.63E+00 | 9.70E+00 | 1.6E-01 | 2.7E-02 |

| | | |
|---|---|---|
| Body Weight = (BW) | 1.77E-01 | kg |
| Food Ingestion Rate = (If) | 1.44E-02 | kg/day |
| Water Ingestion Rate = (Iw) | 1.84E-02 | L/day |
| Soil Ingestion Rate = (Is) | 8.78E-04 | kg/day |
| Home Range = (HR) | 2.86E+01 | acres |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**SHORT-TAILED SHREW - TIER 2, STEP 3A INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Average Soil Conc. (mg/kg) | Invertebrate Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Invert. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| MANGANESE | 2.12E+03 | 8.28E+01 | 1.87E+00 | 8.08E+00 | 9.95E+00 | 5.15E+01 | 1.46E+02 | 1.9E-01 | 6.8E-02 |
| LEAD | 2.62E+01 | 1.12E+01 | 2.30E-02 | 1.09E+00 | 1.12E+00 | 4.70E+00 | 3.02E+01 | 2.4E-01 | 3.7E-02 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.69E-02 | kg |
| Food Ingestion Rate = (If) | 1.65E-03 | kg/day |
| Water Ingestion Rate = (Iw) | 3.80E-03 | L/day |
| Soil Ingestion Rate = (Is) | 1.48E-05 | kg/day |
| Home Range = (HR) | 9.70E-01 | acres |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**AMERICAN WOODCOCK - TIER 2, STEP 3A INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 1**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Average Soil Conc. (mg/kg) | Invertebrate Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Invert. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| MANGANESE | 2.12E+03 | 8.28E+01 | 1.81E+01 | 1.10E+01 | 2.92E+01 | 1.79E+02 | 3.77E+02 | 1.6E-01 | 7.7E-02 |
| LEAD | 2.62E+01 | 1.12E+01 | 2.23E-01 | 1.49E+00 | 1.72E+00 | 1.63E+00 | 9.70E+00 | 1.1E+00 | 1.8E-01 |

| | | |
|---|---|---|
| Body Weight = (BW) | 1.90E-01 | kg |
| Food Ingestion Rate = (If) | 2.53E-02 | kg/day |
| Water Ingestion Rate = (Iw) | 1.90E-02 | L/day |
| Soil Ingestion Rate = (Is) | 1.62E-03 | kg/day |
| Home Range = (HR) | 6.13E+01 | acres |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX G

CHEMICAL CONCENTRATIONS IN SURFACE SOIL AND TISSUE
SWMU 27 - IA 2
NSA CRANE
CRANE, INDIANA

| Chemical | Surface Soil Concentrations (mg/kg) | | | | Surface Water Concentrations (mg/L) | | | | Earthworm Bioaccumulation Factors | | Earthworm Concentrations (mg/kg) | | Plant Bioaccumulation Factors | | Plant Concentrations (mg/kg) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum Detection | Average of All Results | Average of Positive Results | Average [1] | Maximum Detection | Average of All Results | Average of Positive Results | Average[1] | Conservative | Average | Maximum Detection | Average | Conservative | Average | Maximum Detection | Average |
| INORGANICS | | | | | | | | | | | | | | | | |
| BARIUM | 1.32E+02 | 1.10E+02 | 1.10E+02 | 1.10E+02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.10E-02 | 9.10E-02 | 1.20E+01 | 1.00E+01 | 1.56E-01 | 1.56E-01 | 2.06E+01 | 1.72E+01 |
| CADMIUM | 7.98E-01 | 4.30E-01 | 7.98E-01 | 4.30E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | Regression equation from Eco SSL | | 6.92E+00 | 4.23E+00 | Regression equation from Eco SSL | | 5.50E-01 | 3.92E-01 |
| LEAD | 1.58E+01 | 1.47E+01 | 1.47E+01 | 1.47E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | Regression equation from Eco SSL | | 7.46E+00 | 7.04E+00 | Regression equation from Eco SSL | | 1.25E+00 | 1.20E+00 |
| ZINC | 6.02E+01 | 5.59E+01 | 5.59E+01 | 5.59E+01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | Regression equation from Eco SSL | | 3.28E+02 | 3.20E+02 | Regression equation from Eco SSL | | 4.68E+01 | 4.49E+01 |

1 - If the average of all value is the greater than the maximum detection, the average of the positive detections was used as the average value.

APPENDIX G

MEADOW VOLE - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 27 -IA 2
NSA CRANE
CRANE, INDIANA

| Chemical | Max Soil Conc. (mg/kg) | Vegetation Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Veget. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| BARIUM | 1.32E+02 | 2.06E+01 | 2.47E-01 | 1.20E+00 | 1.45E+00 | 5.18E+01 | 8.27E+01 | 2.80E-02 | 1.75E-02 |
| CADMIUM | 7.98E-01 | 5.50E-01 | 1.49E-03 | 3.21E-02 | 3.36E-02 | 7.70E-01 | 6.90E+00 | 4.36E-02 | 4.86E-03 |
| LEAD | 1.58E+01 | 1.25E+00 | 2.95E-02 | 7.27E-02 | 1.02E-01 | 4.70E+00 | 3.02E+01 | 2.18E-02 | 3.39E-03 |
| ZINC | 6.02E+01 | 4.68E+01 | 1.12E-01 | 2.73E+00 | 2.84E+00 | 7.54E+01 | 2.98E+02 | 3.77E-02 | 9.55E-03 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 3.29E-02 | kg |
| Food Ingestion Rate = (If) | 1.92E-03 | kg/day |
| Water Ingestion Rate = (Iw) | 7.70E-03 | L/day |
| Soil Ingestion Rate = (Is) | 6.14E-05 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

APPENDIX G

BOBWHITE QUAIL - TIER 1 INPUTS
TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL
SWMU 27 -IA 2
NSA CRANE
CRANE, INDIANA

| Chemical | Max Soil Conc. (mg/kg) | Vegetation Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Veget. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| INORGANICS | | | | | | | | | |
| BARIUM | 1.32E+02 | 2.06E+01 | 1.86E+00 | 2.08E+00 | 3.94E+00 | 2.08E+01 | 4.17E+01 | 1.9E-01 | 9.5E-02 |
| CADMIUM | 7.98E-01 | 5.50E-01 | 1.12E-02 | 5.57E-02 | 6.69E-02 | 1.47E+00 | 6.35E+00 | 4.6E-02 | 1.1E-02 |
| LEAD | 1.58E+01 | 1.25E+00 | 2.22E-01 | 1.26E-01 | 3.49E-01 | 1.63E+00 | 9.70E+00 | 2.1E-01 | 3.6E-02 |
| ZINC | 6.02E+01 | 4.68E+01 | 8.47E-01 | 4.73E+00 | 5.58E+00 | 6.61E+01 | 1.71E+02 | 8.4E-02 | 3.3E-02 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.62E-01 | kg |
| Food Ingestion Rate = (If) | 1.64E-02 | kg/day |
| Water Ingestion Rate = (Iw) | 2.31E-02 | L/day |
| Soil Ingestion Rate = (Is) | 2.28E-03 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (vegetation) = (Cv * If)(H)/BW

Cv = Contaminant concentration in vegetation
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**SHORT-TAILED SHREW - TIER 1 INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 2**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Max Soil Conc. (mg/kg) | Invertebrate Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Invert. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| **INORGANICS** | | | | | | | | | |
| BARIUM | 1.32E+02 | 1.20E+01 | 6.73E-01 | 2.04E+00 | 2.71E+00 | 5.18E+01 | 8.27E+01 | 5.2E-02 | 3.3E-02 |
| CADMIUM | 7.98E-01 | 6.92E+00 | 4.07E-03 | 1.18E+00 | 1.18E+00 | 7.70E-01 | 6.90E+00 | 1.5E+00 | 1.7E-01 |
| LEAD | 1.58E+01 | 7.46E+00 | 8.06E-02 | 1.27E+00 | 1.35E+00 | 4.70E+00 | 3.02E+01 | 2.9E-01 | 4.5E-02 |
| ZINC | 6.02E+01 | 3.28E+02 | 3.07E-01 | 5.58E+01 | 5.61E+01 | 7.54E+01 | 2.98E+02 | 7.4E-01 | 1.9E-01 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.53E-02 | kg |
| Food Ingestion Rate = (If) | 2.59E-03 | kg/day |
| Water Ingestion Rate = (Iw) | 4.30E-03 | L/day |
| Soil Ingestion Rate = (Is) | 7.78E-05 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)
H=CA/HR (Assume = to 1)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration

**APPENDIX G**

**AMERICAN WOODCOCK - TIER 1 INPUTS**
**TERRESTRIAL WILDLIFE MODEL ECOLOGICAL EFFECTS QUOTIENT CALCULATION - SURFACE SOIL**
**SWMU 27 -IA 2**
**NSA CRANE**
**CRANE, INDIANA**

| Chemical | Max Soil Conc. (mg/kg) | Invertebrate Conc. (mg/kg) | Dose (mg/kg/d) from: Soil | Dose (mg/kg/d) from: Invert. | Total Dose (mg/kg/d) | NOAEL (mg/kg/d) | LOAEL (mg/kg/d) | Hazard Quotients NOAEL | Hazard Quotients LOAEL |
|---|---|---|---|---|---|---|---|---|---|
| BARIUM | 1.32E+02 | 1.20E+01 | 3.95E+00 | 2.19E+00 | 6.15E+00 | 2.08E+01 | 4.17E+01 | 3.0E-01 | 1.5E-01 |
| CADMIUM | 7.98E-01 | 6.92E+00 | 2.39E-02 | 1.26E+00 | 1.29E+00 | 1.47E+00 | 6.35E+00 | 8.8E-01 | 2.0E-01 |
| LEAD | 1.58E+01 | 7.46E+00 | 4.73E-01 | 1.36E+00 | 1.84E+00 | 1.63E+00 | 9.70E+00 | 1.1E+00 | 1.9E-01 |
| ZINC | 6.02E+01 | 3.28E+02 | 1.80E+00 | 5.99E+01 | 6.17E+01 | 6.61E+01 | 1.71E+02 | 9.3E-01 | 3.6E-01 |

Cells are shaded if the value is greater than 1.0

| | | |
|---|---|---|
| Body Weight = (BW) | 1.66E-01 | kg |
| Food Ingestion Rate = (If) | 3.03E-02 | kg/day |
| Water Ingestion Rate = (Iw) | 1.90E-02 | L/day |
| Soil Ingestion Rate = (Is) | 4.97E-03 | kg/day |
| Home Range = (HR) | Assume 100% on site | |
| Contaminated Area = (CA) | Assume equal to home range | |

Dose (soil) = (Cs * Is)(H)/BW
Dose (invertebrate) = (Ci * If)(H)/BW

Ci = Contaminant concentration in invertebrate
Cs = Contaminant concentration in soil
Total Dose = Dose (soil) + Dose (vegetation)

Conc = Concentration
LOAEL = Lowest Observed Adverse Effects Concentration
NOAEL = No Observed Adverse Effects Concentration