



Final Preliminary Assessment/Site Inspection Report

**Additional and Uncharacterized Sites Operable Unit
Crab Orchard National Wildlife Refuge NPL Site
Marion, Illinois (Williamson County)**

June 2003

This Final PA/SI Report is identical to the
"Draft-Final" Report issued in September 2001.

VOLUME X

Sections 22 through 29

18124-1/1-J



00053976

TABLE OF CONTENTS

VOLUME X

SECTION 22	AUS-0062 - COC AREA	22-1
22.1	Historic Search Information	22-2
22.1.1	Site Description	22-2
22.1.2	Operational History and Waste Characteristics.....	22-2
22.1.3	AUS-0062 Previous Sampling Results.....	22-3
22.1.4	Observations During Site Visit.....	22-4
22.1.5	Recommendations Based on Preliminary Assessment.....	22-4
22.2	Site Investigation Information.....	22-4
22.2.1	Field Investigation.....	22-4
22.2.2	Field Results.....	22-5
22.2.2.1	Site Conditions	22-5
22.2.2.1.1	Geologic Conditions	22-5
22.2.2.1.2	Hydrogeologic Conditions	22-5
22.2.2.1.3	Hydrologic Conditions.....	22-5
22.2.2.2	Chemical Results.....	22-5
22.3	Screening Risk Assessment.....	22-6
22.3.1	Human Health Risk	22-7
22.3.1.1	Soil/Sediment	22-7
22.3.1.2	Surface Water.....	22-7
22.3.2	Ecological Risk	22-7
22.3.2.1	Soil	22-7
22.3.2.2	Sediment.....	22-8
22.3.2.3	Surface Water.....	22-9
22.4	Scientific Management Decision Point.....	22-10
SECTION 23	AUS-0063 - COC AREA	23-1
23.1	Historic Search Information	23-1
23.1.1	Site Description	23-1
23.1.2	Operational History and Waste Characteristics.....	23-1
23.1.3	AUS-0063 Previous Sampling Results.....	23-2
23.1.4	Observations During Site Visit.....	23-2
23.1.5	Recommendations Based on Preliminary Assessment.....	23-2
23.2	Site Investigation Information.....	23-2
23.2.1	Field Investigation.....	23-3
23.2.2	Field Results.....	23-3
23.2.2.1	Site Conditions	23-3
23.2.2.1.1	Geologic Conditions	23-3
23.2.2.1.2	Hydrogeologic Conditions	23-3
23.2.2.1.3	Hydrologic Conditions.....	23-3
23.2.2.2	Chemical Results.....	23-3
23.3	Screening Risk Assessment.....	23-4
23.4	Summary and Recommendations.....	23-4
SECTION 24	AUS-0064 - COC AREA	24-1
24.1	Historic Search Information	24-1
24.1.1	Site Description	24-1
24.1.2	Operational History and Waste Characteristics.....	24-1

TABLE OF CONTENTS

24.1.3	AUS-0064 Previous Sampling Results.....	24-1
24.1.4	Observations During Site Visit.....	24-2
24.1.5	Recommendations Based on Preliminary Assessment.....	24-2
24.2	Site Investigation Information.....	24-2
24.2.1	Field Investigation.....	24-2
24.2.2	Field Results.....	24-2
24.2.2.1	Chemical Results.....	24-3
24.3	Screening Risk Assessment.....	24-3
24.3.1	Human Health Risk.....	24-4
24.3.1.1	Soil.....	24-4
24.3.2	Ecological Risk.....	24-4
24.3.2.1	Soil.....	24-4
24.4	Scientific Management Decision Point.....	24-5
24.4.1	Human Health Risk Evaluation.....	24-5
24.4.2	Ecological Risk Evaluation.....	24-6
24.4.3	Summary of Recommendations.....	24-8
SECTION 25	AUS-0065 - COC AREA.....	25-1
25.1	Historic Search Information.....	25-1
25.1.1	Site Description.....	25-1
25.1.2	Operational History and Waste Characteristics.....	25-1
25.1.3	AUS-0065 Previous Sampling Results.....	25-1
25.1.4	Observations During Site Visit.....	25-1
25.1.5	Recommendations Based on Preliminary Assessment.....	25-2
25.2	Site Investigation Information.....	25-2
25.2.1	Field Investigation.....	25-2
25.2.2	Field Results.....	25-2
25.2.2.1	Site Conditions.....	25-2
25.2.2.1.1	Geologic Conditions.....	25-2
25.2.2.1.2	Hydrogeologic Conditions.....	25-3
25.2.2.1.3	Hydrologic Conditions.....	25-3
25.2.2.2	Chemical Results.....	25-3
25.3	Screening Risk Assessment.....	25-3
25.3.1	Human Health Risk.....	25-4
25.3.1.1	Soil.....	25-4
25.3.2	Ecological Risk.....	25-4
25.3.2.1	Soil.....	25-4
25.4	Scientific Management Decision Point.....	25-5
SECTION 26	AUS-0066 - COC AREA.....	26-1
26.1	Historic Search Information.....	26-1
26.1.1	Site Description.....	26-1
26.1.2	Operational History and Waste Characteristics.....	26-1
26.1.3	AUS-0066 Previous Sampling Results.....	26-1
26.1.4	Observations During Site Visit.....	26-2
26.1.5	Recommendations Based on Preliminary Assessment.....	26-2
26.2	Site Investigation Information.....	26-2
26.2.1	Field Investigation.....	26-2
26.2.2	Field Results.....	26-3
26.2.2.1	Site Conditions.....	26-3
26.2.2.1.1	Geologic Conditions.....	26-3

TABLE OF CONTENTS

	26.2.2.1.2 Hydrogeologic Conditions	26-3
	26.2.2.1.3 Hydrologic Conditions	26-3
	26.2.2.2 Chemical Results	26-3
26.3	Screening Risk Assessment	26-4
26.3.1	Human Health Risk	26-4
26.3.1.1	Soil/Sediment	26-4
26.3.1.2	Surface Water	26-5
26.3.2	Ecological Risk	26-5
26.3.2.1	Soil	26-5
26.3.2.2	Sediment	26-6
26.3.2.3	Surface Water	26-7
26.4	Scientific Management Decision Point	26-8
SECTION 27	AUS-0067 - COC AREA.....	27-1
27.1	Historic Search Information	27-1
27.1.1	Site Description	27-1
27.1.2	Operational History and Waste Characteristics.....	27-1
27.1.3	AUS-0067 Previous Sampling Results.....	27-1
27.1.4	Observations During Site Visit.....	27-1
27.1.5	Recommendations Based on Preliminary Assessment.....	27-1
27.2	Site Investigation Information.....	27-2
27.2.1	Field Investigation.....	27-2
27.2.2	Field Results.....	27-2
27.2.2.1	Site Conditions	27-2
27.2.2.1.1	Geologic Conditions	27-2
27.2.2.1.2	Hydrogeologic Conditions	27-2
27.2.2.1.3	Hydrologic Conditions	27-2
27.2.2.2	Chemical Results.....	27-2
27.3	Screening Risk Assessment.....	27-3
27.3.1	Human Health Risk	27-4
27.3.1.1	Soil	27-4
27.3.1.2	Cistern Water.....	27-4
27.3.2	Ecological Risk	27-4
27.3.2.1	Soil	27-4
27.4	Scientific Management Decision Point	27-5
SECTION 28	AUS-0069 - COC AREA.....	28-1
28.1	Historic Search Information	28-1
28.1.1	Site Description	28-1
28.1.2	Operational History and Waste Characteristics.....	28-1
28.1.3	AUS-0069 Previous Sampling Results.....	28-2
28.1.4	Observations During Site Visit.....	28-2
28.1.5	Recommendations Based on Preliminary Assessment.....	28-2
28.2	Site Investigation Information.....	28-2
28.2.1	Field Investigation.....	28-2
28.2.2	Field Results.....	28-4
28.2.2.1	Site Conditions	28-4
28.2.2.1.1	Geologic Conditions	28-4
28.2.2.1.2	Hydrogeologic Conditions	28-4
28.2.2.1.3	Hydrologic Conditions	28-4
28.2.2.2	Chemical Results.....	28-4

TABLE OF CONTENTS

28.3	Screening Risk Assessment.....	28-4
28.3.1	Human Health Risk	28-5
28.3.1.1	Soil/Sediment	28-5
28.3.1.2	Trench Water.....	28-6
28.3.2	Ecological Risk	28-6
28.3.1.1	Soil	28-6
28.3.1.2	Sediment.....	28-7
28.4	Scientific Management Decision Point	28-8
SECTION 29	AUS-0109 - COC AREA.....	29-1
29.1	Historic Search Information	29-1
29.1.1	Site Description	29-1
29.1.2	Operational History and Waste Characteristics.....	29-1
29.1.3	AUS-0109 Previous Sampling Results.....	29-2
29.1.4	Observations During Site Visit.....	29-2
29.1.5	Recommendations Based on Preliminary Assessment.....	29-2
29.2	Site Investigation Information.....	29-2
29.2.1	Field Investigation.....	29-2
29.2.2	Field Results.....	29-3
29.2.2.1	Site Conditions	29-3
29.2.2.1.1	Geologic Conditions	29-3
29.2.2.1.2	Hydrogeologic Conditions	29-3
29.2.2.1.3	Hydrologic Conditions.....	29-3
29.2.2.2	Chemical Results.....	29-3
29.3	Screening Risk Assessment.....	29-3
29.3.1	Human Health Risk	29-4
29.3.1.1	Soil	29-4
29.3.2	Ecological Risk	29-4
29.3.2.1	Soil	29-4
29.4	Scientific Management Decision Point	29-5
29.9.1	Human Health Risk Evaluation.....	29-5
29.9.2	Ecological Risk Evaluation	29-6
29.9.3	Summary of Recommendations	29-7

LIST OF TABLES

Table 22-1	Survey Coordinates for Sample Locations in AUS-0062
Table 22-1A	1998 USEPA Soil Sample Analytical Results Summary
Table 22-2	Matrices Sampled at each Sample Location at AUS-0062
Table 22-3	Soil Sample Analytical Results Summary
Table 22-4	Sediment Sample Analytical Results Summary
Table 22-5	Surface Water Sample Analytical Results Summary
Table 22-6	Human Health Screening of Soil Results from AUS-0062
Table 22-7	Human Health Screening of Sediment Results from AUS-0062
Table 22-8	Human Health Screening of Surface Water Results from AUS-0062
Table 22-9	Ecological Screening of Soil Results from AUS-0062
Table 22-10	Ecological Screening of Sediment Results from AUS-0062
Table 22-11	Ecological Screening of Surface Water Results from AUS-0062
Table 22-12	AUS-0062 - Summary of Human Health COPC Evaluation
Table 22-13	AUS-0062 - Summary of Ecological COPEC Evaluation

TABLE OF CONTENTS

Table 22-14	AUS-0062 – Former Landfill (COC-11), Chemicals Detected Above Screening Criteria and Above Refuge Background (Where Applicable)
Table 23-1	Survey Coordinates for Sample Locations in AUS-0063
Table 23-1A	1998 USEPA Soil Sample Analytical Results Summary
Table 23-2	Matrices Sampled at each Sample Location at AUS-0063
Table 23-3	Sediment Sample Analytical Results Summary
Table 23-4	Surface Water Sample Analytical Results Summary
Table 24-1	Survey Coordinates for Sample Locations in AUS-0064
Table 24-1A	1998 USEPA Soil Sample Analytical Results Summary
Table 24-2	Matrices Sampled at each Sample Location at AUS-0064
Table 24-3	Soil Sample Analytical Results Summary
Table 24-4	Human Health Screening of Soil Results from AUS-0064
Table 24-5	Ecological Screening of Soil Results from AUS-0064
Table 24-6	AUS-0064 - Summary of Human Health COPC Evaluation
Table 24-7	AUS-0064 - Summary of Ecological COPEC Evaluation
Table 25-1	Survey Coordinates for Sample Locations in AUS-0065
Table 25-1A	1998 USEPA Soil Sample Analytical Results Summary
Table 25-2	Matrices Sampled at each Sample Location at AUS-0065
Table 25-3	Soil Sample Analytical Results Summary
Table 25-4	Human Health Screening of Soil Results from AUS-0065
Table 25-5	Ecological Screening of Soil Results from AUS-0065
Table 25-6	AUS-0065 - Summary of Human Health COPC Evaluation
Table 25-7	AUS-0065 - Summary of Ecological COPEC Evaluation
Table 25-8	AUS-0065 – Foundations Northeast of Former COC-1, Chemicals Detected Above Screening Criteria and Above Refuge Background (Where Applicable)
Table 26-1	Survey Coordinates for Sample Locations in AUS-0066
Table 26-1A	1998 USEPA Soil Sample Analytical Results Summary
Table 26-2	Matrices Sampled at each Sample Location at AUS-0066
Table 26-3	Soil Sample Analytical Results Summary
Table 26-4	Sediment Sample Analytical Results Summary
Table 26-5	Surface Water Sample Analytical Results Summary
Table 26-6	Human Health Screening of Soil Results from AUS-0066
Table 26-7	Human Health Screening of Sediment Results from AUS-0066
Table 26-8	Human Health Screening of Surface Water Results from AUS-0066
Table 26-9	Ecological Screening of Soil Results from AUS-0066
Table 26-10	Ecological Screening of Sediment Results from AUS-0066
Table 26-11	Ecological Screening of Surface Water Results from AUS-0066
Table 26-12	AUS-0066 - Summary of Human Health COPC Evaluation
Table 26-13	AUS-0066 - Summary of Ecological COPEC Evaluation
Table 26-14	AUS-0066 – Former EMMA OU Site COC-14, Chemicals Detected Above Screening Criteria and Above Refuge Background (Where Applicable)
Table 27-1	Survey Coordinates for Sample Locations in AUS-0067
Table 27-2	Matrices Sampled at each Sample Location at AUS-0067
Table 27-3	Soil Sample Analytical Results Summary
Table 27-4	Cistern Water Sample Analytical Results Summary
Table 27-5	Human Health Screening of Soil Results from AUS-0067

TABLE OF CONTENTS

Table 27-6	Human Health Screening of Cistern Water Results from AUS-0067
Table 27-7	Ecological Screening of Soil Results from AUS-0067
Table 27-8	AUS-0067 - Summary of Human Health COPC Evaluation
Table 27-9	AUS-0067 - Summary of Ecological COPEC Evaluation
Table 27-10	AUS-0067 – Fence with “Contaminated Area “ Sign, Northwest of COC-6, Chemicals Detected Above Screening Criteria and Above Refuge Background (Where Applicable)
Table 28-1	Survey Coordinates for Sample Locations in AUS-0069
Table 28-2	Matrices Sampled at each Sample Location at AUS-0069
Table 28-3	Soil Sample Analytical Results Summary
Table 28-4	Sediment Sample Analytical Results Summary
Table 28-5	Trench Water Sample Analytical Results Summary
Table 28-6	Human Health Screening of Soil Results from AUS-0069
Table 28-7	Human Health Screening of Sediment Results from AUS-0069
Table 28-8	Human Health Screening of Trench Water Results from AUS-0069
Table 28-9	Ecological Screening of Soil Results from AUS-0069
Table 28-10	Ecological Screening of Sediment Results from AUS-0069
Table 28-11	AUS-0069 - Summary of Human Health COPC Evaluation
Table 28-12	AUS-0069 - Summary of Ecological COPEC Evaluation
Table 28-13	AUS-0069 – Former EMMA OU Site COC-15, Chemicals Detected Above Screening Criteria and Above Refuge Background (Where Applicable)
Table 29-1	Survey Coordinates for Sample Locations in AUS-0109
Table 29-2	Matrices Sampled at each Sample Location at AUS-0109
Table 29-3	Soil Sample Analytical Results Summary
Table 29-4	Human Health Screening of Soil Results from AUS-0109
Table 29-5	Ecological Screening of Soil Results from AUS-0109
Table 29-6	AUS-0109 - Summary of Human Health COPC Evaluation
Table 29-7	AUS-0109 - Summary of Ecological COPEC Evaluation

LIST OF FIGURES

Figure 22-1	Site Location Map for AUS OU Sites Addressed in Volume X
Figure 22-2	EMMA OU COC Site Locations
Figure 22-3	Site COC-1
Figure 22-4	Site COC-2
Figure 22-5	Site COC-4
Figure 22-6	Site COC-5
Figure 22-7	Site COC-6
Figure 22-8	Site COC-7
Figure 22-9	Site COC-8
Figure 22-10	Site COC-9
Figure 22-11	AUS-0062 Sample Locations and Detections in Soils/Sediments
Figure 22-12	AUS-0062 Sample Locations and Detections in Surface Water
Figure 23-1	AUS-0063 Sample Locations and Detections in Sediments and Surface Water
Figure 24-1	AUS-0064 Sample Locations and Detections in Soils
Figure 25-1	AUS-0065 Sample Locations and Detections of Organic Compounds in Soils
Figure 25-2	AUS-0065 Sample Locations and Detections of Inorganic Compounds in Soils

TABLE OF CONTENTS

Figure 26-1	AUS-0066 Sample Locations and Detections of Organic Compounds in Soils/Sediments
Figure 26-2	AUS-0066 Sample Locations and Detections of Inorganic Compounds in Soils/Sediments
Figure 26-3	AUS-0066 Sample Locations and Detections in Surface Water
Figure 27-1	AUS-0067 Sample Locations and Detections in Soils and Cistern Water
Figure 28-1	AUS-0069 Sample Locations and Detections of Organic Compounds in Soils/Sediments
Figure 28-2	AUS-0069 Sample Locations and Detections of Inorganic Compounds in Soils/Sediments
Figure 28-3	AUS-0069 Sample Locations and Detections in Trench Water
Figure 29-1	AUS-0109 Sample Locations and Detections in Soils

ACRONYM LIST
Crab Orchard AUS OU PA/SI Report

ACRONYM	DEFINITION
3S _b	Mean plus three standard deviations
A.N.	Ammonium Nitrate
ARAR	Applicable, Relevant and Appropriate Requirements
AOC	Area of Concern
AST	Aboveground Storage Tank
ASTER	Assessment Tools for the Management of Risk (USEPA database)
AUS OU	Additional Uncharacterized Sites Operable Unit
BGS	Below Ground Surface
BNA	Base-Neutral Acids
BOD	Biological Oxygen Demand
BOR	U.S. Bureau of Reclamation
BRA	Baseline Risk Assessment
BTAG	Biological Technical Assistance Group
BTOC	Below Top of Casing
BWT	Below Water Table
CCME	Canadian Council of Ministers of the Environment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act of 1980 (a.k.a. Superfund)
CIA	Central Intelligence Agency
CIPS	Central Illinois Public Service
CLP	Contract Laboratory Program
CM/SEC	Centimeters per Second
COC	Chain-of-Custody
COC	Chemical of Concern
COC	Crab Orchard Cemetery
COI	Chemical of Interest
COL	Crab Orchard Lake
CONWR	Crab Orchard National Wildlife Refuge
COP	Crab Orchard Pond
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CSC	Commercial Solvents Corporation
CSEQGs	Canadian Sediment Quality Guidelines
CSOQGs	Canadian Soil Quality Guidelines
CTI	Central Technologies Incorporated
CVOC	Chlorinated Volatile Organic Compounds
CWQG	Canadian Water Quality Guidelines
DAF	Dilution Attenuation Factor
DEHP	bis(2-ethylhexyl)phthalate
DERP	Defense Environmental Restoration Program
DGOLs	New Dutchlist Groundwater Optimum Levels
DNT	Dinitrotoluene
DOD	Department of Defense
DOI	U.S. Department of the Interior

ACRONYM LIST
Crab Orchard AUS OU PA/SI Report

ACRONYM	DEFINITION
DQCR	Daily Quality Control Reports
DQO	Data Quality Objective
DRO	Diesel Range Organics
DSOLs	New Dutchlist Soil Optimum Levels
DTW	Depth to water
DU	Depleted Uranium
EMMA OU	Explosives and Munitions Manufacturing Area Operable Unit
EPA	U.S. Environmental Protection Agency
EqP	Equilibrium Partitioning
ERL	Effects-Range Low
ERM	Effects-Range Medium
ESV	Ecological Screening Value
FDAP	Field Director of Ammunition Plants
FFA	Federal Facility Agreement
FID	Flame Ionization Detector
FOIA	Freedom of Information Act
FNH	Flashless Non-hydroscopic Powder
FS	Feasibility Study
FSP	Field Sampling Plan
FT	feet or foot
FWS	U.S. Fish and Wildlife Service
GPS	Global Positioning System
GRO	Gasoline Range Organics
GSA	General Services Administration
GW	Ground Water
HBX	High Blast Explosives
HE	High Explosives
HEDP	High Explosive Detonation Product
HEI	High Explosives Igniter
HMX	Her Majesty's Explosive (Cyclotetramethylenetetranitramine)
HQ	Hazard Quotient
HSA	Hollow Stem Auger
HSP	Health and Safety Plan
IAC	Illinois Administrative Code
IDW	Investigation Derived Waste
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
IOP	Illinois Ordnance Plant
K _{ow}	Octanol-to-Water Partitioning Coefficient
LAW	Light Antitank Weapon
LOEC	Lowest Observed Effects Concentration
MAOU	Metals Area Operable Unit
MATC	Maximum Acceptable Toxicant Concentration

ACRONYM LIST
Crab Orchard AUS OU PA/SI Report

ACRONYM	DEFINITION
TSS	Total Suspended Solids
UET	Upper Effect Threshold
UG/KG	micrograms per kilogram
UG/L	micrograms per liter
UMC	Universal Match Corporation
USACE	U.S. Army Corp of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
ECOTOX	Ecological Toxicity Database
USFWS	United States Fish & Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VJ Day	Victory over Japan day (August 15, 1945)
VOCs	Volatile Organic Compounds
WAA	War Assets Administration
WSA	West Shop Area
WWII	World War II
WWTP	Wastewater Treatment Plant

ACRONYM LIST
Crab Orchard AUS OU PA/SI Report

ACRONYM	DEFINITION
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MG/KG	milligrams per kilogram
MG/L	milligrams per liter
MHSPE	Ministry of Housing, Spatial Planning, and the Environment
MISCA OU	Miscellaneous Areas Operable Unit
MM	millimeter
MOCA	4,4' - Methylenebis (2-chloroaniline)
MSDS	Material Safety Data Sheets
MSL	Mean Sea Level
MW	Monitoring Well
NA	Not analyzed
NA	Not applicable
NAPL	Non-aqueous Phase Liquid
NEC	No Effect Concentration
NCP	National Contingency Plan
ND	Not detected
NG	Nitroglycerin
NG/KG	Nanograms per kilogram
NOAA	National Oceanic and Atmospheric Administration
NaOH	Caustic Soda
NOEC	No-observed-effect concentration
NPL	National Priorities List
OD	Outside Diameter
OE	Ordnance and Explosives
OEW	Ordnance and Explosive Waste
OFDAP	Ordnance Field Director of Ammunition Plants
OU	Operable Unit
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbons
PA/SI	Preliminary Assessment/Site Investigation
PBX	Plastic Bonded Explosives
PCB	Poly-chlorinated Biphenyl
PCB OU	PCB Operable Unit
PCE	Tetrachloroethylene
PEC	Probable Effect Concentration
PEL	Probable Effect Level
PETN	Pentaerythritol Tetranitrate
PID	Photo Ionization Detector
PLC	Preliminary Levels of Concern
PM	Project Manager
PPB	Parts Per Billion
PPE	Personnel Protection Equipment

ACRONYM LIST
Crab Orchard AUS OU PA/SI Report

ACRONYM	DEFINITION
PPM	Parts Per Million
PRG	Preliminary Remediation Goals
PRP	Potentially Responsible Party
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QCSR	Quality Control Summary Report
R&D	Research & Development
RAGS	Risk Assessment Guidance for Superfund (USEPA document)
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive (Cyclonite)
RI	Remedial Investigation
RI/FS	Remedial Investigation / Feasibility Study
RL	Reporting Limit
ROD	Record of Decision
RR	Railroad
RRTC	Railroad Tank Car
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act (1986)
SI	Site Investigation
SIU	Southern Illinois University
SMCL	Secondary Maximum Contaminant Level
SMDP	Scientific Management Decision Point
SOP	Standard Operating Procedure
SPO	Solid Propellant Operations
SSLs	Soil Screening Levels (USEPA)
SVOC	Semi-volatile Organic Compound
SWDC	Sherwin Williams Defense Corporation
TACO	Tiered Approach to Corrective Action Objectives
TAL	Target Analyte List
TBD	To Be Determined
TCDD	Tetrachlorodibenzo-p-Dioxin
TCE	Trichloroethylene
TCL	Target Compound List
TDS	Total Dissolved Solids
TEC	Threshold Effect Concentration
TEL	Threshold Effect Level
TEQ	Toxicity Equivalent for Dioxins/Furans
TNT	Trinitrotoluene
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
TRV	Toxicity Reference Value

COC AREA SITES

This volume of the report includes the eight Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in the Crab Orchard Cemetery (COC) area that were investigated in the Site Investigation (SI). The sites are on the south side of Crab Orchard Lake (Figure 22-1), in the vicinity of Wolf Creek Road and an abandoned roadway that has been designated for this report as the COC Area Road. The COC Area, which is remote from industrial and public areas, was used by the Army for detonation of surplus munitions after the end of World War II. Army records indicate that in 1943 "burning pits were constructed...near Hampton Cemetery and put into operation".¹ The Army also reportedly fenced off several ½ acre to 2 acre areas around Hampton Cemetery in 1946 for the disposal of ordnance components, specifically landmine parts.² Two former employees at the IOP stated that there were pits at the where landmines, primers, and detonators were destroyed by detonation. The locations of these pits could not be determined but one of them was described as being deep and lined with red brick.³

As discussed below, a number of sites in this area were investigated, and some were remediated, as part of the Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU). Except for Site AUS-0063, as discussed below, EMMA OU sites that were determined to require no further action, based on the results of a chemical investigation, were excluded from the AUS OU investigation.

Each of the eight AUS OU sites in the COC area was included in the SI for one or more of the following reasons:

- The site was reportedly used as a landfill (Site AUS-0062).
- Suspect debris, signage and/or fencing were found at the site (Sites AUS-0063, -0064, -0065, -0066, -0067, and -0069).
- The site is an EMMA OU COC site, but chemical data were not collected as part of the EMMA OU; only ordnance searches were done (Sites AUS-0062, 0063⁴, -0064, -0066, and -0069).
- Historic aerial photography interpretation indicated that the site may have been used for detonations (Site AUS-0109).

COC AREA—EMMA OU

There were 10 COC sites included in the EMMA OU Remedial Investigation (RI), COC-1 through COC-10.⁵ These sites were investigated for chemical contamination. Five more sites

¹ U.S. Army Corps of Engineers, Rock Island District, August 1993. Archives Search Report Findings for the former Illinois Ordnance Plant, page 12, 3(c).

² U.S. Army Corps of Engineers, Rock Island District, August 1993. Archives Search Report Findings for the former Illinois Ordnance Plant, page 12, 3(e).

³ U.S. Army Corps of Engineers, Rock Island District, August 1993. Archives Search Report Findings for the former Illinois Ordnance Plant, Appendix E, page E-5, B.3.

⁴ Site AUS-0063 was intended to be at the location of COC-12. The locations that were sampled were actually part of COC-9. See discussion in Section 23.

⁵ Environmental Science and Engineering, Draft Final RI Report for the Explosives/Munitions Manufacturing Operable Unit, Crab Orchard National Wildlife Refuge, September 15, 1994.

were added (COC-11 through COC-15) in a later investigation that addressed only unexploded ordnance (UXO) and ordnance scrap.⁶ The COC sites are shown in Figure 22-2⁷.

Figures 22-3 through 22-10 present the previous sampling results for Sites COC-1, COC-2, COC-4, COC-5, COC-6, COC-7, COC-8, and COC-9, respectively. Results for Site COC-3 are not included because that site was remediated as part of the EMMA OU. The remaining sites for which chemical analytical results are available, shown in Figures 22-3 through 22-10, were determined to require no further action.^{8,9,10}

AUS-0062

According to the United States Fish & Wildlife Service (USFWS), AUS-0062 is a former landfill that was closed by the Refuge in 1974. This site was identified by the USFWS and corresponds to COC-11 of the EMMA OU. It is located on the south side of the COC Area Road, about 1.1 miles west of Wolf Creek Road (Figure 22-1).

AUS Original Site Designations

AUS-0062 is one of the original AUS OU sites designated in 1997-1999 by USFWS.

22.1 HISTORIC SEARCH INFORMATION

22.1.1 Site Description

This site was originally described as an area of mounds and pits approximately 100 yards west of former COC-1. The site measures approximately 600 feet (ft) (in an east-west direction) by 200 ft (in a north-south direction).¹¹

22.1.2 Operational History and Waste Characteristics

The aerial photograph interpretation indicated that this site appeared to be a roadside clearing and fill operation in 1971, the year of the first photograph that showed any signs of activity in

⁶ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois

⁷ COC-10 is not shown and is outside the area shown in the figure. COC-10 is discussed in Section 41 of this report and the location is shown in Figure 41-1. Sampling results from the EMMA OU investigation are shown in Figure 41-2 of this report.

⁸ Environmental Science and Engineering, Inc., Draft Final RI Report for the Explosives/Munitions Manufacturing Operable Unit, Crab Orchard National Wildlife Refuge, September 15, 1994.

⁹ Environmental Science and Engineering, Inc., Record of Decision (ROD) for Crab Orchard National Wildlife Refuge, Explosives/Munitions Manufacturing Area (EMMA) Operable Unit (OU), dated April 22, 1996, Pages D-1 to D-2.

¹⁰ U.S. Army Corps of Engineers and U.S. Environmental Protection Agency, Crab Orchard National Wildlife Refuge, Explanation of Significant Differences (ESD), Explosives/Munitions Area Operable Unit (EMMA OU), Site COC-4, dated May 1999.

¹¹ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-25.

this area.¹² No waste materials could be discerned from the 1971 photograph. Some mounds of unidentifiable materials were noted near the western edge of the assumed fill material.¹³ By 1980, the site appeared to be inactive (which agrees with information obtained from the USFWS, that this landfill was closed in 1974) and the aerial extent of the fill area appeared to extend farther west than in the 1971 photo.¹⁴ It appears that the site activity progressed from east to west, based on visual observation of the vegetation in the aerial photos. In the 1993 aerial photograph, there appeared to be a large linear scar located at the geographic center of the fill.¹⁵ This suggests recent activity, however the nature of the activity could not be determined from the aerial photographs.¹⁶

There have been no known industrial lessees of this property.

22.1.3 AUS-0062 Previous Sampling Results

No samples for chemical analysis were taken at this site as part of the EMMA OU.

Parsons Engineering, 1997

As part of the EMMA OU, the Department of the Army conducted an Ordnance and Explosive Waste (OEW) investigation at this site (formerly COC-11) in 1997¹⁷. Two 100-ft square grids were investigated at this site and a total of 133 magnetic anomalies were identified.¹⁸ Forty-two of these were investigated and all were non-ordnance scrap except for one, which was a munitions fragment (not classified as UXO).¹⁹

¹² Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-32 and Volume II (Maps) Page R. The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

¹³ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-32 and Volume II (Maps) Page R.

¹⁴ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-32 and Volume II (Maps) Page R.

¹⁵ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-32 and Volume II (Maps) Page R.

¹⁶ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-32 and Volume II (Maps) Page R.

¹⁷ The work was done by Parsons Engineering Science, Inc., under contract to the Army.

¹⁸ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Pages 2-25 through 2-27.

¹⁹ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-27.

USEPA Sampling, 1998

The United States Environmental Protection Agency (USEPA) collected two samples (62-01C and 62-02C) from AUS-0062. USEPA sample locations are shown in Figures 22-11 and 22-12. The results for all detected constituents are listed in Table 22-1A. No polynuclear aromatic hydrocarbons (PAHs), mercury, or volatile organic compounds (VOCs) were detected. Nickel (210 milligrams per kilogram (mg/kg)) exceeded USEPA Soil Screening Levels (SSLs) and Refuge background²⁰ in both samples.

22.1.4 Observations During Site Visit

This site is located in a valley just south of the COC Area Road (Figure 22-1). An east-west drainageway traverses the site (Figure 22-11). Several mounded areas and pits were observed. Some of these mounds and pits are likely the result of previous UXO investigations (such as those found in a grassy area with hand dug pits and flag markers) and others are more likely the result of other activities such as dumping or landfilling.

22.1.5 Recommendations Based on Preliminary Assessment

AUS-0062 was included in the SI because the 1998 USEPA sample results exceeded the preliminary screening levels, and because of the reported history of usage as a landfill.

22.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0062 on May 3, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)²¹ for the AUS OU PA/SI. AUS OU SI sample locations are shown on Figures 22-11 and 22-12. Survey coordinates for all sample locations in AUS-0062 are listed in Table 22-1. Table 22-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples unless otherwise noted.

22.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted.

Soil Mounds and Pits

Soil samples 0062-001 and 0062-008 were collected from mounded areas identified during the site reconnaissance. Sediment Sample 0062-005 was collected from a pit that was observed during the site reconnaissance. The origin of the mounds and pits is unknown.

²⁰ See Table 1-11 of this report for Refuge background soil values used for the PA.

²¹ U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

Drainage Ditch

Sediment and surface water locations 0062-004 and 0062-007 were in the east-west drainageway. Location 0062-004 was in an area of the drainageway that appears to receive runoff the northern part of the site. Location 0062-007 was in a ponded area of this drainageway, near the exit of the COC Area Road culvert, close to a partial 55-gallon drum (Figure 22-11). The previous contents and origin of the drum are not known.

Other Locations

Soil samples 0062-002 and 0062-003 were collected from the grassy area with hand dug pits and flag markers. It is likely that this is the area of the previous UXO investigation. This area may also be the location of the former landfill.

Soil sample 0062-006 was collected next to the partial 55-gallon drum.

22.2.2 Field Results**22.2.2.1 Site Conditions****22.2.2.1.1 *Geologic Conditions***

There were no test pits or monitoring wells installed at AUS-0062. The upper two ft of material from the hand auger borings was described as silty clay fill. The fill at sample location AUS-0062-006 included debris.

22.2.2.1.2 *Hydrogeologic Conditions*

No hydrogeological information is available for this site.

22.2.2.1.3 *Hydrologic Conditions*

There was some water in the east-west drainageway at the time of the field investigation, including a small amount of ponded water at the east end of the site, near the discharge of the COC Area Road culvert.

22.2.2.2 Chemical Results

The sample analytical results are summarized in the following tables:

- Table 22-3 – soil samples results,
- Table 22-4 – sediment results, and
- Table 22-5 – surface water samples results.

These tables list all the chemicals detected in AUS-0062 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report (QCSR).

Sample results are presented on the following figures:

- Figure 22-11 – results for soil and sediment samples, and
- Figure 22-12 – results for surface water samples at this site.

22.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 22-6 through 22-11 as follows:

- Table 22-6--human health risk screening for soils,
- Table 22-7--human health risk screening for sediment,
- Table 22-8--human health risk screening for surface water,
- Table 22-9--ecological risk screening for soils,
- Table 22-10--ecological risk screening for sediment, and
- Table 22-11--ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0062. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criteria is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level “cancer risk” is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed for but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a “U” qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs, but rather as uncertainties.

In Figures 22-11 and 22-12, the shading convention used is the same as for the tables, discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with “J”) are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 22-12 (human health risk) and 22-13 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 22-12) and COPECs (Table 22-13) are shaded in the tables.

22.3.1 Human Health Risk**22.3.1.1 Soil/Sediment**

Human health screening results for soil and sediment samples are presented in Tables 22-6 and 22-7, respectively. Soil screening values were used to screen the sediment samples, since sediment-specific data are not available for human health risk.

For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

22.3.1.2 Surface Water

Human health risk screening results for chemicals in surface water at AUS-0062 are presented in Table 22-8. The maximum concentrations from AUS-0062 were screened against the State of Illinois General Use Surface Water Quality Criteria – Human Health.

22.3.2 Ecological Risk**22.3.2.1 Soil**

Ecological screening results for soil samples are presented in Table 22-9. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)²²
- Environment Canada (1995)²³
- Talmage *et al.* (1999)²⁴
- Efrogmson *et al.* (1997a, 1997b)²⁵

²² USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

²³ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

²⁴ Talmage, S.S., D.M. Opreško, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

²⁵ Efrogmson, 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, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

- CCME (1999)²⁶
- MHSPE (1994)²⁷
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)²⁸ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

22.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 22-10. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)²⁹
- USEPA (1996 – summarized by Ingersoll et al. 1996)³⁰
- Ontario Ministry of the Environment and Energy (1995)³¹
- NOAA (1999)³²
- Ecotox (USEPA 1996)³³

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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

²⁶ Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

²⁷ Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

²⁸ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft)*. US Environmental Protection Agency Office of Research and Development, Washington, D.C.

²⁹ MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems*. MacDonald Environmental Services Ltd., British Columbia, Canada.

³⁰ Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfield, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyaella azteca* and the midge *Chironomus riparius*. *J. Great Lakes Res.* 22(3):602-623.

³¹ Ontario Ministry of Environment and Energy. 1995. Ontario's Approach to Sediment Assessment and Remediation. Second SETAC World Congress (16TH Annual Meeting). Vancouver, British Columbia, Canada.

³² NOAA. 1999. *Screening quick Reference Tables*. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

³³ USEPA. 1996. *ECO Update: Ecotox Thresholds*. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

- Long *et al.* (1995)³⁴
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll *et al.* (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald *et al.* (2000) developed “consensus-based” freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll *et al.* 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald *et al.* [1999], Ingersoll *et al.* [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long *et al.* 1995). If screening values were unavailable from the sources noted above, the “equilibrium-partitioning” (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 22.3.2.1.

22.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 22-11. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)³⁵

³⁴ Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environ. Management.* 19(1): 81-97.

³⁵ USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.

- EcoTox (USEPA 1996)³⁶
- USEPA Region IV Freshwater Screening Values (1999b)³⁷
- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)³⁸
- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 22.3.2.1.

22.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-0062, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not necessarily be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 22-12, and include antimony and cadmium in sediment; and antimony, arsenic, barium, and selenium in soil. On the COPEC list, Table 22-13 the constituents coded with "D" includes beryllium in surface water; cadmium and mercury in sediment; and boron, manganese, mercury, and selenium in soil. These chemicals may later be included in the RI for other reasons, but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs on Tables 22-12 and 22-13 should be investigated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 22-14.

Note that a number of the human health COPCs exceed migration to groundwater screening criteria. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site and media and contaminants in addition to those

³⁶ USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

³⁷ USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at <http://www.epa.gov/region4/waste/oftecser/ecolbul.htm>.

³⁸ ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

addressed in this study may warrant investigation in the RI. These issues will be addressed in the Work Plan for the RI.

**TABLE 22-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0062**

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0062-001	377231.8	768472.2	440.01	NA	
0062-002	377291.8	768438.7	434.64	NA	
0062-003	377285.0	768393.0	433.80	NA	
0062-004	377331.5	768354.1	430.89	NA	
0062-005	377222.1	768481.5	435.91	NA	
0062-006	377360.5	768537.9	435.65	NA	
0062-007	377354.2	768509.5	433.12	NA	
0062-008	377347.6	768320.1	436.34	NA	

Sheet 1 of 1

NA = Not Applicable

TABLE 22-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
62-01C	Aluminum	11,000
	Barium	110
	Beryllium	0.6
	Calcium	2,900
	Chromium	25
	Cobalt	9.5
	Copper	18
	Iron	30,000
	Lead	19
	Magnesium	2,300
	Manganese	390
	Mercury	0.04
	Nickel	39
	Potassium	1,100
	Silver	1.6
62-02C	Vanadium	46
	Zinc	50
	Bis(2-Ethylhexyl)phthalate	0.11J
	Aluminum	15,000
	Barium	73
	Beryllium	0.7
	Calcium	1,800
	Chromium	23
	Cobalt	4.5
	Copper	7.9
	Iron	16,000
	Magnesium	2,100
	Manganese	140
	Mercury	0.04
	Nickel	210
Potassium	1,000	
Vanadium	36	
Zinc	32	

Sheet 1 of 1

mg/kg = milligrams per kilogram
J = estimated

**TABLE 22-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0062**

Sediment	Soil	Surface Water
AUS-0062-004	AUS-0062-001	AUS-0062-004
AUS-0062-005	AUS-0062-002	AUS-0062-007
AUS-0062-007	AUS-0062-003	
	AUS-0062-006	
	AUS-0062-008*	

Sheet 1 of 1

* Note that the samples at this location were originally designated as sediment, but are actually soil samples.

TABLE 22-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Volatile Organic Compounds		
Trichloroethylene (TCE)	2/7	3 ug/kg to 4 ug/kg
Metals		
Aluminum	7/7	11,100 mg/kg to 28,000 mg/kg
Antimony	4/7	0.25 mg/kg to 0.52 mg/kg
Arsenic	7/7	3.5 mg/kg to 8.6 mg/kg
Barium	7/7	58.1 mg/kg to 131 mg/kg
Beryllium	7/7	0.42 mg/kg to 0.74 mg/kg
Boron	2/7	1.6 mg/kg
Cadmium	2/7	0.63 mg/kg to 0.78 mg/kg
Calcium	7/7	1,080 mg/kg to 2,390 mg/kg
Chromium, Total	7/7	18.6 mg/kg to 29.8 mg/kg
Cobalt	7/7	3.6 mg/kg to 11.4 mg/kg
Copper	7/7	8.4 mg/kg to 15.6 mg/kg
Iron	7/7	13,100 mg/kg to 26,100 mg/kg
Lead	7/7	9.2 mg/kg to 37.5 mg/kg
Magnesium	7/7	1,760 mg/kg to 3,230 mg/kg
Manganese	7/7	168 mg/kg to 652 mg/kg
Mercury	7/7	0.017 mg/kg to 0.051 mg/kg
Nickel	7/7	13.6 mg/kg to 24.1 mg/kg
Potassium	7/7	578 mg/kg to 1,300 mg/kg
Selenium	3/7	0.38 mg/kg to 1.1 mg/kg
Sodium	7/7	40.8 mg/kg to 545 mg/kg
Thallium	1/7	0.66 mg/kg
Vanadium	7/7	31.1 mg/kg to 43 mg/kg
Zinc	7/7	27.9 mg/kg to 56 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

TABLE 22-4
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Metals		
Aluminum	3/3	8,900 mg/kg to 13,900 mg/kg
Antimony	1/3	0.41 mg/kg
Arsenic	3/3	3.3 mg/kg to 15.8 mg/kg
Barium	3/3	108 mg/kg to 200 mg/kg
Beryllium	3/3	0.65 mg/kg to 1.7 mg/kg
Boron	3/3	1 mg/kg to 4.6 mg/kg
Cadmium	2/3	0.92 mg/kg to 1.5 mg/kg
Calcium	3/3	1,220 mg/kg to 2,930 mg/kg
Chromium, Total	3/3	10.2 mg/kg to 34.4 mg/kg
Cobalt	3/3	3.7 mg/kg to 14.7 mg/kg
Copper	3/3	10.3 mg/kg to 32.7 mg/kg
Iron	3/3	10,600 mg/kg to 39,700 mg/kg
Lead	3/3	10 mg/kg to 28.8 mg/kg
Magnesium	3/3	1,740 mg/kg to 2,510 mg/kg
Manganese	3/3	92.3 mg/kg to 472 mg/kg
Mercury	3/3	0.03 mg/kg to 0.035 mg/kg
Nickel	3/3	13.2 mg/kg to 47.7 mg/kg
Potassium	3/3	838 mg/kg to 3,360 mg/kg
Selenium	1/3	1.6 mg/kg
Silver	1/3	0.31 mg/kg
Sodium	3/3	53.1 mg/kg to 224 mg/kg
Thallium	1/3	0.55 mg/kg
Vanadium	3/3	8.6 mg/kg to 60 mg/kg
Zinc	3/3	29.5 mg/kg to 133 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

TABLE 22-5
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Metals		
Aluminum	2/2	7,160 ug/L to 8,230 ug/L
Arsenic	1/2	5 ug/L
Barium	2/2	48.1 ug/L to 180 ug/L
Beryllium	1/2	3.2 ug/L
Boron	2/2	70.4 ug/L to 71.4 ug/L
Cadmium	2/2	5.3 ug/L to 11 ug/L
Calcium	2/2	146,000 ug/L to 163,000 ug/L
Chromium, Total	2/2	3 ug/L to 14.1 ug/L
Cobalt	2/2	28.5 ug/L to 240 ug/L
Copper	1/2	11.7 ug/L
Iron	2/2	6,540 ug/L to 28,400 ug/L
Lead	1/2	3.9 ug/L
Magnesium	2/2	81,000 ug/L to 102,000 ug/L
Manganese	2/2	3,410 ug/L to 10,800 ug/L
Nickel	2/2	364 ug/L to 917 ug/L
Potassium	2/2	8,060 ug/L to 8,480 ug/L
Sodium	2/2	44,100 ug/L to 45,600 ug/L
Vanadium	2/2	6.3 ug/L to 18.8 ug/L
Zinc	2/2	395 ug/L to 993 ug/L

Sheet 1 of 1

ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

**TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			1.80E-06	6.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	6	UJ	UG/KG		6.68E-09	1.54E-06	3.00E+01
79-00-5	1,1,2-Trichloroethane	6	UJ	UG/KG		3.16E-09	3.94E-05	6.67E+00
75-34-3	1,1-Dichloroethane	6	UJ	UG/KG			2.91E-06	6.00E-03
75-35-4	1,1-Dichloroethene	6	UJ	UG/KG		5.05E-08	8.91E-05	2.00E+00
107-06-2	1,2-Dichloroethane (EDC)	6	UJ	UG/KG		7.85E-09	1.70E-04	6.00E+00
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	6	U	UG/KG		7.81E-09	2.82E-04	6.00E+00
78-93-3	2-Butanone (MEK)	12	U	UG/KG			4.33E-07	
591-78-6	2-Hexanone	12	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			4.16E-06	
67-64-1	Acetone	12	U	UG/KG			1.93E-06	1.50E-02
71-43-2	Benzene	6	UJ	UG/KG		4.10E-09	2.48E-04	3.00E+00
75-27-4	Bromodichloromethane	6	U	UG/KG		2.55E-09	5.75E-06	2.00E-01
75-25-2	Bromoform	6	UJ	UG/KG		1.92E-11	3.41E-07	1.50E-01
74-83-9	Bromomethane	6	UJ	UG/KG			4.57E-04	6.00E-01
75-15-0	Carbon disulfide	6	UJ	UG/KG			4.96E-06	3.00E-03
56-23-5	Carbon tetrachloride	6	U	UG/KG		1.13E-08	8.58E-04	2.00E+00
108-90-7	Chlorobenzene	6	U	UG/KG			1.11E-05	8.57E-02
75-00-3	Chloroethane	6	UJ	UG/KG		9.22E-10	3.18E-07	
67-66-3	Chloroform	6	U	UG/KG		1.15E-08	4.66E-03	2.00E-01
74-87-3	Chloromethane	6	U	UG/KG		2.25E-09		
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG			4.07E-05	3.00E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
124-48-1	Dibromochloromethane	6	U	UG/KG		2.26E-09	3.77E-06	3.00E-01
100-41-4	Ethylbenzene	6	U	UG/KG			1.00E-06	8.57E-03
75-09-2	Methylene chloride	6	U	UG/KG		2.92E-10	6.14E-07	6.00E+00
110-54-3	N-Hexane	6	UJ	UG/KG			1.49E-05	
100-42-5	Styrene	6	UJ	UG/KG			2.94E-07	3.00E-02
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG		3.21E-10	3.52E-06	2.00E+00
108-88-3	Toluene	6	U	UG/KG			3.02E-06	1.00E-02
1330-20-7	total Xylenes	6	UJ	UG/KG			1.35E-06	6.00E-04
156-60-5	trans-1,2-Dichloroethene	6	UJ	UG/KG			2.80E-05	2.00E-01
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
79-01-6	Trichloroethylene (TCE)	4	J	UG/KG		6.54E-10	5.06E-05	1.33E+00
75-01-4	Vinyl chloride	6	UJ	UG/KG		1.23E-07		8.57E+00
Explosives								
99-35-4	1,3,5-Trinitrobenzene	310	U	UG/KG			1.17E-05	
99-65-0	1,3-Dinitrobenzene	310	U	UG/KG			3.52E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	620	U	UG/KG		7.54E-09	1.41E-03	
121-14-2	2,4-Dinitrotoluene	310	U	UG/KG			1.76E-04	7.75E+03
606-20-2	2,6-Dinitrotoluene	620	U	UG/KG			7.04E-04	2.07E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	620	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	620	U	UG/KG				
99-08-1	3-Nitrotoluene	620	U	UG/KG			3.05E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	620	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	620	U	UG/KG			3.05E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
2691-41-0	HMX	620	U	UG/KG			1.41E-05	
98-95-3	Nitrobenzene	310	U	UG/KG			2.71E-03	
121-82-4	RDX	620	U	UG/KG		2.76E-08	2.35E-04	
479-45-8	Tetryl	940	U	UG/KG			1.07E-04	
Metals								
7429-90-5	Aluminum	28000		MG/KG	9.72E-01		1.67E-02	
7440-36-0	Antimony	0.52	J	MG/KG	6.27E-01		6.36E-04	1.73E+00
7440-38-2	Arsenic	8.6		MG/KG	6.37E-01	3.15E-06	1.96E-02	8.60E+00
7440-39-3	Barium	131		MG/KG	6.72E-01		1.05E-03	1.64E+00
7440-41-7	Beryllium	0.74		MG/KG	9.74E-01	3.30E-10	2.00E-04	2.47E-01
7440-42-8	Boron	1.6	J	MG/KG	3.02E-01		2.02E-05	
7440-43-9	Cadmium	0.78		MG/KG	4.11E+00	2.61E-10	9.63E-04	1.95E+00
7440-70-2	Calcium	2390		MG/KG	9.57E-01			
7440-47-3	Chromium	29.8		MG/KG	1.18E+00	6.65E-08		1.49E+01
7440-48-4	Cobalt	11.4		MG/KG	5.25E-01		9.30E-05	
7440-50-8	Copper	15.6		MG/KG	1.38E+00		2.06E-04	
7439-89-6	Iron	26100		MG/KG	1.35E+00		4.26E-02	
7439-92-1	Lead	37.5		MG/KG	1.60E+00			
7439-95-4	Magnesium	3230		MG/KG	2.08E+00			
7439-96-5	Manganese	652		MG/KG	1.79E-01		2.02E-02	
7439-97-6	Mercury	0.051	J	MG/KG	8.50E-01			
7440-02-0	Nickel	24.1		MG/KG	1.28E+00		5.90E-04	3.44E+00
2023695	Potassium	1300		MG/KG	2.08E+00			
7782-49-2	Selenium	1.1		MG/KG	4.70E-01		1.08E-04	3.67E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-22-4	Silver	1.2	U	MG/KG	2.07E+00		1.17E-04	6.00E-01
7440-23-5	Sodium	545		MG/KG	3.21E+00			
7440-28-0	Thallium	0.66	J	MG/KG	1.61E+00		4.61E-06	
7440-62-2	Vanadium	43		MG/KG	9.11E-01		3.01E-03	1.43E-01
7440-66-6	Zinc	56		MG/KG	1.09E+00		9.14E-05	9.33E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			3.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	6	UJ	UG/KG			
79-00-5	1,1,2-Trichloroethane	6	UJ	UG/KG	7.32E-07	7.32E-07	3.00E-01
75-34-3	1,1-Dichloroethane	6	UJ	UG/KG	3.00E-08	3.00E-08	2.61E-04
75-35-4	1,1-Dichloroethene	6	UJ	UG/KG	3.33E-07	3.33E-06	1.00E-01
107-06-2	1,2-Dichloroethane (EDC)	6	UJ	UG/KG	9.52E-05	4.29E-06	3.00E-01
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	6	U	UG/KG	7.14E-05	3.33E-06	2.00E-01
78-93-3	2-Butanone (MEK)	12	U	UG/KG			
591-78-6	2-Hexanone	12	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			
67-64-1	Acetone	12	U	UG/KG	6.00E-08	6.00E-08	7.50E-04
71-43-2	Benzene	6	UJ	UG/KG	3.00E-05	1.40E-06	2.00E-01
75-27-4	Bromodichloromethane	6	U	UG/KG	6.52E-05	3.00E-06	1.00E-02
75-25-2	Bromoform	6	UJ	UG/KG	8.33E-06	3.75E-07	7.50E-03
74-83-9	Bromomethane	6	UJ	UG/KG	2.07E-06	6.00E-06	3.00E-02
75-15-0	Carbon disulfide	6	UJ	UG/KG	3.00E-08	3.00E-07	1.88E-04
56-23-5	Carbon tetrachloride	6	U	UG/KG	1.36E-04	1.46E-05	8.57E-02
108-90-7	Chlorobenzene	6	U	UG/KG	1.46E-07	1.46E-06	6.00E-03
75-00-3	Chloroethane	6	UJ	UG/KG			
67-66-3	Chloroform	6	U	UG/KG	6.38E-06	3.00E-06	1.00E-02
74-87-3	Chloromethane	6	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG			
124-48-1	Dibromochloromethane	6	U	UG/KG	1.46E-07	1.46E-07	1.50E-02
100-41-4	Ethylbenzene	6	U	UG/KG	3.00E-08	3.00E-07	4.62E-04
75-09-2	Methylene chloride	6	U	UG/KG	7.89E-06	5.00E-07	3.00E-01
110-54-3	N-Hexane	6	UJ	UG/KG			
100-42-5	Styrene	6	UJ	UG/KG	1.46E-08	1.46E-07	1.50E-03
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG	5.45E-05	2.50E-06	1.00E-01
108-88-3	Toluene	6	U	UG/KG	1.46E-08	1.46E-08	5.00E-04
1330-20-7	total Xylenes	6	UJ	UG/KG	6.00E-09	1.46E-08	4.00E-05
156-60-5	trans-1,2-Dichloroethene	6	UJ	UG/KG	1.46E-07	1.46E-07	8.57E-03
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	4	J	UG/KG	7.69E-06	3.33E-06	6.67E-02
75-01-4	Vinyl chloride	6	UJ	UG/KG	2.00E-03	9.23E-05	6.00E-01
Explosives							
99-35-4	1,3,5-Trinitrobenzene	310	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	310	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	620	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	310	U	UG/KG	3.69E-02	1.72E-03	3.88E+02
606-20-2	2,6-Dinitrotoluene	620	U	UG/KG	7.38E-02	3.44E-03	8.86E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	620	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	620	U	UG/KG			
99-08-1	3-Nitrotoluene	620	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	620	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	620	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 22-6

HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
2691-41-0	HMX	620	U	UG/KG			
98-95-3	Nitrobenzene	310	U	UG/KG	3.10E-04	3.10E-04	3.10E+00
121-82-4	RDX	620	U	UG/KG			
479-45-8	Tetryl	940	U	UG/KG			
Metals							
7429-90-5	Aluminum	28000		MG/KG			
7440-36-0	Antimony	0.52	J	MG/KG	6.34E-04	6.34E-03	1.04E-01
7440-38-2	Arsenic	8.6		MG/KG	2.87E+00	1.41E-01	3.07E-01
7440-39-3	Barium	131		MG/KG	9.36E-04	9.36E-03	1.09E-01
7440-41-7	Beryllium	0.74		MG/KG	7.40E-01	2.55E-02	1.12E-01
7440-42-8	Boron	1.6	J	MG/KG	8.89E-06	8.89E-05	
7440-43-9	Cadmium	0.78		MG/KG	3.90E-04	3.90E-03	2.11E-01
7440-70-2	Calcium	2390		MG/KG			
7440-47-3	Chromium	29.8		MG/KG	2.98E-03	7.27E-03	1.06E+00
7440-48-4	Cobalt	11.4		MG/KG	9.50E-05	9.50E-04	
7440-50-8	Copper	15.6		MG/KG	1.90E-04	1.90E-03	1.42E-03
7439-89-6	Iron	26100		MG/KG			
7439-92-1	Lead	37.5		MG/KG	9.38E-02	9.38E-02	
7439-95-4	Magnesium	3230		MG/KG			
7439-96-5	Manganese	652		MG/KG	6.79E-03	6.79E-02	
7439-97-6	Mercury	0.051	J	MG/KG	8.36E-05	8.36E-04	3.40E-01
7440-02-0	Nickel	24.1		MG/KG	5.88E-04	5.88E-03	3.17E-01
2023695	Potassium	1300		MG/KG			
7782-49-2	Selenium	1.1		MG/KG	1.10E-04	1.10E-03	4.58E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-22-4	Silver	1.2	U	MG/KG	1.20E-04	1.20E-03	8.00E-01
7440-23-5	Sodium	545		MG/KG			
7440-28-0	Thallium	0.66	J	MG/KG	4.13E-03	4.13E-03	2.75E-01
7440-62-2	Vanadium	43		MG/KG	3.07E-03	3.07E-02	4.39E-02
7440-66-6	Zinc	56		MG/KG	9.18E-05	9.18E-04	1.56E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			1.44E-05	
99-65-0	1,3-Dinitrobenzene	380	U	UG/KG			4.31E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	760	U	UG/KG		9.24E-09	1.73E-03	
121-14-2	2,4-Dinitrotoluene	380	U	UG/KG			2.16E-04	9.50E+03
606-20-2	2,6-Dinitrotoluene	760	U	UG/KG			8.63E-04	2.53E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	760	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	760	U	UG/KG				
99-08-1	3-Nitrotoluene	760	U	UG/KG			3.74E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	760	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	760	U	UG/KG			3.74E-04	
2691-41-0	HMX	760	U	UG/KG			1.73E-05	
98-95-3	Nitrobenzene	380	U	UG/KG			3.32E-03	
121-82-4	RDX	760	U	UG/KG		3.39E-08	2.88E-04	
479-45-8	Tetryl	1100	U	UG/KG			1.25E-04	
Metals								
7429-90-5	Aluminum	13900		MG/KG	1.24E+00		8.29E-03	
7440-36-0	Antimony	0.41	J	MG/KG	2.16E-01		5.01E-04	1.37E+00
7440-38-2	Arsenic	15.8		MG/KG	1.53E+00	5.79E-06	3.60E-02	1.58E+01
7440-39-3	Barium	200		MG/KG	1.02E+00		1.61E-03	2.50E+00
7440-41-7	Beryllium	1.7		MG/KG	1.06E+00	7.58E-10	4.60E-04	5.67E-01
7440-42-8	Boron	4.6	J	MG/KG			5.81E-05	
7440-43-9	Cadmium	1.5		MG/KG	9.38E-01	5.02E-10	1.85E-03	3.75E+00
7440-70-2	Calcium	2930		MG/KG	2.02E+00			
7440-47-3	Chromium	34.4		MG/KG	2.00E+00	7.67E-08		1.72E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-48-4	Cobalt	14.7		MG/KG	1.62E+00		1.20E-04	
7440-50-8	Copper	32.7		MG/KG	1.95E+00		4.31E-04	
7439-89-6	Iron	39700		MG/KG	1.91E+00		6.48E-02	
7439-92-1	Lead	28.8	J	MG/KG	1.20E+00			
7439-95-4	Magnesium	2510		MG/KG	1.31E+00			
7439-96-5	Manganese	472		MG/KG	4.53E-01		1.46E-02	
7439-97-6	Mercury	0.035	J	MG/KG	2.33E-01			
7440-02-0	Nickel	47.7		MG/KG	2.82E+00		1.17E-03	6.81E+00
2023695	Potassium	3360		MG/KG	2.36E+00			
7782-49-2	Selenium	1.6		MG/KG	2.50E+00		1.57E-04	5.33E+00
7440-22-4	Silver	0.31	J	MG/KG	1.03E-01		3.03E-05	1.55E-01
7440-23-5	Sodium	224		MG/KG	1.54E-01			
7440-28-0	Thallium	0.55	J	MG/KG	1.77E+00		3.84E-06	
7440-62-2	Vanadium	60		MG/KG	2.14E+00		4.19E-03	2.00E-01
7440-66-6	Zinc	133		MG/KG	2.33E+00		2.17E-04	2.22E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 22-7

HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0062

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	380	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	760	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	380	U	UG/KG	4.52E-02	2.11E-03	4.75E+02
606-20-2	2,6-Dinitrotoluene	760	U	UG/KG	9.05E-02	4.22E-03	1.09E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	760	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	760	U	UG/KG			
99-08-1	3-Nitrotoluene	760	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	760	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	760	U	UG/KG			
2691-41-0	HMX	760	U	UG/KG			
98-95-3	Nitrobenzene	380	U	UG/KG	3.80E-04	3.80E-04	3.80E+00
121-82-4	RDX	760	U	UG/KG			
479-45-8	Tetryl	1100	U	UG/KG			
Metals							
7429-90-5	Aluminum	13900		MG/KG			
7440-36-0	Antimony	0.41	J	MG/KG	5.00E-04	5.00E-03	8.20E-02
7440-38-2	Arsenic	15.8		MG/KG	5.27E+00	2.59E-01	5.64E-01
7440-39-3	Barium	200		MG/KG	1.43E-03	1.43E-02	1.67E-01
7440-41-7	Beryllium	1.7		MG/KG	1.70E+00	5.86E-02	2.58E-01
7440-42-8	Boron	4.6	J	MG/KG	2.56E-05	2.56E-04	
7440-43-9	Cadmium	1.5		MG/KG	7.50E-04	7.50E-03	4.05E-01
7440-70-2	Calcium	2930		MG/KG			
7440-47-3	Chromium	34.4		MG/KG	3.44E-03	8.39E-03	1.23E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class 1 Soil Component of Groundwater Criteria
7440-48-4	Cobalt	14.7		MG/KG	1.23E-04	1.23E-03	
7440-50-8	Copper	32.7		MG/KG	3.99E-04	3.99E-03	2.97E-03
7439-89-6	Iron	39700		MG/KG			
7439-92-1	Lead	28.8	J	MG/KG	7.20E-02	7.20E-02	
7439-95-4	Magnesium	2510		MG/KG			
7439-96-5	Manganese	472		MG/KG	4.92E-03	4.92E-02	
7439-97-6	Mercury	0.035	J	MG/KG	5.74E-05	5.74E-04	2.33E-01
7440-02-0	Nickel	47.7		MG/KG	1.16E-03	1.16E-02	6.28E-01
2023695	Potassium	3360		MG/KG			
7782-49-2	Selenium	1.6		MG/KG	1.60E-04	1.60E-03	6.67E-01
7440-22-4	Silver	0.31	J	MG/KG	3.10E-05	3.10E-04	2.07E-01
7440-23-5	Sodium	224		MG/KG			
7440-28-0	Thallium	0.55	J	MG/KG	3.44E-03	3.44E-03	2.29E-01
7440-62-2	Vanadium	60		MG/KG	4.29E-03	4.29E-02	6.12E-02
7440-66-6	Zinc	133		MG/KG	2.18E-04	2.18E-03	3.69E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-8
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	5	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		
67-64-1	Acetone	5	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	1	U	UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1	U	UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	UJ	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	UJ	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	UJ	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-8
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
121-14-2	2,4-Dinitrotoluene	0.25	UJ	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	UJ	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	UJ	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	UJ	UG/L		
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	UJ	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	UJ	UG/L		
2691-41-0	HMX	0.5	UJ	UG/L		
98-95-3	Nitrobenzene	0.25	UJ	UG/L		
121-82-4	RDX	0.5	UJ	UG/L		
479-45-8	Tetryl	0.75	UJ	UG/L		
Metals						
7429-90-5	Aluminum	8230		UG/L	4.12E+01	
7440-36-0	Antimony	6	U	UG/L	1.00E+00	
7440-38-2	Arsenic	5	J	UG/L	5.00E-01	
7440-39-3	Barium	180	J	UG/L	7.93E+00	3.60E-02
7440-41-7	Beryllium	3.2	J	UG/L	6.40E-01	
7440-42-8	Boron	71.4	J	UG/L		7.14E-02
7440-43-9	Cadmium	11		UG/L	2.20E+00	
7440-70-2	Calcium	163000		UG/L	2.26E+01	
7440-47-3	Chromium	14.1		UG/L	1.41E+00	
7440-48-4	Cobalt	240		UG/L	4.80E+00	
7440-50-8	Copper	11.7		UG/L	1.17E+00	
7439-89-6	Iron	28400		UG/L	2.84E+02	2.84E+01
7439-92-1	Lead	3.9		UG/L	1.95E+00	
7439-95-4	Magnesium	102000		UG/L	4.03E+01	
7439-96-5	Manganese	10800		UG/L	1.86E+01	1.08E+01
7439-97-6	Mercury	0.2	U	UG/L	1.00E+00	1.67E+01
7440-02-0	Nickel	917		UG/L	9.17E+01	9.17E-01
2023695	Potassium	8480		UG/L	5.26E+00	
7782-49-2	Selenium	5	U	UG/L	1.85E+00	5.00E-03
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	45600		UG/L	1.44E+01	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	18.8	J	UG/L	3.76E-01	
7440-66-6	Zinc	993		UG/L	4.97E+01	9.93E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 22-9
 ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0062

**ADDITIONAL AND UNCHARACTERIZED SITES OU
 CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		6	U	UG/KG	2.01E-04	
79-34-5	1,1,2,2-Tetrachloroethane		6	UJ	UG/KG	4.72E-02	
79-00-5	1,1,2-Trichloroethane		6	UJ	UG/KG	2.10E-04	
75-34-3	1,1-Dichloroethane		6	UJ	UG/KG	2.99E-04	
75-35-4	1,1-Dichloroethene		6	UJ	UG/KG	7.25E-04	
107-06-2	1,2-Dichloroethane (EDC)		6	UJ	UG/KG	2.83E-04	
540-59-0	1,2-Dichloroethene (total)		6	U	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		6	U	UG/KG	8.57E-06	
78-93-3	2-Butanone (MEK)		12	U	UG/KG	1.34E-04	
591-78-6	2-Hexanone		12	U	UG/KG	9.52E-04	
108-10-1	4-Methyl-2-pentanone (MIBK)		12	U	UG/KG	2.71E-05	
67-64-1	Acetone		12	U	UG/KG	4.80E-03	
71-43-2	Benzene		6	UJ	UG/KG	3.75E-04	
75-27-4	Bromodichloromethane		6	U	UG/KG	1.11E-02	
75-25-2	Bromoform		6	UJ	UG/KG	3.77E-04	
74-83-9	Bromomethane		6	UJ	UG/KG	2.55E-02	
75-15-0	Carbon disulfide		6	UJ	UG/KG	6.37E-02	
56-23-5	Carbon tetrachloride		6	U	UG/KG	6.00E-06	
108-90-7	Chlorobenzene		6	U	UG/KG	1.50E-04	
75-00-3	Chloroethane		6	UJ	UG/KG		
67-66-3	Chloroform		6	U	UG/KG	5.04E-03	
74-87-3	Chloromethane		6	U	UG/KG	5.77E-04	
156-59-2	cis-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-01-5	cis-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
124-48-1	Dibromochloromethane		6	U	UG/KG	2.93E-03	
100-41-4	Ethylbenzene		6	U	UG/KG	1.20E-03	
75-09-2	Methylene chloride		6	U	UG/KG	1.48E-03	
110-54-3	N-Hexane		6	UJ	UG/KG		
100-42-5	Styrene		6	UJ	UG/KG	2.00E-05	
127-18-4	Tetrachloroethylene (PCE)		6	U	UG/KG	4.62E-04	
108-88-3	Toluene		6	U	UG/KG	2.00E-03	
1330-20-7	total Xylenes		6	UJ	UG/KG	1.00E-02	
156-60-5	trans-1,2-Dichloroethene		6	UJ	UG/KG	7.62E-03	
10061-02-6	trans-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
79-01-6	Trichloroethylene (TCE)		4	J	UG/KG	4.44E-04	
75-01-4	Vinyl chloride		6	UJ	UG/KG	9.29E-03	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		310	U	UG/KG	8.24E-01	
99-65-0	1,3-Dinitrobenzene		310	U	UG/KG	4.73E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		620	U	UG/KG	2.07E-02	
121-14-2	2,4-Dinitrotoluene		310	U	UG/KG	2.42E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
 J = Estimated U = Nondetect

**TABLE 22-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
606-20-2	2,6-Dinitrotoluene		620	U	UG/KG	1.89E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		620	U	UG/KG	7.75E-03	
88-72-2	2-Nitrotoluene (ONT)		620	U	UG/KG		
99-08-1	3-Nitrotoluene		620	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		620	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		620	U	UG/KG		
2691-41-0	HMX		620	U	UG/KG	2.48E-02	
98-95-3	Nitrobenzene		310	U	UG/KG	7.75E-03	
121-82-4	RDX		620	U	UG/KG	6.20E-03	
479-45-8	Tetryl		940	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	28000		MG/KG		
7440-36-0	Antimony	0.83	0.52	J	MG/KG	1.04E-01	
7440-38-2	Arsenic	13.5	8.6		MG/KG	9.56E-01	
7440-39-3	Barium	195	131		MG/KG	2.62E-01	
7440-41-7	Beryllium	0.76	0.74		MG/KG	7.40E-02	
7440-42-8	Boron	5.3	1.6	J	MG/KG	3.20E+00	
7440-43-9	Cadmium	0.19	0.78		MG/KG	2.69E-02	
7440-70-2	Calcium	2497	2390		MG/KG		
7440-47-3	Chromium	25.2	29.8		MG/KG	5.96E+00	
7440-48-4	Cobalt	21.7	11.4		MG/KG	5.70E-01	
7440-50-8	Copper	11.3	15.6		MG/KG	5.03E-01	
7439-89-6	Iron	19306	26100		MG/KG	1.31E+02	
7439-92-1	Lead	23.4	37.5		MG/KG	8.66E-02	
7439-95-4	Magnesium	1552	3230		MG/KG		
7439-96-5	Manganese	3640	652		MG/KG	6.52E+00	
7439-97-6	Mercury	0.06	0.051	J	MG/KG	7.29E-03	YES
7440-02-0	Nickel	18.9	24.1		MG/KG	8.03E-01	
2023695	Potassium	625	1300		MG/KG		
7782-49-2	Selenium	2.34	1.1		MG/KG	1.10E+00	YES
7440-22-4	Silver	0.58	1.2	U	MG/KG	6.00E-01	
7440-23-5	Sodium	170	545		MG/KG		
7440-28-0	Thallium	0.41	0.66	J	MG/KG	6.60E-01	
7440-62-2	Vanadium	47.2	43		MG/KG	9.35E-01	
7440-66-6	Zinc	51.4	56		MG/KG	4.67E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Explosives							
99-35-4	1,3,5-Trinitrobenzene		380	U	UG/KG	9.27E+00	
99-65-0	1,3-Dinitrobenzene		380	U	UG/KG	7.60E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		760	U	UG/KG	1.31E+00	
121-14-2	2,4-Dinitrotoluene		380	U	UG/KG	5.86E-01	
606-20-2	2,6-Dinitrotoluene		760	U	UG/KG	8.87E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		760	U	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		760	U	UG/KG	4.52E-02	
99-08-1	3-Nitrotoluene		760	U	UG/KG	6.39E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		760	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		760	U	UG/KG	4.06E-02	
2691-41-0	HMX		760	U	UG/KG	7.60E+01	
98-95-3	Nitrobenzene		380	U	UG/KG	6.49E-01	
121-82-4	RDX		760	U	UG/KG	3.80E+00	
479-45-8	Tetryl		1100	U	UG/KG		
Metals							
7429-90-5	Aluminum	11241	13900		MG/KG	5.35E-01	
7440-36-0	Antimony	1.9	0.41	J	MG/KG	1.37E-01	
7440-38-2	Arsenic	10.3	15.8		MG/KG	1.61E+00	
7440-39-3	Barium	196	200		MG/KG		
7440-41-7	Beryllium	1.6	1.7		MG/KG		
7440-42-8	Boron		4.6	J	MG/KG		
7440-43-9	Cadmium	1.6	1.5		MG/KG	1.52E+00	
7440-70-2	Calcium	1448	2930		MG/KG		
7440-47-3	Chromium	17.2	34.4		MG/KG	7.93E-01	
7440-48-4	Cobalt	9.1	14.7		MG/KG	2.94E-01	
7440-50-8	Copper	16.8	32.7		MG/KG	1.03E+00	
7439-89-6	Iron	20750	39700		MG/KG	2.09E-01	
7439-92-1	Lead	24	28.8	J	MG/KG	8.04E-01	
7439-95-4	Magnesium	1909	2510		MG/KG		
7439-96-5	Manganese	1043	472		MG/KG	7.49E-01	
7439-97-6	Mercury	0.15	0.035	J	MG/KG	1.94E-01	YES
7440-02-0	Nickel	16.9	47.7		MG/KG	2.10E+00	
2023695	Potassium	1421	3360		MG/KG		
7782-49-2	Selenium	0.64	1.6		MG/KG		YES
7440-22-4	Silver	3	0.31	J	MG/KG	3.10E-01	
7440-23-5	Sodium	1450	224		MG/KG		
7440-28-0	Thallium	0.31	0.55	J	MG/KG		
7440-62-2	Vanadium	28	60		MG/KG		
7440-66-6	Zinc	57.1	133		MG/KG	1.10E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-11
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		5	U	UG/L	3.57E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		5	U	UG/L	2.94E-02	
67-64-1	Acetone		5	U	UG/L	9.86E-03	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		1	U	UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1	U	UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	UJ	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	UJ	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	UJ	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	UJ	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	UJ	UG/L	1.19E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-11
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AUS-0062**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	UJ	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		0.5	UJ	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	UJ	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	UJ	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	UJ	UG/L	7.14E-05	
2691-41-0	HMX		0.5	UJ	UG/L	1.52E-03	
98-95-3	Nitrobenzene		0.25	UJ	UG/L	9.26E-04	
121-82-4	RDX		0.5	UJ	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	UJ	UG/L		
Metals							
7429-90-5	Aluminum	200	8230		UG/L	9.46E+01	
7440-36-0	Antimony	6	6	U	UG/L	2.00E-01	
7440-38-2	Arsenic	10	5	J	UG/L	2.63E-02	
7440-39-3	Barium	22.7	180	J	UG/L	3.60E-02	
7440-41-7	Beryllium	5	3.2	J	UG/L	6.04E+00	
7440-42-8	Boron		71.4	J	UG/L	7.14E-02	
7440-43-9	Cadmium	5	11		UG/L	1.00E+01	
7440-70-2	Calcium	7197	163000		UG/L	1.41E+00	
7440-47-3	Chromium	10	14.1		UG/L	6.81E-02	
7440-48-4	Cobalt	50	240		UG/L	1.04E+02	
7440-50-8	Copper	10	11.7		UG/L	9.92E-01	
7439-89-6	Iron	100	28400		UG/L	2.84E+01	
7439-92-1	Lead	2	3.9		UG/L	1.94E-01	
7439-95-4	Magnesium	2534	102000		UG/L	1.24E+00	
7439-96-5	Manganese	582	10800		UG/L	1.08E+01	
7439-97-6	Mercury	0.2	0.2	U	UG/L	1.54E-01	
7440-02-0	Nickel	10	917		UG/L	9.17E-01	
2023695	Potassium	1613	8480		UG/L	1.60E-01	
7782-49-2	Selenium	2.7	5	U	UG/L	5.00E-03	
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	45600		UG/L	6.71E-02	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	18.8	J	UG/L	9.89E-01	
7440-66-6	Zinc	20	993		UG/L	9.93E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 22-12, AUS-0062
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
1,1-Dichloroethane	No	C	NA	NA	NA	NA	No	A
1,1-Dichloroethene	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	C	NA	NA	NA	NA	Uncertainty	B
2-Butanone (MEK)	No	C	NA	NA	NA	NA	No	A
2-Hexanone	No	C	NA	NA	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	No	C	NA	NA	NA	NA	No	A
Acetone	No	C	NA	NA	NA	NA	No	A
Benzene	No	A	NA	NA	NA	NA	Uncertainty	B
Bromodichloromethane	No	C	NA	NA	NA	NA	No	A
Bromoform	No	C	NA	NA	NA	NA	No	A
Bromomethane	No	C	NA	NA	NA	NA	No	A
Carbon disulfide	No	C	NA	NA	NA	NA	No	A
Carbon tetrachloride	No	C	NA	NA	NA	NA	Uncertainty	B
Chlorobenzene	No	C	NA	NA	NA	NA	No	A
Chloroethane	No	C	NA	NA	NA	NA	No	A
Chloroform	No	C	NA	NA	NA	NA	No	A
Chloromethane	No	C	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	No	C	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	No	C	NA	NA	NA	NA	No	A
Dibromochloromethane	No	C	NA	NA	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	NA	NA	No	A
Methylene chloride	No	A	NA	NA	NA	NA	Uncertainty	B
N-Hexane	No	C	NA	NA	NA	NA	No	A
Styrene	No	C	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	No	C	NA	NA	NA	NA	Uncertainty	B
Toluene	No	A	NA	NA	NA	NA	No	A
total Xylenes	No	A	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	No	C	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	No	C	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	No	C	NA	NA	NA	NA	Yes	E
Vinyl chloride	No	C	NA	NA	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA

**TABLE 22-12, AUS-0062
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
Accenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA

**TABLE 22-12, AUS-0062
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Metals and Inorganics								
Aluminum	Uncertainty	G	NA	NA	No	F	No	F
Antimony	No	C	NA	NA	Yes	D	Yes	D
Arsenic	Uncertainty	G	NA	NA	Yes	E	Yes	D
Barium	No	F	NA	NA	Yes	E	Yes	D
Beryllium	Uncertainty	G	NA	NA	Yes	E	No	F
Boron	No	F	NA	NA	No	F	No	F
Cadmium	Uncertainty	G	NA	NA	Yes	D	Yes	E
Calcium	No	H	NA	NA	No	H	No	H
Chromium	Uncertainty	G	NA	NA	Yes	E	Yes	E
Cobalt	Uncertainty	G	NA	NA	No	F	No	F
Copper	Uncertainty	G	NA	NA	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	NA	NA	No	F	No	F
Lead	Uncertainty	G	NA	NA	No	F	No	F
Magnesium	No	H	NA	NA	No	H	No	H
Manganese	Yes	E	NA	NA	No	F	No	F
Mercury	Uncertainty	B	NA	NA	No	F	No	F
Nickel	No	F	NA	NA	Yes	E	Yes	E
Potassium	No	H	NA	NA	No	H	No	H
Selenium	No	A	NA	NA	Yes	E	Yes	D
Silver	Uncertainty	B	NA	NA	No	F	No	A
Sodium	No	H	NA	NA	No	H	No	H
Thallium	No	C	NA	NA	No	F	No	F
Vanadium	Uncertainty	G	NA	NA	No	F	No	F
Zinc	No	F	NA	NA	No	F	No	F
Explosives								
1,3,5-Trinitrobenzene	No	C	NA	NA	No	A	No	A
1,3-Dinitrobenzene	No	C	NA	NA	No	A	No	A

**TABLE 22-12, AUS-0062
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	NA	NA	No	A	No	A
2,4-Dinitrotoluene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2,6-Dinitrotoluene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	C	NA	NA	No	C	No	C
2-Nitrotoluene (ONT)	No	C	NA	NA	No	C	No	C
3-Nitrotoluene	No	C	NA	NA	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	NA	NA	No	C	No	C
4-Nitrotoluene (PNT)	No	C	NA	NA	No	A	No	A
HMX	No	C	NA	NA	No	A	No	A
Nitrobenzene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	NA	NA	No	A	No	A
Tetryl	No	C	NA	NA	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 22-13, AUS-0062
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	A	NA	NA	No	A
1,1,2-Trichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethene	No	A	NA	NA	No	A
1,2-Dichloroethane (EDC)	No	A	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	A	NA	NA	No	A
2-Butanone (MEK)	No	A	NA	NA	No	A
2-Hexanone	No	A	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	No	A	NA	NA	No	A
Acetone	No	A	NA	NA	No	A
Benzene	No	A	NA	NA	No	A
Bromodichloromethane	No	A	NA	NA	No	A
Bromoform	No	A	NA	NA	No	A
Bromomethane	No	A	NA	NA	No	A
Carbon disulfide	Uncertainty	B	NA	NA	No	A
Carbon tetrachloride	No	A	NA	NA	No	A
Chlorobenzene	No	A	NA	NA	No	A
Chloroethane	No	A	NA	NA	No	C
Chloroform	No	A	NA	NA	No	A
Chloromethane	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	No	A	NA	NA	No	A
cis-1,3-Dichloropropene	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	A	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	No	A
Methylene chloride	No	A	NA	NA	No	A
N-Hexane	No	C	NA	NA	No	C
Styrene	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	No	A	NA	NA	No	A
Toluene	No	A	NA	NA	No	A
total Xylenes	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	No	A	NA	NA	No	A
Trichloroethylene (TCE)	No	A	NA	NA	No	F
Vinyl chloride	No	A	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA

**TABLE 22-13, AUS-0062
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA

TABLE 22-13, AUS-0062
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	A	No	F	No	F
Arsenic	No	F	Yes	E	No	F
Barium	No	F	Uncertainty	G	No	F
Beryllium	Yes	D	Uncertainty	G	No	F
Boron	No	F	Uncertainty	G	Yes	D
Cadmium	Yes	E	Yes	D	No	F
Calcium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	No	F	Yes	E
Cobalt	Yes	E	No	F	No	F
Copper	No	F	Yes	E	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	Yes	E
Lead	No	F	No	F	No	F
Magnesium	Yes	E,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	Yes	E	No	F	Yes	D
Mercury	No	A	Yes	D	Yes	D
Nickel	No	F	Yes	E	Yes	J
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	No	A	Yes	E	Yes	D
Silver	Uncertainty	B	No	F	No	A
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Uncertainty	B	Uncertainty	G	No	F
Vanadium	No	F	Uncertainty	G	No	F
Zinc	No	F	Yes	E	No	F
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	No	A
1,3-Dinitrobenzene	No	A	Uncertainty	B	No	A

TABLE 22-13, AUS-0062
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Uncertainty	B	No	A
2,4-Dinitrotoluene	No	A	No	A	No	A
2,6-Dinitrotoluene	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	A	No	C	No	A
2-Nitrotoluene (ONT)	No	A	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	A	No	C	No	C
4-Nitrotoluene (PNT)	No	A	No	A	No	C
HMX	No	A	Uncertainty	B	No	A
Nitrobenzene	No	A	No	A	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	Uncertainty	B	No	A
Tetryl	No	C	No	C	No	C

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 22-14
 AUS-0062 - FORMER LANDFILL (COC-11)
 CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
 (WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum ¹	Soil	Sediment	Ground Water	Surface Water
VOCs					
Trichloroethylene (TCE)		H	NA	NA	
Metals					
Aluminum				NA	E
Arsenic			H,E	NA	
Barium			H	NA	
Beryllium			H	NA	
Cadmium		H		NA	E
Calcium				NA	E
Chromium		H,E	H	NA	
Cobalt				NA	E
Copper			E	NA	
Iron		E		NA	H,E
Magnesium				NA	E
Manganese				NA	H,E
Nickel		H,E	H,E	NA	
Selenium			H,E	NA	
Zinc			E	NA	

Key:

¹ Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded

File: E:\45FOM9602N\FIG_22-1.DWG Last edited: 07/16/01 @ 1:00 p.m. © MDC-ST. LOUIS



SOURCE: USGS DIGITAL RASTER GRAPHIC



PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

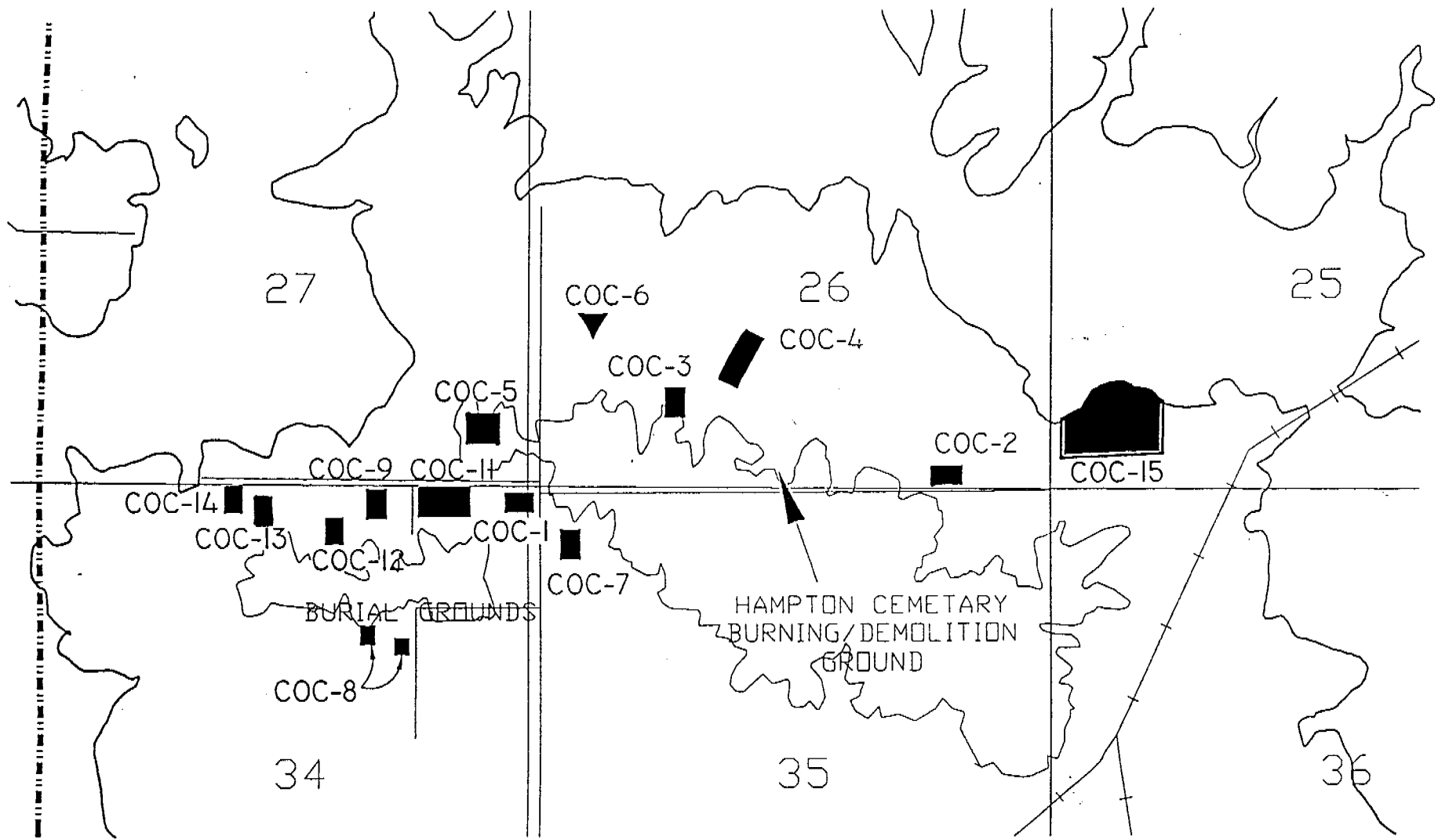
PROJECT NO.
2320000026.00

URS

DRN. BY:djd 9/7/99
DSGN. BY:mam
CHKD. BY:mch

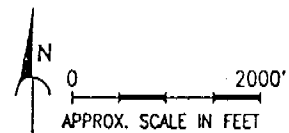
Site Location Map for AUS OU Sites
Addressed in Volume X

FIG. NO.
22-1



LEGEND

Note: This figure was obtained from the EE/CA Report done by Parsons Engineering Science, Inc. in October 1997 (Figure 2.1).



726641A3

CG/AM 6-25-96

PA/SI REPORT AUS OU
 CRAB ORCHARD NWR
 MARION, ILLINOIS

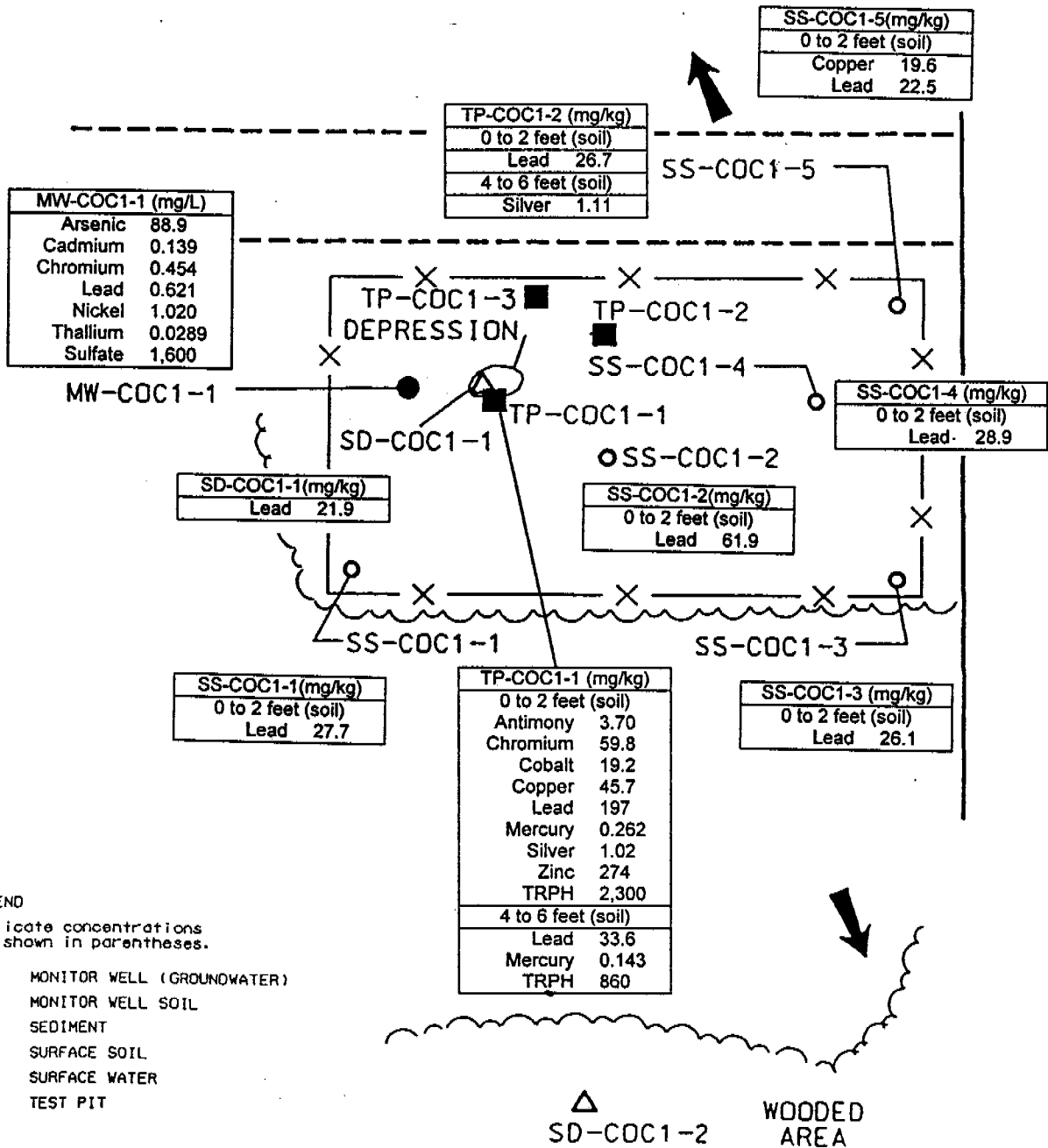
PROJECT NO.
 2320000026.00

URS Corporation

DRN. BY: djd 9/7/99
 DSGN. BY: mh
 CHKD. BY:

EMMA OU COC Site
 Locations

FIG. NO.
 22-2



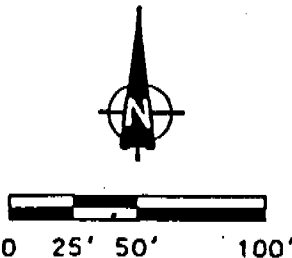
LEGEND

Duplicate concentrations are shown in parentheses.

- MW MONITOR WELL (GROUNDWATER)
- MWS MONITOR WELL SOIL
- SD SEDIMENT
- SS SURFACE SOIL
- SV SURFACE WATER
- TP TEST PIT

LEGEND

- MONITOR WELL LOCATION
- X — FENCE LINE
- △ SEDIMENT SAMPLE
- SURFACE SOIL SAMPLE
- TEST PIT LOCATION (PHASE 1)
- ➔ GROUNDWATER FLOW DIRECTION



Note: The base map used for this figure is taken from Figure 4-2 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-6 and 4-7 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-3
Site COC-1

LEGEND

- MONITOR WELL LOCATION
- DIRECTION OF SURFACE DRAINAGE
- DRAINAGE WAY
- X — FENCE LINE
- △ SEDIMENT SAMPLE LOCATION
- TEST PIT LOCATION
- SURFACE SOIL SAMPLE
- GROUNDWATER FLOW DIRECTION

- LEGEND
- MW MONITOR WELL (GROUNDWATER)
 - MWS MONITOR WELL SOIL
 - SD SEDIMENT
 - SS SURFACE SOIL
 - SW SURFACE WATER
 - TP TEST PIT

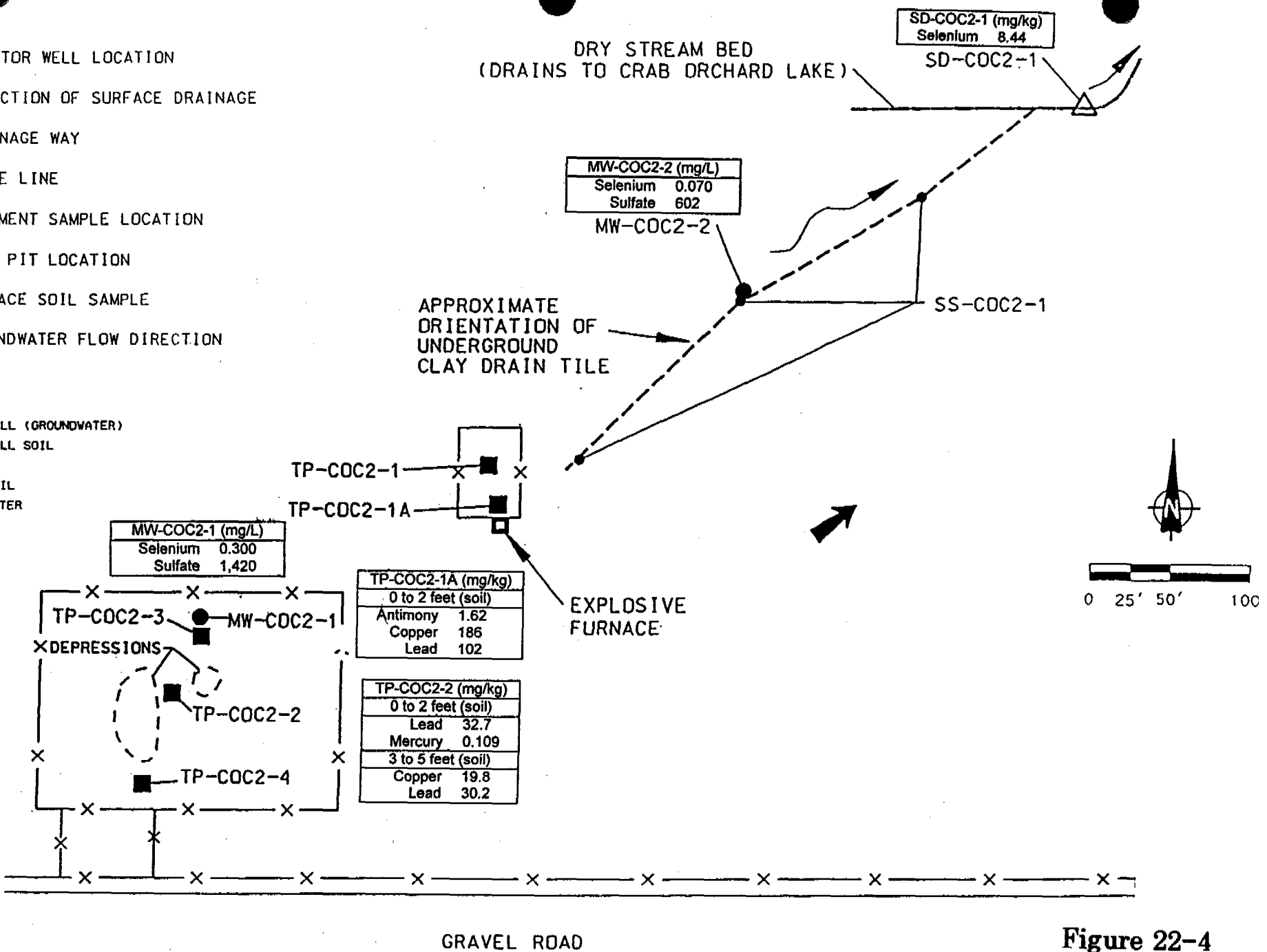
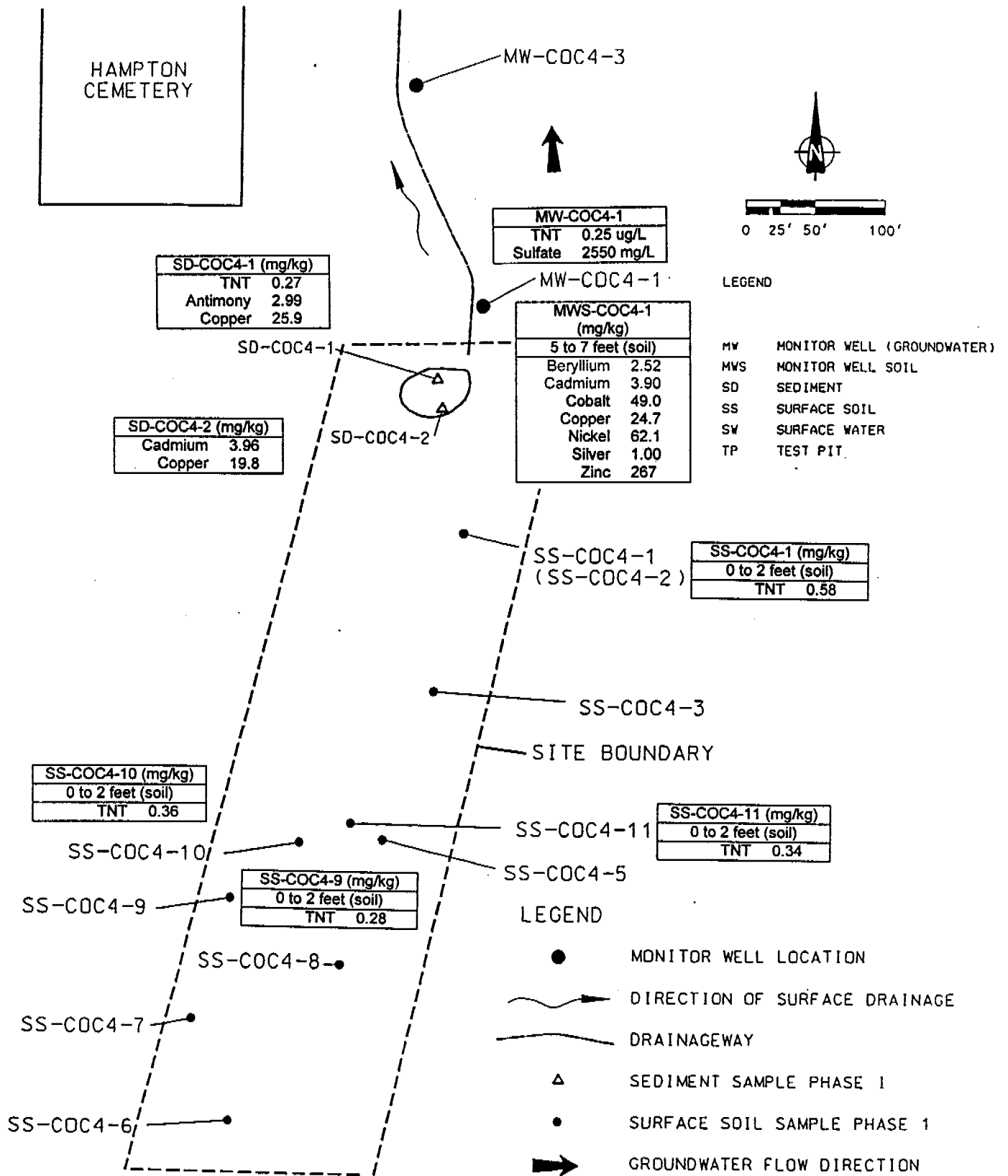


Figure 22-4

Note: The base map used for this figure is taken from Figure 4-3 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-8, 4-9, and 4-10 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C. 1995.



Note: The base map used for this figure is taken from Figure 4-5 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-17, 4-18, and 4-20 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-5
Site COC-4

LEGEND

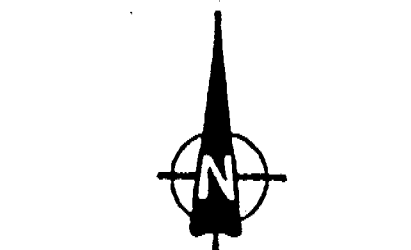
- MW MONITOR WELL (GROUNDWATER)
- MWS MONITOR WELL SOIL
- SD SEDIMENT
- SS SURFACE SOIL
- SW SURFACE WATER
- TP TEST PIT

LEGEND

- MONITOR WELL LOCATION
- DRAINAGEWAY
- > DIRECTION OF SURFACE DRAINAGE
- X— FENCE LINE
- * SURFACE WATER SAMPLE
- △ SEDIMENT SAMPLE (PHASE 2)
- ▲ SEDIMENT SAMPLE (PHASE 1)
- TEST PIT LOCATION
- ➔ GROUNDWATER FLOW DIRECTION

MW-COC5-2

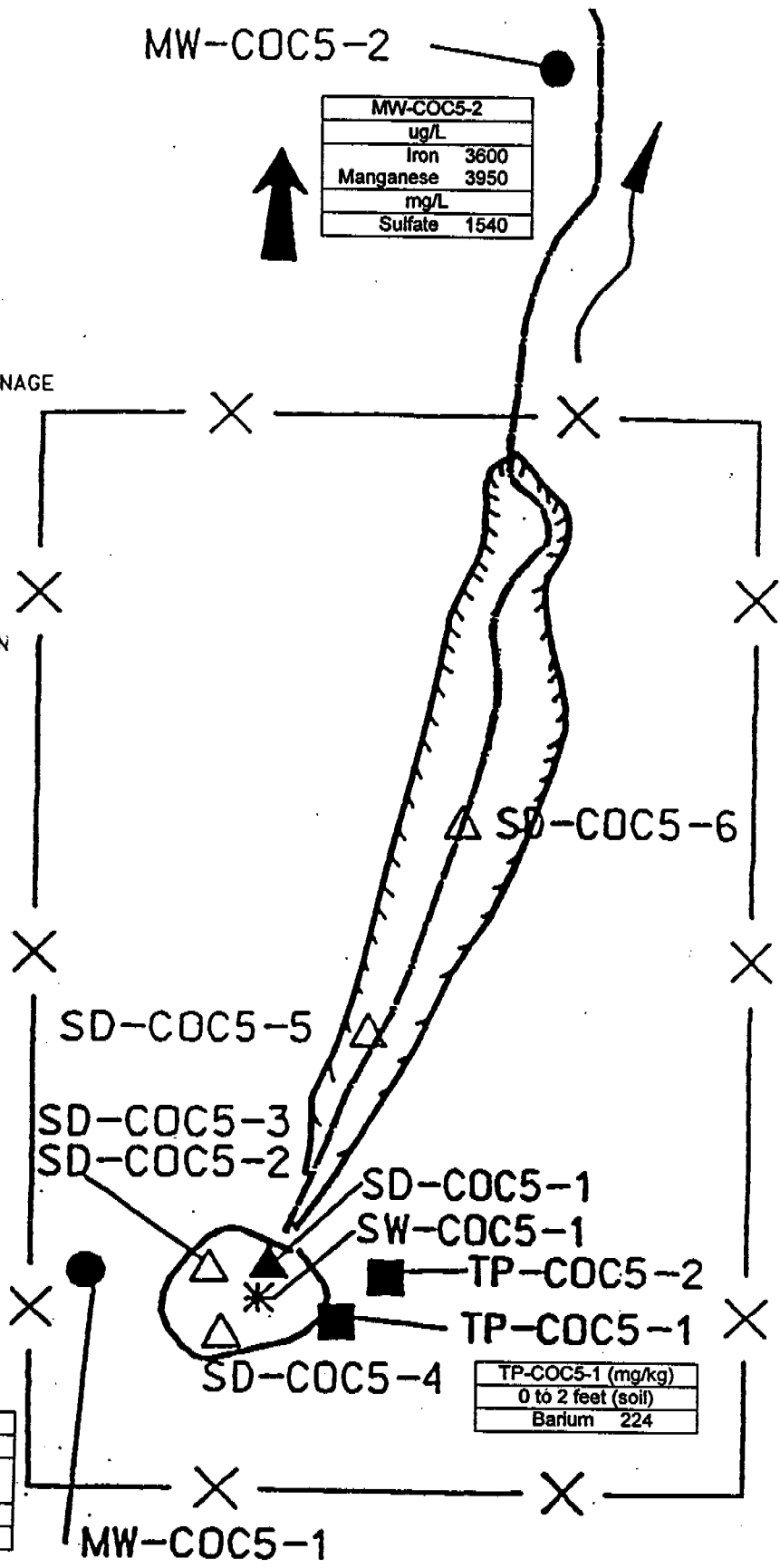
MW-COC5-2	
ug/L	
Iron	3600
Manganese	3950
mg/L	
Sulfate	1540



0 25' 50' 100'

MW-COC5-1	
ug/L	
Cadmium	20.0
Iron	7140
mg/L	
Sulfate	722

TP-COC5-1 (mg/kg)	
0 to 2 feet (soil)	
Barium	224

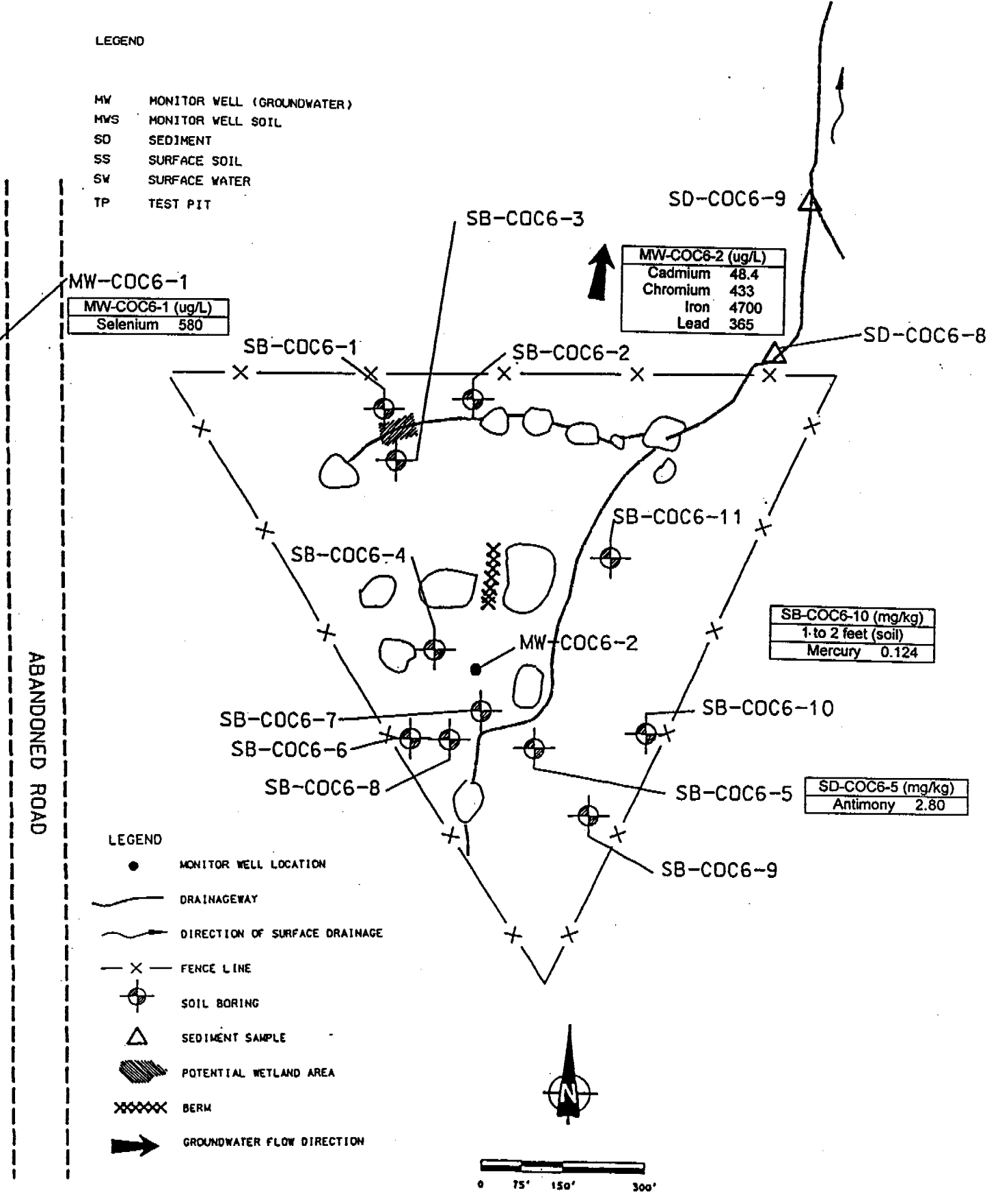


Note: The base map used for this figure is taken from Figure 4-6 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-21 and 4-23 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-6
Site COC-5

LEGEND

- MW MONITOR WELL (GROUNDWATER)
- MWS MONITOR WELL SOIL
- SD SEDIMENT
- SS SURFACE SOIL
- SW SURFACE WATER
- TP TEST PIT



Note: The base map used for this figure is taken from Figure 4-7 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-24, 4-25, and 4-27 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-7
Site COC-6

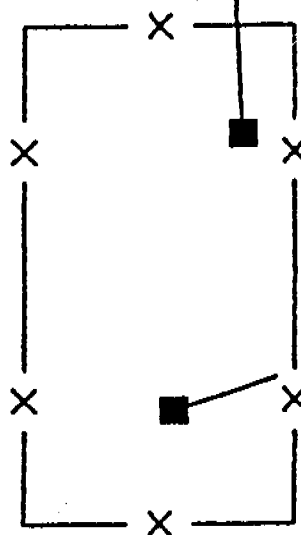
LEGEND

- MW MONITOR WELL (GROUNDWATER)
- MWS MONITOR WELL SOIL
- SD SEDIMENT
- SS SURFACE SOIL
- SW SURFACE WATER
- TP TEST PIT

LEGEND

- MONITOR WELL LOCATION
- X — FENCE LINE
- TEST PIT
- ➔ GROUNDWATER FLOW DIRECTION

TP-COC7-2

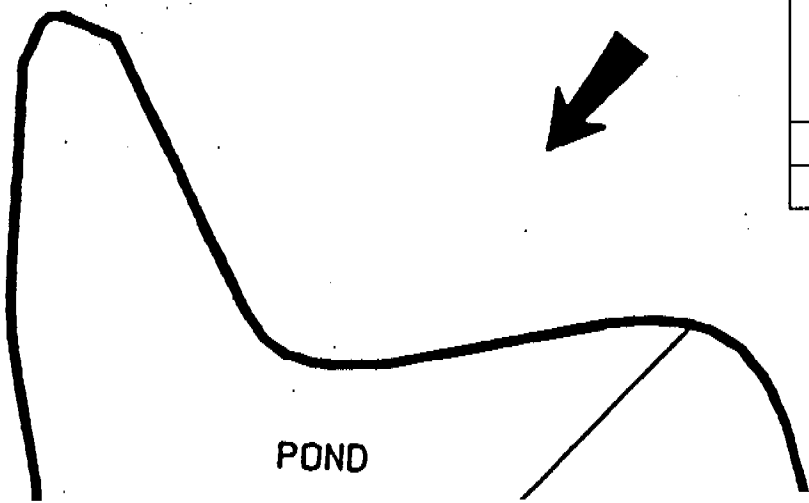


TP-COC7-2 (mg/kg)	
0 TO 2 feet (soil)	
Cobalt	22.99

TP-COC7-1

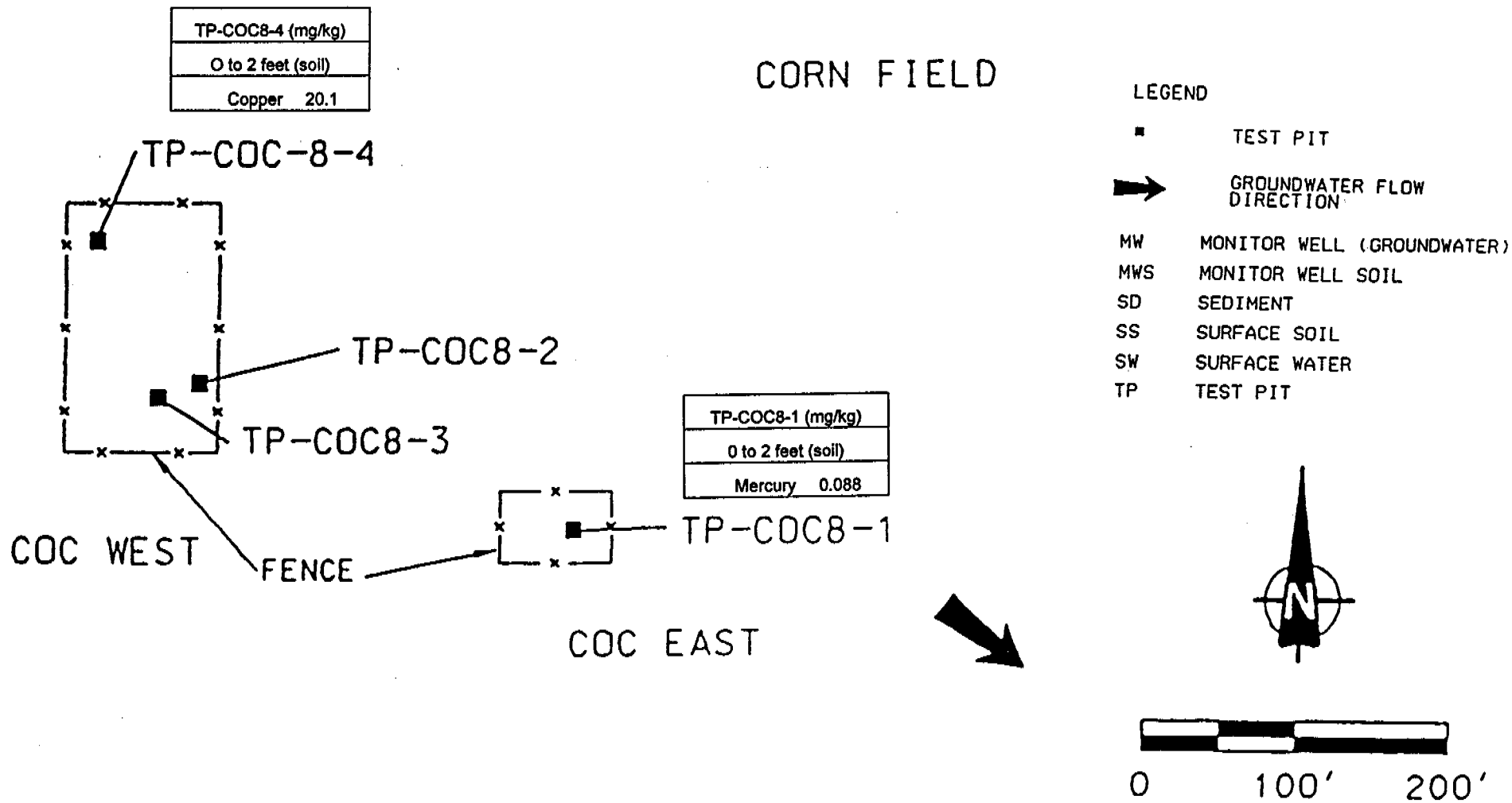
MW-COC7-3

MW-COC7-3	
ug/L	
TNT	0.21
Cadmium	20.0
Iron	3260
mg/L	
Sulfate	1880



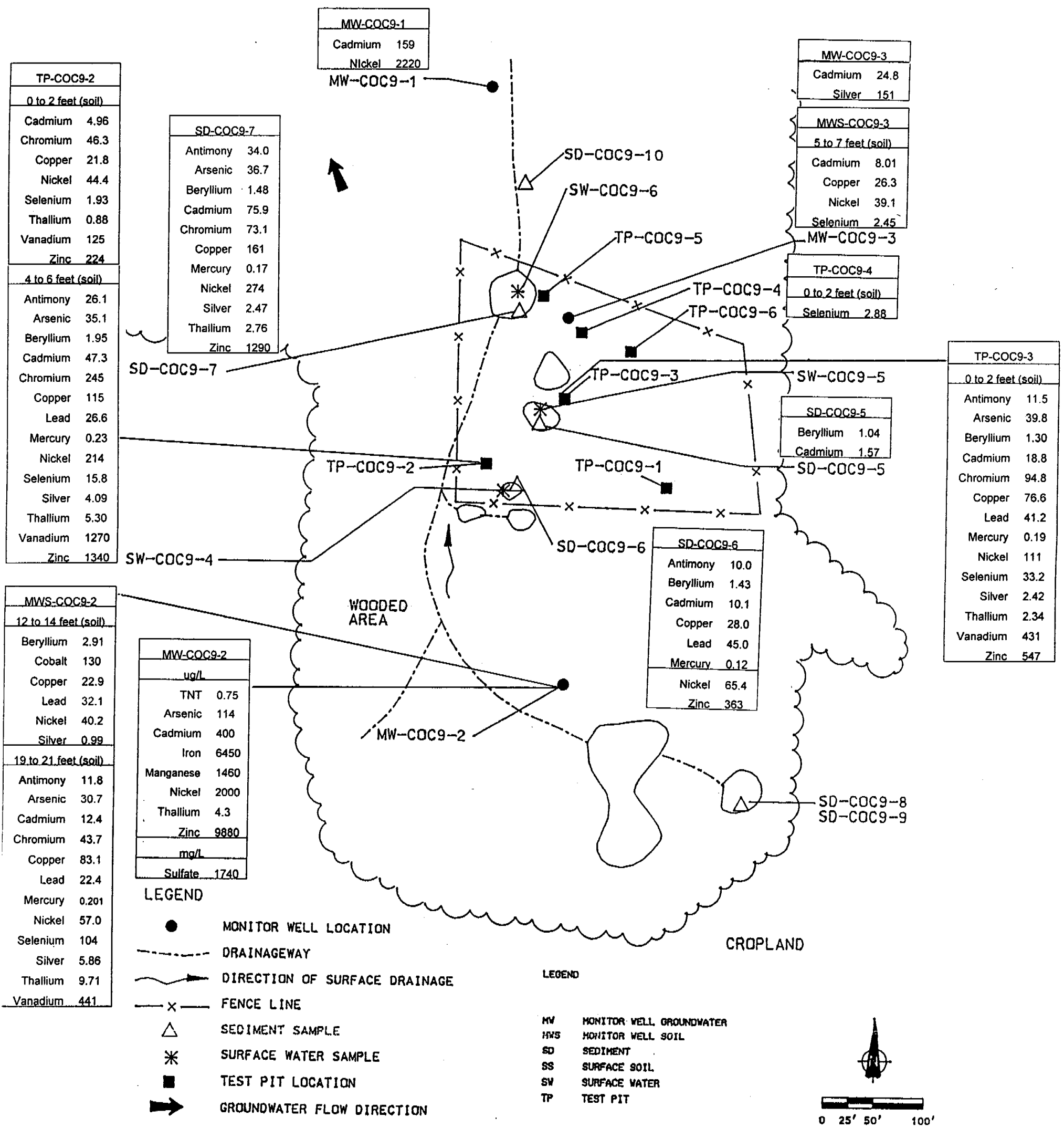
Note: The base map used for this figure is taken from Figure 4-8 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-28 and 4-29 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-8
Site COC-7



Note: The base map used for this figure is taken from Figure 4-9 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Table 4-30 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-9
Site COC-8



Note: The tables below present detected concentrations for sample locations that are not shown on this figure.

SD-COC9-1	
ug/kg	
TNT	0.74
1,3,5-TNB	0.61
mg/kg	
Arsenic	26.1
Cadmium	7.87
Copper	24.8
Mercury	0.119

SD-COC9-3	
ug/kg	
TNT	0.32
mg/kg	
Antimony	6.64
Arsenic	20.9
Cadmium	14.4
Copper	42.1
Lead	38.2
Mercury	0.13
Nickel	62.7
Selenium	5.37
Silver	0.95
Thallium	0.84
Zinc	429

SD-COC9-4	
ug/kg	
TNT	21.1
mg/kg	
Antimony	2.98
Cadmium	2.93
Copper	26.0
Lead	22.9
Selenium	4.05

TP-COC9-8	
0 to 2 feet (soil)	
Cadmium	5.23
Nickel	36.4
Selenium	4.34
Thallium	1.06
Vanadium	112

Note: The base map used for this figure is taken from Figure 4-10 of the ESE EMMA OU Draft Final RI Report, September 15, 1994. Data are from Tables 4-31, 4-32 and 4-34 of the 1994 ESE Report, which list "Constituent Concentrations Above Background or Detection Limits." The background values used for the ESE report are referenced as being from a 1993 USACE-Omaha database (ESE report, page 4-8). The full reference for the database is not included in the ESE report. The background values are similar to those used for this Historic Search Report, which are from W-C, 1995.

Figure 22-10
Site COC-9

File: E:\232000026.00\PA-SI REPORT-AUS OU\AUS-0062(22-11).DWG Last edited: SEP. 24, 01 @ 07:51 a.m. URS Corp.

AUS-0062-008		Units	Result:	Reference	Result:	Reference	Result:	Reference
			0 - 6 in	Code	2 ft	Code	4 ft	Code
Volatile Organic Compounds								
All VOCs	UG/KG	NA						
Trichloroethylene (TCE)	UG/KG			3		4		h5
Explosives								
All Explosives	UG/KG	ND		NA		ND		
Metals								
All Metals	MG/KG			NA			28000	
Aluminum	MG/KG	12100						
Antimony	MG/KG	0.26						ND
Arsenic	MG/KG	5.5		h1,h5,h7			5.1	h1,h5,h7
Barium	MG/KG	131		h5			58.1	
Beryllium	MG/KG	0.74					0.58	
Calcium	MG/KG	1340					2390	
Chromium	MG/KG	21.2		e1,h5			29.8	b1,e1,h5,h9
Cobalt	MG/KG	11.4					8.8	
Copper	MG/KG	8.4					13.5	b1
Iron	MG/KG	18300		e1			24500	b1,e1
Lead	MG/KG	14.2					16.5	
Magnesium	MG/KG	1760		b1			3230	b1
Manganese	MG/KG	652		e1			201	e1
Mercury	MG/KG	0.041		e5			0.051	e5
Nickel	MG/KG	19.5		b1,h5			20.2	b1,h5
Potassium	MG/KG	780		b1			920	b1
Selenium	MG/KG	0.8		e5,h5			ND	
Sodium	MG/KG	73.2					545	b1
Vanadium	MG/KG	34.4					35.5	
Zinc	MG/KG	34.5					49	

LEGEND

⊕ DRUM

⊕ HAND AUGER LOCATION

● 1998 USEPA SAMPLE LOCATIONS

AUS-0062-007		Units	Result:	Reference
			0 - 6 in	Code
Sediment				
Explosives				
All Explosives	UG/KG	ND		
Metals				
Aluminum	MG/KG	13600		b2
Antimony	MG/KG	0.41		h5
Arsenic	MG/KG	15.8		b2,e2,h1,h5,h7
Barium	MG/KG	171		h5
Beryllium	MG/KG	1.7		b2,h7
Boron	MG/KG	3.3		
Cadmium	MG/KG	1.5		e2,h5
Calcium	MG/KG	2930		b2
Chromium	MG/KG	28.8		b2,h5,h9
Cobalt	MG/KG	14.7		b2
Copper	MG/KG	20.1		b2
Iron	MG/KG	39700		b2
Lead	MG/KG	28.8		b2
Magnesium	MG/KG	2460		b2
Manganese	MG/KG	472		
Mercury	MG/KG	0.035		e5
Nickel	MG/KG	47.7		b2,e2,h5
Potassium	MG/KG	1410		
Selenium	MG/KG	1.8		b2,e5,h5
Sodium	MG/KG	111		
Vanadium	MG/KG	60		b2
Zinc	MG/KG	133		b2,e2

AUS-0062-006		Units	Result:	Reference	Result:	Reference
			0 - 6 in	Code	2 ft	Code
Volatile Organic Compounds						
All VOCs	UG/KG	NA				ND
Explosives						
All Explosives	UG/KG	ND		NA		
Metals						
All Metals	MG/KG			NA		
Aluminum	MG/KG	13500				
Antimony	MG/KG	0.27				
Arsenic	MG/KG	7.6		h1,h5,h7		
Barium	MG/KG	73.6				
Beryllium	MG/KG	0.53				
Cadmium	MG/KG	0.78		b1,h5		
Calcium	MG/KG	2140				
Chromium	MG/KG	21.5		e1,h5		
Cobalt	MG/KG	6.3				
Copper	MG/KG	12.8		b1		
Iron	MG/KG	28100		b1,e1		
Lead	MG/KG	37.5		b1		
Magnesium	MG/KG	2170		b1		
Manganese	MG/KG	398		e1		
Mercury	MG/KG	0.021		e5		
Nickel	MG/KG	13.8		h5		
Potassium	MG/KG	1140		b1		
Selenium	MG/KG	0.38		e5,h5		
Sodium	MG/KG	40.8				
Vanadium	MG/KG	37.7				
Zinc	MG/KG	55.5		b1		

AUS-0062-004		Units	Result:	Reference
			0 - 6 in	Code
Sediment				
Explosives				
All Explosives	UG/KG	ND		
Metals				
Aluminum	MG/KG	8900		
Arsenic	MG/KG	3.8		h1,h5,h7
Barium	MG/KG	200		b2,h5
Beryllium	MG/KG	0.69		
Boron	MG/KG	4.6		
Cadmium	MG/KG	0.92		h5
Calcium	MG/KG	1920		b2
Chromium	MG/KG	10.2		h5
Cobalt	MG/KG	9.1		
Copper	MG/KG	32.7		b2,e2
Iron	MG/KG	10800		
Lead	MG/KG	10		
Magnesium	MG/KG	2510		b2
Manganese	MG/KG	447		
Mercury	MG/KG	0.033		e5
Nickel	MG/KG	26.4		b2,e2,h5
Potassium	MG/KG	3360		b2
Silver	MG/KG	0.31		
Sodium	MG/KG	224		
Thallium	MG/KG	0.55		b2
Vanadium	MG/KG	8.6		
Zinc	MG/KG	45.8		

AUS-0062-003		Units	Result:	Reference	Result:	Reference
			0 - 6 in	Code	2 ft	Code
Volatile Organic Compounds						
All VOCs	UG/KG	NA				ND
Explosives						
All Explosives	UG/KG	ND		NA		
Metals						
All Metals	MG/KG			NA		
Aluminum	MG/KG	11100				
Antimony	MG/KG	0.52		h5		
Arsenic	MG/KG	5.4		h1,h5,h7		
Barium	MG/KG	105		h5		
Beryllium	MG/KG	0.71				
Boron	MG/KG	1.6		e1		
Cadmium	MG/KG	0.63		b1,h5		
Calcium	MG/KG	1540				
Chromium	MG/KG	21.3		e1,h5		
Cobalt	MG/KG	8.6				
Copper	MG/KG	13.4		b1		
Iron	MG/KG	17200		e1		
Lead	MG/KG	14.9				
Magnesium	MG/KG	1980		b1		
Manganese	MG/KG	387		e1		
Mercury	MG/KG	0.038		e5		
Nickel	MG/KG	24.1		b1,h5		
Potassium	MG/KG	1290		b1		
Selenium	MG/KG	1.1		e1,e5,h5		
Sodium	MG/KG	57.7				
Thallium	MG/KG	0.86		b1		
Vanadium	MG/KG	43				
Zinc	MG/KG	56		b1		

AUS-0062-005		Units	Result:	Reference
			0 - 6 in	Code
Sediment				
Explosives				
All Explosives	UG/KG	ND		
Metals				
Aluminum	MG/KG	13900		b2
Arsenic	MG/KG	3.3		h1,h5,h7
Barium	MG/KG	108		h5
Beryllium	MG/KG	0.65		
Boron	MG/KG	1		
Calcium	MG/KG	1220		
Chromium	MG/KG	34.4		b2,h5,h9
Cobalt	MG/KG	3.7		
Copper	MG/KG	10.3		
Iron	MG/KG	15700		
Lead	MG/KG	14.1		
Magnesium	MG/KG	1740		
Manganese	MG/KG	82.3		
Mercury	MG/KG	0.03		e5
Nickel	MG/KG	13.2		h5
Potassium	MG/KG	838		
Sodium	MG/KG	53.1		
Vanadium	MG/KG	42.5		b2
Zinc	MG/KG	29.5		

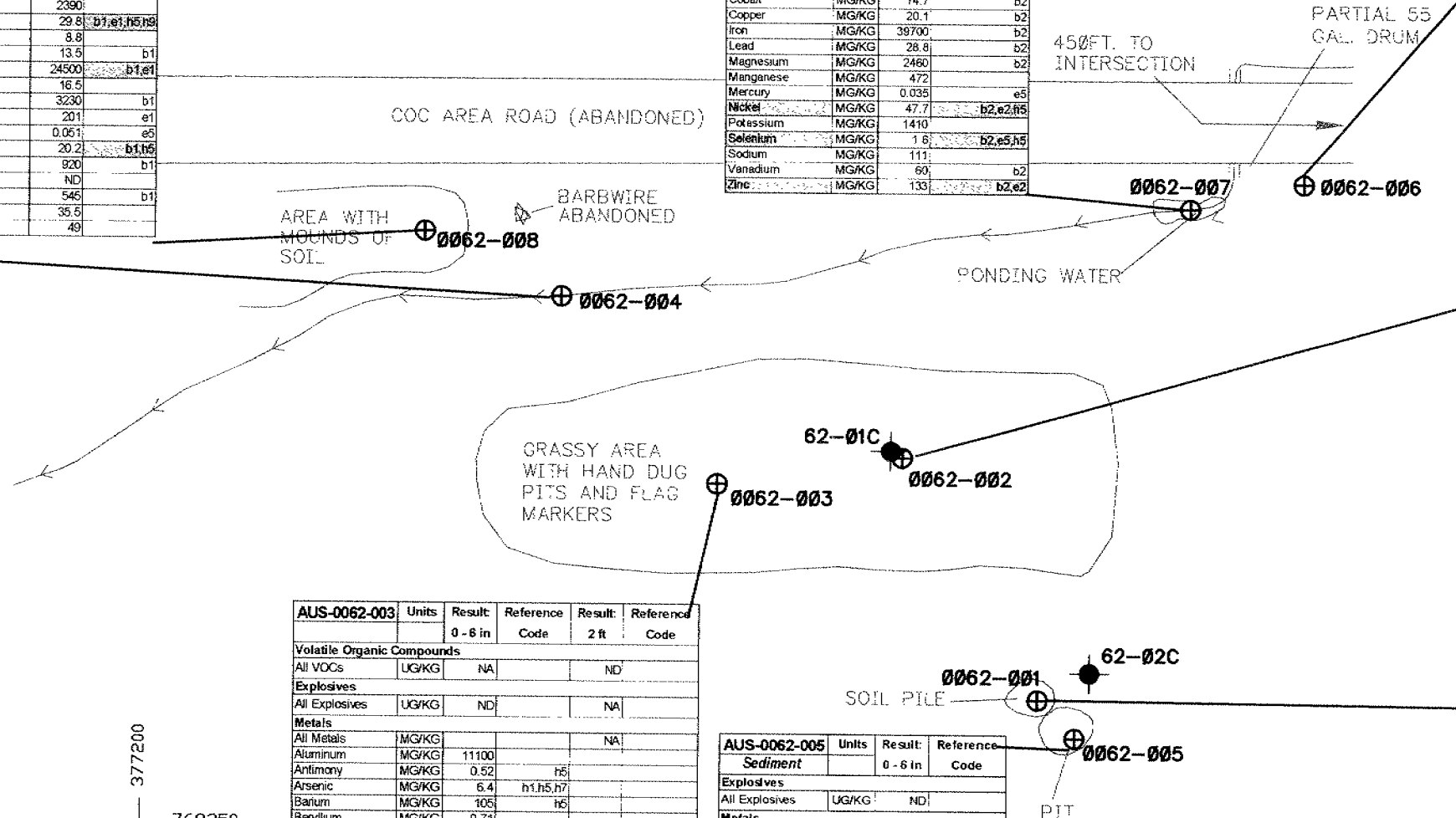
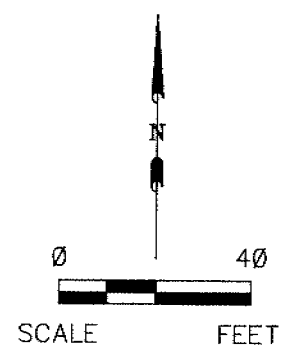
AUS-0062-001		Units	Result:	Reference	Result:	Reference
			0 - 6 in	Code	2 ft	Code
Volatile Organic Compounds						
All VOCs	UG/KG	NA				ND
Explosives						
All Explosives	UG/KG	ND		NA		
Metals						
All Metals	MG/KG			NA		
Aluminum	MG/KG	12700				12300
Antimony	MG/KG	0.27				ND
Arsenic	MG/KG	6		h1,h5,h7		3.5
Barium	MG/KG	99.1		h5		98.8
Beryllium	MG/KG	0.62				0.66
Calcium	MG/KG	2150				1730
Chromium	MG/KG	18.6		e1,h5		19.5
Cobalt	MG/KG	10				3.6
Copper	MG/KG	11.1				9.6
Iron	MG/KG	21200		b1,e1		13100
Lead	MG/KG	9.2				11.1
Magnesium	MG/KG	1820		b1		2160
Manganese	MG/KG	541		e1		188
Mercury	MG/KG	0.028		e5		0.024
Nickel	MG/KG	19.7		b1,h5		16.3
Potassium	MG/KG	1070		b1		578
Sodium	MG/KG	52.2				130
Vanadium	MG/KG	34.7				31.1
Zinc	MG/KG	47.2				27.9

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Low values (potential bioaccumulators)	e5
USEPA Region IX Industrial Soil PRG - carcinous	h1
USEPA Region IX Industrial Soil PRG - noncarcinous	h2
USEPA Region IX Tap Water PRG - carcinous	h3
USEPA Region IX Tap Water PRG - noncarcinous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

- NOTES:**
1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
 2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
 3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.
 4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-0062-FORMER LANDFILL (COC-11)

PA/SI REPORT--AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 232000026.00
URS	
DRN. BY:djd 12/16/00 DSGN. BY:mam CHKD. BY:mch/cmw	FIG. NO. 22-11

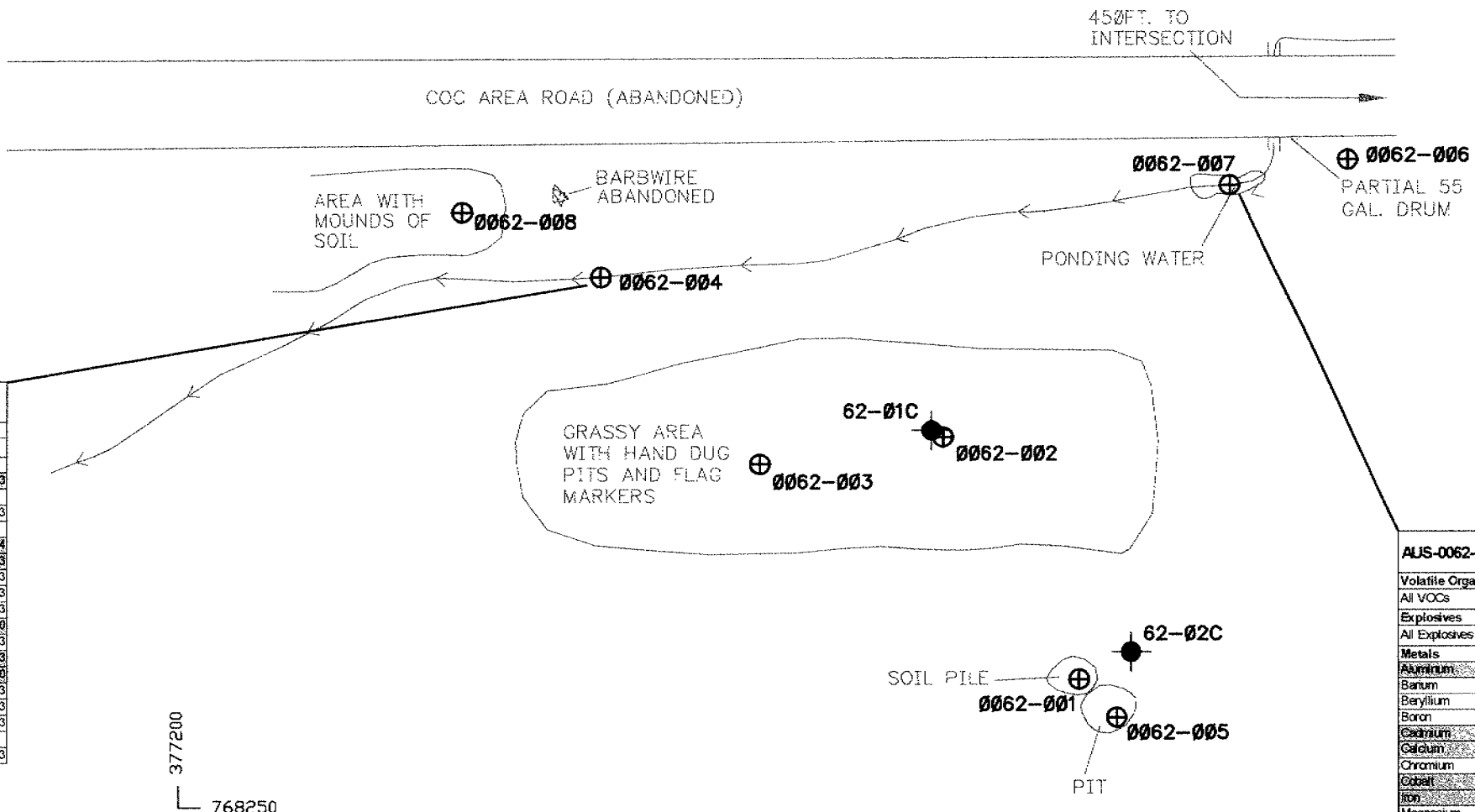


File: E:\2320000026\PA-SI REPORT-AUS OU\AUS-0062(22-12).DWG Last edited: SEP. 24, 01 @ 08:22 a.m. URS Corp.

LEGEND

- ⊕ DRUM
- ⊕ HAND AUGER LOCATION
- 1998 USEPA SAMPLE LOCATIONS

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
EPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulater)	e5
USEPA Region IX Industrial Soil PRG - carcinous	h1
USEPA Region IX Industrial Soil PRG - noncarcinous	h2
USEPA Region IX Tap Water PRG - carcinous	h3
USEPA Region IX Tap Water PRG - noncarcinous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
EPA TACO Industrial/Commercial Soil Ingestion	h7
EPA TACO Construction Worker Soil Ingestion	h8
EPA TACO Class I Soil Component of Groundwater	h9
EPA General Use Surface Water Quality Human Health	h10



AUS-0062-004-SW-00	Units	Result	Screening Codes
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	8230	b3,e3
Arsenic	UG/L	5	
Barium	UG/L	180	b3
Boron	UG/L	70.4	
Cadmium	UG/L	11	b3,e3,e4
Calcium	UG/L	146000	b3,e3
Chromium	UG/L	14.1	b3
Cobalt	UG/L	28.5	e3
Copper	UG/L	11.7	b3
Iron	UG/L	6540	b3,e3,e4,h10
Lead	UG/L	3.9	b3
Magnesium	UG/L	102000	b3,e3
Manganese	UG/L	3410	b3,e3,e4,h10
Nickel	UG/L	364	b3
Potassium	UG/L	8480	b3
Sodium	UG/L	45600	b3
Vanadium	UG/L	18.8	
Zinc	UG/L	395	b3

AUS-0062-007-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	7160	b3,e3
Barium	UG/L	48.1	b3
Beryllium	UG/L	3.2	e3
Boron	UG/L	71.4	
Cadmium	UG/L	5.3	b3,e3,e4
Calcium	UG/L	163000	b3,e3
Chromium	UG/L	3	
Cobalt	UG/L	240	b3,e3
Iron	UG/L	28400	b3,e3,e4,h10
Magnesium	UG/L	81000	b3
Manganese	UG/L	10800	b3,e3,e4,h10
Nickel	UG/L	917	b3
Potassium	UG/L	8060	b3
Sodium	UG/L	44100	b3
Vanadium	UG/L	6.3	
Zinc	UG/L	993	b3

NOTES:

1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-0062-FORMER LANDFILL (COC-11)

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY:djd 12/16/00 DSGN. BY:mam CHKD. BY:mch/cmw	AUS-0062 Sample Locations and Detections in Surface Water
	FIG. NO. 22-12

See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC Area. AUS-0063, shown in Figure 22-1, is located approximately 1.3 miles west of the intersection of Wolf Creek Road and the COC Area Road, on the south side of the COC Area Road.

AUS-0063 was included in the original AUS OU list because of the presence of a suspect fenced area, and the fact that it was thought to be part of COC-12, an Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU) site which was investigated for unexploded ordnance (UXO) but not chemical contamination.

AUS Original Site Designations

AUS-0063 is one of the original sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS) as part of the AUS OU.

23.1 HISTORIC SEARCH INFORMATION

23.1.1 Site Description

AUS-0063 was originally described as “fenced areas west of COC-11”. The fenced areas were first suspected of being explosive detonation areas, but were identified during the SI by USFWS personnel as deer exclosures. The aerial photo interpretation did not identify any historic activities in the vicinity of these fenced areas.

During the SI field investigation, three additional samples were collected from the same ditch (near the fenced area) that United States Environmental Protection Agency (USEPA) sampled in 1998. After the sampling was done, it was determined that the ditch was actually part of the EMMA OU Site COC-9, and not COC-12, as intended. USFWS evaluated the USEPA 1998 results and the SI results in the context of the findings of the EMMA baseline risk assessment (BRA) and verified that the BRA determination of no further action for COC-9 was still applicable.

This site will not be included in further investigations because it was determined previously to be a No-Action site.¹ Results from this current investigation are presented for informational purposes only.

23.1.2 Operational History and Waste Characteristics

There have been no known industrial lessees of this property. The site was identified as a former homestead during the aerial photo interpretation.

¹ U.S. Environmental Protection Agency, Region V, 1997. Record of Decision for Crab Orchard National Wildlife Refuge Explosives/Munitions Operable Unit.

23.1.3 AUS-0063 Previous Sampling Results**EMMA OU RI, 1994**

Analytical results from the EMMA OU Remedial Investigation (RI) for Site COC-9 are presented in Figure 22-10.

USEPA Sampling, 1998

In 1998, USEPA collected one soil sample (63-01) from “a small creek west of fenced in area.” The sample location is shown in Figure 23-1. The results for all detected constituents are listed in Table 23-1A. There were no PAHs, mercury, or VOCs detected in this sample. Cadmium (3.4 milligrams per kilogram (mg/kg)), and nickel (32 mg/kg) exceeded USEPA Soil Screening Levels (SSLs) and Refuge background values.² Zinc (140 mg/kg) exceeded New Dutchlist Soil Optimum Levels (DSOLs) and Refuge background.

23.1.4 Observations During Site Visit

During the October 17, 2000 site visit, the drainage for the site was described as a maze of ditches that converged and flowed north. The main north-flowing ditch was dry during the site visit. The site is wooded. At the time of the site visit, there was a plowed field to the east and south, and a field with tall grass to the west.

23.1.5 Recommendations Based on Preliminary Assessment

This site was included in the SI because it was on the original AUS OU list (fenced area and EMMA COC site) and because of exceedances of screening criteria in the 1998 USEPA sampling.

23.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0063 on May 8, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)³ for the AUS OU PA/SI. AUS OU SI sample locations are shown on Figure 23-1. Survey coordinates for all sample locations in AUS-0063 are listed in Table 23-1. Table 23-2 lists the sample locations and the matrix sampled at that location.

² See Table 2-6 of this report for Refuge background soil values used for the PA.

³ U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

23.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. Three sample locations (0063-001, 0063-002 and 0063-003) were in the drainageway that flows northward through the site. Sediment was collected at each of these, and surface water was collected at Location 0063-002.

All samples were collected in accordance with the Field Sampling Plan with the following exceptions:

- AUS-0063-001-SW-00 The sample was not collected due to lack of surface water at this location.
- AUS-0063-002-SW-00 A surface water sample was added at this location to replace the surface water sample that was not collected at AUS-0063-001-SW-00.

23.2.2 Field Results**23.2.2.1 Site Conditions****23.2.2.1.1 *Geologic Conditions***

There were no test pits or monitoring wells installed at AUS-0063 as part of the AUS OU SI. The soil from the hand auger borings, which extended to depths of two feet (ft), was described as silty clay fill. At sample location 0062-0006 the soil was described as including debris, and at sample location 0063-002 the soil was described as including some sand and gravel.

Additional geologic information is available in the EMMA OU RI.

23.2.2.1.2 *Hydrogeologic Conditions*

No hydrogeological data were collected during the SI. A discussion of hydrogeologic conditions is contained in the EMMA OU RI.

23.2.2.1.3 *Hydrologic Conditions*

There are multiple small drainageways that converge to flow north via the main drainageway shown in Figure 23-1.

23.2.2.2 Chemical Results

The sample analytical results are summarized in the following tables:

- Table 23-3 – sediment samples results, and
- Table 23-4 – surface water sample results.

These tables list all the chemicals detected in AUS-0063 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report. All results are shown in Figure 23-1.

23.3 SCREENING RISK ASSESSMENT

The screening risk assessment is not applicable to this site because it was previously evaluated in a baseline risk assessment. See discussion in Section 23.1.1 above.

23.4 SUMMARY AND RECOMMENDATIONS

The results of the investigation are presented for informational purposes only. The samples were mistakenly taken at COC-9, an EMMA OU site which had previously been determined to require no further action, based on analytical results and a baseline risk assessment.

TABLE 23-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0063

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0063-001	377389.6	767553.5	412.79	NA	
0063-002	377156.4	767542.8	416.95	NA	
0063-003	376683.3	767434.7	433.70	NA	

Sheet 1 of 1

NA = Not Applicable

**TABLE 23-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY**

Sample ID	Constituent	Result (mg/kg)
63-01	Aluminum	15,000
	Arsenic	10
	Barium	150
	Beryllium	0.9
	Cadmium	3.4
	Calcium	1,800
	Chromium	24
	Cobalt	13
	Copper	16
	Iron	25,000
	Magnesium	2,000
	Manganese	470
	Mercury	0.04
	Nickel	32
	Potassium	1,600
	Silver	1.3
	Vanadium	52
Zinc	140	

Sheet 1 of 1

mg/kg = milligrams per kilogram

**TABLE 23-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0063**

Sediment	Surface Water
AUS-0063-001	AUS-0063-002
AUS-0063-002	
AUS-0063-003	

Sheet 1 of 1

TABLE 23-3
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Metals		
Aluminum	3/3	15,100 mg/kg to 19,500 mg/kg
Antimony	2/3	0.62 mg/kg to 1 mg/kg
Arsenic	3/3	8.8 mg/kg to 17.7 mg/kg
Barium	3/3	50.2 mg/kg to 107 mg/kg
Beryllium	3/3	0.93 mg/kg to 3.3 mg/kg
Boron	2/3	1.3 mg/kg to 1.4 mg/kg
Cadmium	3/3	1.8 mg/kg to 5.7 mg/kg
Calcium	3/3	1,440 mg/kg to 1,760 mg/kg
Chromium, Total	3/3	21.4 mg/kg to 42.8 mg/kg
Cobalt	3/3	13.8 mg/kg to 191 mg/kg
Copper	3/3	15.6 mg/kg to 24 mg/kg
Iron	3/3	22,700 mg/kg to 34,200 mg/kg
Lead	3/3	24.6 mg/kg to 34.4 mg/kg
Magnesium	3/3	1,720 mg/kg to 2,040 mg/kg
Manganese	3/3	340 mg/kg to 8,520 mg/kg
Mercury	3/3	0.034 mg/kg to 0.078 mg/kg
Nickel	3/3	33 mg/kg to 63 mg/kg
Potassium	3/3	1,040 mg/kg to 1,290 mg/kg
Selenium	3/3	1.4 mg/kg to 3 mg/kg
Sodium	3/3	79.9 mg/kg to 105 mg/kg
Vanadium	3/3	44.4 mg/kg to 70 mg/kg
Zinc	3/3	110 mg/kg to 259 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

TABLE 23-4
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Metals		
Aluminum	1/1	4,570 ug/L
Barium	1/1	36.4 ug/L
Beryllium	1/1	2.1 ug/L
Boron	1/1	47.5 ug/L
Cadmium	1/1	3.3 ug/L
Calcium	1/1	141,000 ug/L
Chromium, Total	1/1	3.2 ug/L
Cobalt	1/1	44 ug/L
Copper	1/1	5.3 ug/L
Iron	1/1	2,930 ug/L
Lead	1/1	2 ug/L
Magnesium	1/1	39,100 ug/L
Manganese	1/1	5,090 ug/L
Nickel	1/1	177 ug/L
Potassium	1/1	3,390 ug/L
Sodium	1/1	21,400 ug/L
Vanadium	1/1	7.6 ug/L
Zinc	1/1	510 ug/L

Sheet 1 of 1

ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are included only when the duplicate results are greater than original sample results, or when an analyte was detected in a duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are lower than the low end of the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

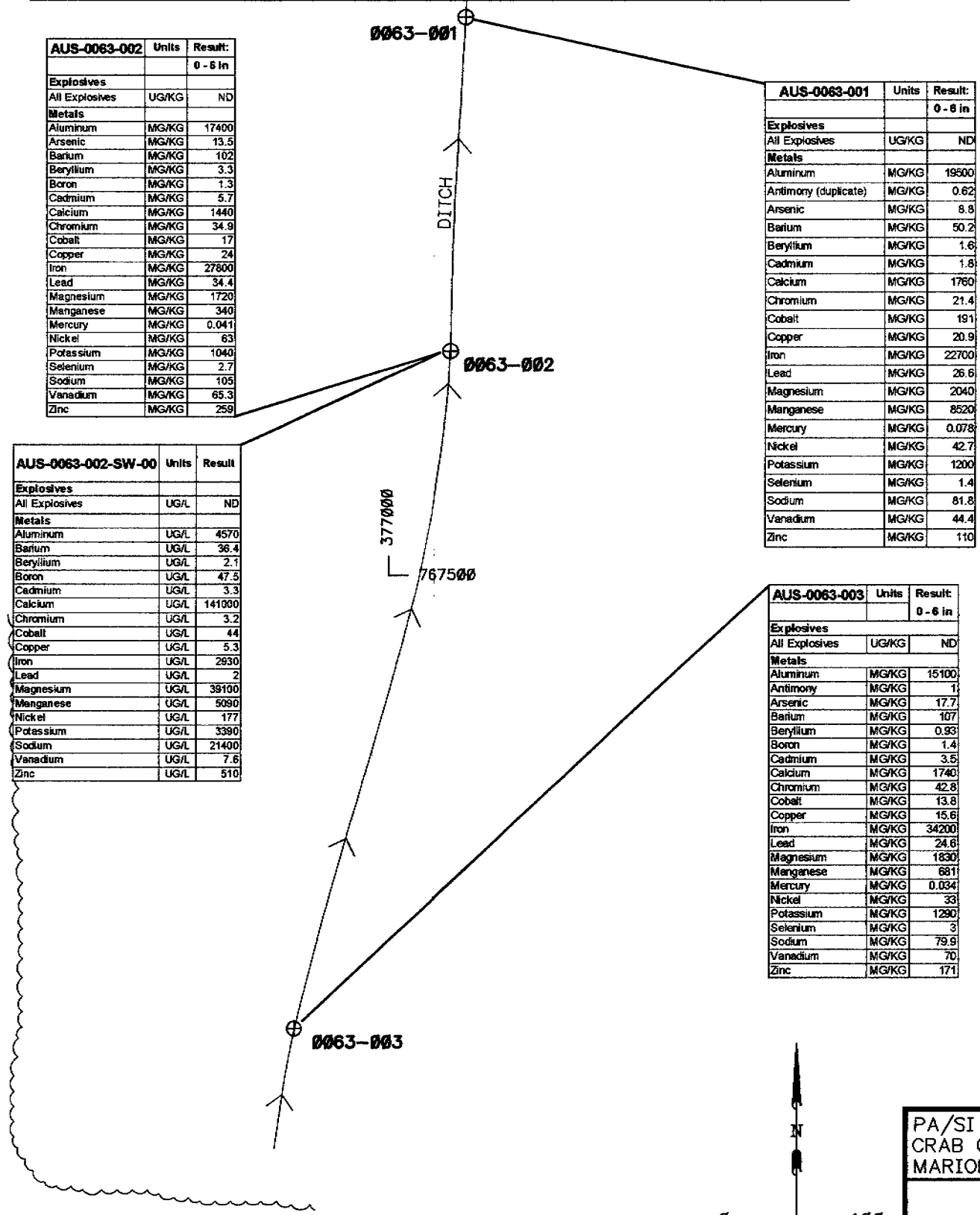
Checked by: MMF 7/23/01

LEGEND

- ⊕ MONITORING WELL LOCATION
- ⊕ HAND AUGER LOCATION
- ⊕ 1998 USEPA SAMPLE LOCATIONS
- ~ TREELINE

AUS-0063-FORMER EMMA OU COC-9

COC AREA ROAD (ABANDONED)



AUS-0063-002	Units	Result:
0 - 6 in		
Explosives		
All Explosives	UG/KG	ND
Metals		
Aluminum	MG/KG	17400
Arsenic	MG/KG	13.5
Barium	MG/KG	102
Beryllium	MG/KG	3.3
Boron	MG/KG	1.3
Cadmium	MG/KG	5.7
Calcium	MG/KG	1440
Chromium	MG/KG	34.9
Cobalt	MG/KG	17
Copper	MG/KG	24
Iron	MG/KG	27800
Lead	MG/KG	34.4
Magnesium	MG/KG	1720
Manganese	MG/KG	340
Mercury	MG/KG	0.041
Nickel	MG/KG	63
Potassium	MG/KG	1040
Selenium	MG/KG	2.7
Sodium	MG/KG	105
Vanadium	MG/KG	65.3
Zinc	MG/KG	259

AUS-0063-001	Units	Result:
0 - 6 in		
Explosives		
All Explosives	UG/KG	ND
Metals		
Aluminum	MG/KG	19500
Antimony (duplicate)	MG/KG	0.62
Arsenic	MG/KG	8.8
Barium	MG/KG	50.2
Beryllium	MG/KG	1.6
Cadmium	MG/KG	1.8
Calcium	MG/KG	1760
Chromium	MG/KG	21.4
Cobalt	MG/KG	191
Copper	MG/KG	20.9
Iron	MG/KG	22700
Lead	MG/KG	26.6
Magnesium	MG/KG	2040
Manganese	MG/KG	8520
Mercury	MG/KG	0.078
Nickel	MG/KG	42.7
Potassium	MG/KG	1200
Selenium	MG/KG	1.4
Sodium	MG/KG	81.8
Vanadium	MG/KG	44.4
Zinc	MG/KG	110

AUS-0063-002-SW-00	Units	Result
Explosives		
All Explosives	UG/L	ND
Metals		
Aluminum	UG/L	4570
Barium	UG/L	36.4
Beryllium	UG/L	2.7
Boron	UG/L	47.5
Cadmium	UG/L	3.3
Calcium	UG/L	141000
Chromium	UG/L	3.2
Cobalt	UG/L	44
Copper	UG/L	5.3
Iron	UG/L	2930
Lead	UG/L	2
Magnesium	UG/L	38100
Manganese	UG/L	5090
Nickel	UG/L	177
Potassium	UG/L	3390
Sodium	UG/L	21400
Vanadium	UG/L	7.6
Zinc	UG/L	510

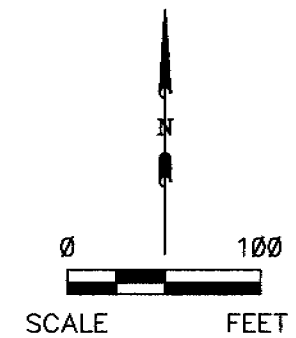
AUS-0063-003	Units	Result:
0 - 6 in		
Explosives		
All Explosives	UG/KG	ND
Metals		
Aluminum	MG/KG	15100
Antimony	MG/KG	1
Arsenic	MG/KG	17.7
Barium	MG/KG	107
Beryllium	MG/KG	0.93
Boron	MG/KG	1.4
Cadmium	MG/KG	3.5
Calcium	MG/KG	1740
Chromium	MG/KG	42.8
Cobalt	MG/KG	13.8
Copper	MG/KG	15.6
Iron	MG/KG	34200
Lead	MG/KG	24.8
Magnesium	MG/KG	1830
Manganese	MG/KG	681
Mercury	MG/KG	0.034
Nickel	MG/KG	33
Potassium	MG/KG	1290
Selenium	MG/KG	3
Sodium	MG/KG	79.9
Vanadium	MG/KG	70
Zinc	MG/KG	171

File: E:\2320000026\PA-SI REPORT-AUS OU\AUS-0063.DWG Last edited: SEP. 24. 01 @ 07:58 a.m. URS Corp.

- NOTES:**
1. BASED MAP FROM SKETCH PREPARED DURING SITE INVESTIGATION.
 2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
 3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS		PROJECT NO. 2320000026.00
URS		
DRN. BY: djd 11/20/00 DSGN. BY: mam CHKD. BY: mch/cmw	AUS-0063 Sample Locations and Detections in Sediments and Surface Water	FIG. NO. 23-1

FARMERS FIELD



See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC Area. AUS-0064 is located south of the COC Area Road, about 1.4 miles west of the intersection of Wolf Creek Road and the COC Area Road.

AUS-0064 is Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU) Site COC-13, one of the COC sites for which no chemical data were collected during EMMA OU investigations.

AUS Original Site Designations

AUS-0064 is one of the original AUS OU sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS).

24.1 HISTORIC SEARCH INFORMATION

24.1.1 Site Description

AUS-0064 was originally described as “mounds and a brick pit near Site 63 (AUS-0063)” and it was identified as COC-13 of the EMMA OU. COC-13 is a small site, with dimensions of approximately 35 feet (ft) by 35 ft.¹ The site is a very small wooded area.

24.1.2 Operational History and Waste Characteristics

AUS-0064 may have been the location of a former farmstead according to the 1943 aerial photographs.² No other evidence of activity was observed in the historical aerial photographs.

There have been no known industrial lessees of this property.

24.1.3 AUS-0064 Previous Sampling Results

Parsons Engineering, 1997

Under contract to the Department of the Army, Parsons Engineering conducted an ordnance and explosive waste (OEW) investigation at this site (COC-13) in 1997. The entire site was investigated for OEW and a total of 35 magnetic anomalies were identified.³ Eleven of these anomalies were investigated and two of them were identified as ordnance scrap (munitions

¹ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-27.

² Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume II (Maps) Page R. The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

³ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-27.

fragments) and the rest were non-ordnance scrap.⁴ No unexploded ordnance (UXO) items were recovered.

USEPA Sampling, 1998

In 1998, the United States Environmental Agency (USEPA) collected one soil sample (64-01)⁵ from this site, “near intersection in road, downstream of tipped barrel,” according to USEPA field notes. Survey coordinates were not available for this sample; therefore, the location does not appear on any figures. The results for all detected constituents are listed in Table 24-1A. No target semi-volatile organic compounds (SVOCs) were detected. Beryllium (1.1 milligrams per kilogram (mg/kg)) exceeded USEPA Soil Screening Levels (SSLs) and Refuge background levels.⁶

24.1.4 Observations During Site Visit

The site was not visited during the Preliminary Assessment (PA).

24.1.5 Recommendations Based on Preliminary Assessment

AUS-0064 was not originally included in the Site Investigation (SI) since USFWS was unable to locate the site during the site reconnaissance. During the SI field investigation, the USFWS located the site and it was added to the SI field investigation since previous USEPA sample results revealed exceedances of PA screening levels. AUS-0064 was also included in the SI because of suspect debris on site and because it was a COC site investigated for UXO only (no chemical analyses).

24.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0064 on May 12, 2000. The rationale for sample locations, media, and analytes was not included in the FSP for the AUS OU PA/SI, since sample locations at this site were added after the FSP had been completed. AUS OU SI sample locations are shown on Figure 24-1. Survey coordinates for all sample locations in AUS-0064 are listed in Table 24-1. Table 24-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples.

24.2.1 Field Investigation

Two soil samples (0064-001 and 0064-002) were collected from this site. No other samples were taken.

24.2.2 Field Results

There were no test pits or monitoring wells installed at AUS-0064. The soil from the hand auger samples, which extended to depths of two ft, was described as silty clay fill.

⁴ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-27.

⁵ The sample was also labeled AUS-102.

⁶ See Table 1-11 of this report for Refuge background soil values used for the PA.

24.2.2.1 Chemical Results

Table 24-3 lists the chemicals detected at AUS-0064 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report (QCSR). Sample results are shown in Figure 24-1.

24.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 24-4 and 24-5 as follows:

- Table 24-4--human health risk screening for soils, and
- Table 24-5--ecological risk screening for soils.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0064. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level “cancer risk” is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as contaminants of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a “U” qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs, but rather as uncertainties.

In Figure 24-1, the shading convention used is the same as for the tables, discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with “J”) are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 24-6 (human health risk) and 24-7 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 24-6) and COPECs (Table 24-7) are shaded in the tables.

24.3.1 Human Health Risk

24.3.1.1 Soil

Human health screening results for soil samples are presented in Table 24-4. For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

24.3.2 Ecological Risk

24.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 24-5. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)⁷
- Environment Canada (1995)⁸
- Talmage *et al.* (1999)⁹
- Efroymsen *et al.* (1997a, 1997b)¹⁰
- CCME (1999)¹¹
- MHSPE (1994)¹²
- Other Sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

⁷ USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

⁸ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

⁹ Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

¹⁰ Efroymsen, 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, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efroymsen, 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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

¹¹ Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

¹² Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)¹³ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

24.4 SCIENTIFIC MANAGEMENT DECISION POINT

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs/COPECs for further evaluation. These are the constituents coded with “D” on the COPC list, Table 24-6; and on the COPEC list, Table 24-7. On the COPC list constituents in this category include arsenic, chromium, nickel and selenium in soil. COPECs coded with a “D” on Table 24-7 include boron, chromium, manganese, and selenium in soil. Soil was the only media sampled.

24.4.1 Human Health Risk Evaluation

Constituents that exceeded both the screening criteria and Refuge background are discussed below, with recommendations.

Barium. The maximum barium concentration detected, 197 mg/kg, exceeded the calculated background value of 195 mg/kg for barium by one percent¹⁴. The Region 9 migration to groundwater criteria for a DAF 1 for barium is 80 mg/kg. The screening value for the soil component of the groundwater ingestion route for State of Illinois Class I groundwater was not exceeded. The Region 9 DAF 1 factor assumes that groundwater is at the surface, an unnecessarily conservative assumption for this site, which is located on the side of a hill. At the Refuge, groundwater can be expected to occasionally rise to the surface in flat low-lying areas, but not on hillsides. The Region 9 screening value for DAF 20 (assuming a dilution/attenuation factor of 20) is 1,600 mg/kg, almost an order of magnitude greater than the maximum detected concentration.

In addition, the maximum concentration detected is well below the mean plus three standard deviations, which was calculated as 361 mg/kg for barium¹⁵. USEPA guidance states that the

¹³ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

¹⁴ This is the 95 percent upper tolerance limit (UTL), based on the 95 percent confidence level. See Section 2 for the development of background values.

¹⁵ See discussion and results in Section 2 and Table 2-7.

mean plus three standard deviations ($3S_b$) comprises a reasonable maximum allowable or upper limit.¹⁶

For the reasons presented above, it is recommended that barium not be retained as a COPC for further evaluation.

Cadmium. The maximum cadmium concentration detected, 0.88 mg/kg, exceeded the calculated background value of 0.2 mg/kg for cadmium¹⁷. The Region 9 DAF 1 value for cadmium is 0.4 mg/kg. The screening value for the Illinois TACO soil component of the groundwater ingestion route for Class I groundwater was not exceeded. The Region 9 screening value for DAF 20 (assuming a dilution/attenuation factor of 20) is 8 mg/kg, almost an order of magnitude greater than the maximum detected concentration. Based on these data and the magnitude of the detection, it is recommended that cadmium not be retained as a COPC based on potential groundwater impacts.

Several chemicals represent uncertainties for AUS-0064 because, while they were not detected, the reporting limit was equal to or exceeded the screening criteria. These are indicated as uncertainties on Table 24-6, and coded with a "B." The uncertainty associated with these chemicals is not considered to be significant.

Note that concentrations of beryllium (1.1 mg/kg) and nickel (19 mg/kg) from the USEPA 1998 sampling exceeded the screening criteria used for the PA. The beryllium concentration of 1.1 mg/kg does not exceed any of the SI human health screening criteria, and the nickel concentration is essentially at background, based on current data (18.9 mg/kg for nickel).

In summary, results of the soil analyses at AUS-0064 indicate there are no chemicals present at levels of potential human health concern warranting further evaluation. It is recommended that none of the chemicals be retained as COPCs for this site.

24.4.2 Ecological Risk Evaluation

Chemicals identified as COPECs for Site AUS-0064 include boron, chromium, iron, manganese, mercury, selenium and zinc. As discussed above, the maximum detected concentrations of boron, chromium, manganese and selenium were below Refuge background levels. It is recommended that these chemicals not be retained as COPECs. Iron, mercury, and zinc are discussed below.

Iron - The maximum concentration of iron (20,300 mg/kg) was slightly (about 5 percent) above the background concentration (19,306 mg/kg -- Table 24-5). Though the maximum detection exceeded the screening value, iron is not considered a significant ecological concern since it is generally considered to have low toxicity, it is an essential nutrient, and is similar to the background concentration.

¹⁶ USEPA, 1995. Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites. OSWER Engineering Forum Issue. EPA/540/5-96/500.

¹⁷ This the 95 percent upper tolerance limit (UTL), based on the 95 percent confidence level. See Section 2 for the development of background values.

Mercury - The screening hazard quotient for mercury was less than one, indicating that mercury does not pose a risk associated with direct exposures in soils, but is discussed because it was detected and is a potential bioaccumulative constituent. The maximum concentration of mercury (0.11 mg/kg) was higher than background (0.06 mg/kg). However, the background mean plus three standard deviations is 0.11 mg/kg. As discussed in Section 2, this approach (in addition to the 95% UTL) also represents a reasonable maximum value for reference area data sets as based on guidance in *Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites*.¹⁸ In addition, though mercury is a potentially bioaccumulative constituent, its bioaccumulation potential is less pronounced in terrestrial as compared to aquatic systems.¹⁹ Therefore, mercury at AUS-0064 is not believed to be sufficiently elevated to warrant further evaluation.

Zinc - The maximum concentration of zinc (144 mg/kg) resulted in a screening HQ of 1.2 (Table 24-5). This suggests there may be a potential for direct exposure risks associated with zinc in soils. However, the maximum zinc concentration is below all other Level A toxicity reference values presented in Appendix G. In addition, the mean concentration of zinc was 93.6 mg/kg, which is below all the Level A toxicity reference values in Appendix G. Because the screening HQ based on the maximum concentration only slightly exceeds unity, and a screening quotient based on the mean concentration would be less than 1, zinc is not believed to present a significant ecological concern.

One organic chemical and several inorganic chemicals represent uncertainties at AUS-0064 (Tables 24-5 and 24-7). The single organic, 2,6-dinitrotoluene, was not detected, but the reporting limit exceeded the screening value. In fact, none of the explosives were detected. Therefore, the uncertainty associated with 2,6-dinitrotoluene is considered low. Similarly, thallium was not detected but represents an uncertainty because the reporting limit exceeded the ecological screening value (HQ = 1.4). Because it was not detected, and the associated HQ only slightly exceeds unity, thallium is not considered a significant ecological concern. Other inorganics were identified as uncertainties because they were detected but no screening values were identified. These include calcium, magnesium, potassium, and sodium. Both calcium and sodium were below background concentrations. Though the maximum concentrations of magnesium and potassium were above background levels, these are essential nutrients (as are calcium and sodium) and uptake is physiologically controlled. Therefore, the uncertainty associated with these chemicals is not considered significant. Aluminum was also characterized as an uncertainty. The screening criterion for aluminum is based on soil pH, and there are no site-specific pH data available for AUS-0064. However, the maximum concentration is below background, and thus aluminum is not considered a significant ecological concern.

In summary, results of the soil analyses at AUS-0064 indicate there are no chemicals present at levels of potential ecological concern warranting further evaluation. It is recommended that none of the chemicals be retained as COPECs for this site.

¹⁸ United States Environmental Protection Agency, *Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Site*, EPA/540/S-96/500, 1995.

¹⁹ Lodenius, M. 1994. Mercury in Terrestrial Ecosystems: A Review. In *Mercury Pollution Integration and Synthesis*, Carl J. Watras and John W. Huckabee, editors. Lewis Publishers, Boca Raton, Florida.

24.4.3 Summary of Recommendations

Based on the above discussions, it is recommended that none of the constituents detected at AUS-0064 be retained for further evaluation. Site AUS-0064 is judged to require no further action.

TABLE 24-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0064

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0064-001	377122.9	766301.3	441.76	NA	
0064-002	377108.0	766311.0	440.46	NA	

Sheet 1 of 1

NA = Not Applicable

TABLE 24-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
64-01	Aluminum	14,000
	Barium	180
	Beryllium	1.1
	Calcium	5,100
	Chromium	19
	Cobalt	13
	Copper	13
	Iron	21,000
	Magnesium	3,800
	Manganese	560
	Nickel	19
	Potassium	950
	Silver	1.2
	Sodium	300
	Vanadium	35
Zinc	72	

Sheet 1 of 1

mg/kg = milligrams per kilogram

**TABLE 24-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0064**

Soil
AUS-0064-001
AUS-0064-002

Sheet 1 of 1

TABLE 24-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Metals		
Aluminum	2/2	11,100 mg/kg to 15,100 mg/kg
Arsenic	2/2	7.9 mg/kg to 8.8 mg/kg
Barium	2/2	125 mg/kg to 197 mg/kg
Beryllium	2/2	0.48 mg/kg to 0.73 mg/kg
Boron	2/2	0.57 mg/kg to 1.1 mg/kg
Cadmium	1/2	0.88 mg/kg
Calcium	2/2	1,150 mg/kg to 2,200 mg/kg
Chromium, Total	2/2	13.9 mg/kg to 16.9 mg/kg
Cobalt	2/2	11.4 mg/kg to 11.9 mg/kg
Copper	2/2	10.9 mg/kg to 17.5 mg/kg
Iron	2/2	16,400 mg/kg to 20,300 mg/kg
Lead	2/2	14.6 mg/kg to 82.8 mg/kg
Magnesium	2/2	1,500 mg/kg to 2,190 mg/kg
Manganese	2/2	745 mg/kg to 1,770 mg/kg
Mercury	2/2	0.056 mg/kg to 0.11 mg/kg
Nickel	2/2	12.7 mg/kg to 13.8 mg/kg
Potassium	2/2	850 mg/kg to 1,220 mg/kg
Selenium	2/2	0.58 mg/kg to 0.68 mg/kg
Sodium	2/2	46.3 mg/kg to 54.4 mg/kg
Vanadium	2/2	27.3 mg/kg to 34.7 mg/kg
Zinc	2/2	43.2 mg/kg to 144 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

TABLE 24-4

HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0064

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Explosives								
99-35-4	1,3,5-Trinitrobenzene	350	U	UG/KG			1.32E-05	
99-65-0	1,3-Dinitrobenzene	350	U	UG/KG			3.97E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	700	U	UG/KG		8.51E-09	1.59E-03	
121-14-2	2,4-Dinitrotoluene	350	U	UG/KG			1.99E-04	8.75E+03
606-20-2	2,6-Dinitrotoluene	700	U	UG/KG			7.95E-04	2.33E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	700	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	700	U	UG/KG				
99-08-1	3-Nitrotoluene	700	U	UG/KG			3.45E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	700	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	700	U	UG/KG			3.45E-04	
2691-41-0	HMX	700	U	UG/KG			1.59E-05	
98-95-3	Nitrobenzene	350	U	UG/KG			3.06E-03	
121-82-4	RDX	700	U	UG/KG		3.12E-08	2.65E-04	
479-45-8	Tetryl	1100	U	UG/KG			1.25E-04	
Metals								
7429-90-5	Aluminum	15100		MG/KG	5.24E-01		9.01E-03	
7440-36-0	Antimony	0.84	U	MG/KG	1.01E+00		1.03E-03	2.80E+00
7440-38-2	Arsenic	8.8		MG/KG	6.52E-01	3.23E-06	2.00E-02	8.80E+00
7440-39-3	Barium	197		MG/KG	1.01E+00		1.58E-03	2.46E+00
7440-41-7	Beryllium	0.73		MG/KG	9.61E-01	3.26E-10	1.98E-04	2.43E-01
7440-42-8	Boron	1.1	J	MG/KG	2.08E-01		1.39E-05	
7440-43-9	Cadmium	0.88		MG/KG	4.63E+00	2.94E-10	1.09E-03	2.20E+00
7440-70-2	Calcium	2200		MG/KG	8.81E-01			
7440-47-3	Chromium	16.9		MG/KG	6.71E-01	3.77E-08		8.45E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 24-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0064**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-48-4	Cobalt	11.9		MG/KG	5.48E-01		9.71E-05	
7440-50-8	Copper	17.5		MG/KG	1.55E+00		2.31E-04	
7439-89-6	Iron	20300		MG/KG	1.05E+00		3.31E-02	
7439-92-1	Lead	82.8		MG/KG	3.54E+00			
7439-95-4	Magnesium	2190		MG/KG	1.41E+00			
7439-96-5	Manganese	1770		MG/KG	4.86E-01		5.49E-02	
7439-97-6	Mercury	0.11	J	MG/KG	1.83E+00			
7440-02-0	Nickel	13.8		MG/KG	7.30E-01		3.38E-04	1.97E+00
2023695	Potassium	1220		MG/KG	1.95E+00			
7782-49-2	Selenium	0.68	J	MG/KG	2.91E-01		6.65E-05	2.27E+00
7440-22-4	Silver	1.4	U	MG/KG	2.41E+00		1.37E-04	7.00E-01
7440-23-5	Sodium	54.4	J	MG/KG	3.20E-01			
7440-28-0	Thallium	1.4	U	MG/KG	3.41E+00		9.78E-06	
7440-62-2	Vanadium	34.7		MG/KG	7.35E-01		2.43E-03	1.16E-01
7440-66-6	Zinc	144		MG/KG	2.80E+00		2.35E-04	2.40E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 24-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0064**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Explosives							
99-35-4	1,3,5-Trinitrobenzene	350	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	350	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	700	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	350	U	UG/KG	4.17E-02	1.94E-03	4.38E+02
606-20-2	2,6-Dinitrotoluene	700	U	UG/KG	8.33E-02	3.89E-03	1.00E+03
35572-78-2	2-Amino-4,6-Dinitrotoluene	700	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	700	U	UG/KG			
99-08-1	3-Nitrotoluene	700	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	700	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	700	U	UG/KG			
2691-41-0	HMX	700	U	UG/KG			
98-95-3	Nitrobenzene	350	U	UG/KG	3.50E-04	3.50E-04	3.50E+00
121-82-4	RDX	700	U	UG/KG			
479-45-8	Tetryl	1100	U	UG/KG			
Metals							
7429-90-5	Aluminum	15100		MG/KG			
7440-36-0	Antimony	0.84	U	MG/KG	1.02E-03	1.02E-02	1.68E-01
7440-38-2	Arsenic	8.8		MG/KG	2.93E+00	1.44E-01	3.14E-01
7440-39-3	Barium	197		MG/KG	1.41E-03	1.41E-02	1.64E-01
7440-41-7	Beryllium	0.73		MG/KG	7.30E-01	2.52E-02	1.11E-01
7440-42-8	Boron	1.1	J	MG/KG	6.11E-06	6.11E-05	
7440-43-9	Cadmium	0.88		MG/KG	4.40E-04	4.40E-03	2.38E-01
7440-70-2	Calcium	2200		MG/KG			
7440-47-3	Chromium	16.9		MG/KG	1.69E-03	4.12E-03	6.04E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 24-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0064**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-48-4	Cobalt	11.9		MG/KG	9.92E-05	9.92E-04	
7440-50-8	Copper	17.5		MG/KG	2.13E-04	2.13E-03	1.59E-03
7439-89-6	Iron	20300		MG/KG			
7439-92-1	Lead	82.8		MG/KG	2.07E-01	2.07E-01	
7439-95-4	Magnesium	2190		MG/KG			
7439-96-5	Manganese	1770		MG/KG	1.84E-02	1.84E-01	
7439-97-6	Mercury	0.11	J	MG/KG	1.80E-04	1.80E-03	7.33E-01
7440-02-0	Nickel	13.8		MG/KG	3.37E-04	3.37E-03	1.82E-01
2023695	Potassium	1220		MG/KG			
7782-49-2	Selenium	0.68	J	MG/KG	6.80E-05	6.80E-04	2.83E-01
7440-22-4	Silver	1.4	U	MG/KG	1.40E-04	1.40E-03	9.33E-01
7440-23-5	Sodium	54.4	J	MG/KG			
7440-28-0	Thallium	1.4	U	MG/KG	8.75E-03	8.75E-03	5.83E-01
7440-62-2	Vanadium	34.7		MG/KG	2.48E-03	2.48E-02	3.54E-02
7440-66-6	Zinc	144		MG/KG	2.36E-04	2.36E-03	4.00E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 24-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0064**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Explosives							
99-35-4	1,3,5-Trinitrobenzene		350	U	UG/KG	9.30E-01	
99-65-0	1,3-Dinitrobenzene		350	U	UG/KG	5.35E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		700	U	UG/KG	2.33E-02	
121-14-2	2,4-Dinitrotoluene		350	U	UG/KG	2.73E-01	
606-20-2	2,6-Dinitrotoluene		700	U	UG/KG	2.13E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		700	U	UG/KG	8.75E-03	
88-72-2	2-Nitrotoluene (ONT)		700	U	UG/KG		
99-08-1	3-Nitrotoluene		700	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		700	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		700	U	UG/KG		
2691-41-0	HMX		700	U	UG/KG	2.80E-02	
98-95-3	Nitrobenzene		350	U	UG/KG	8.75E-03	
121-82-4	RDX		700	U	UG/KG	7.00E-03	
479-45-8	Tetryl		1100	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	15100		MG/KG		
7440-36-0	Antimony	0.83	0.84	U	MG/KG	1.68E-01	
7440-38-2	Arsenic	13.5	8.8		MG/KG	9.78E-01	
7440-39-3	Barium	195	197		MG/KG	3.94E-01	
7440-41-7	Beryllium	0.76	0.73		MG/KG	7.30E-02	
7440-42-8	Boron	5.3	1.1	J	MG/KG	2.20E+00	
7440-43-9	Cadmium	0.19	0.88		MG/KG	3.03E-02	
7440-70-2	Calcium	2497	2200		MG/KG		
7440-47-3	Chromium	25.2	16.9		MG/KG	3.38E+00	
7440-48-4	Cobalt	21.7	11.9		MG/KG	5.95E-01	
7440-50-8	Copper	11.3	17.5		MG/KG	5.65E-01	
7439-89-6	Iron	19306	20300		MG/KG	1.02E+02	
7439-92-1	Lead	23.4	82.8		MG/KG	1.91E-01	
7439-95-4	Magnesium	1552	2190		MG/KG		
7439-96-5	Manganese	3640	1770		MG/KG	1.77E+01	
7439-97-6	Mercury	0.06	0.11	J	MG/KG	1.57E-02	YES
7440-02-0	Nickel	18.9	13.8		MG/KG	4.60E-01	
2023695	Potassium	625	1220		MG/KG		
7782-49-2	Selenium	2.34	0.68	J	MG/KG	6.80E-01	YES
7440-22-4	Silver	0.58	1.4	U	MG/KG	7.00E-01	
7440-23-5	Sodium	170	54.4	J	MG/KG		
7440-28-0	Thallium	0.41	1.4	U	MG/KG	1.40E+00	
7440-62-2	Vanadium	47.2	34.7		MG/KG	7.54E-01	
7440-66-6	Zinc	51.4	144		MG/KG	1.20E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 24-6, AUS-0064
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
N-Hexane	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
total Xylenes	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 24-6, AUS-0064
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA

**TABLE 24-6, AUS-0064
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Metals and Inorganics								
Aluminum	NA	NA	NA	NA	NA	NA	No	F
Antimony	NA	NA	NA	NA	NA	NA	Uncertainty	B
Arsenic	NA	NA	NA	NA	NA	NA	Yes	D
Barium	NA	NA	NA	NA	NA	NA	Yes	E
Beryllium	NA	NA	NA	NA	NA	NA	Yes	J
Boron	NA	NA	NA	NA	NA	NA	No	F
Cadmium	NA	NA	NA	NA	NA	NA	Yes	E
Calcium	NA	NA	NA	NA	NA	NA	No	H
Chromium	NA	NA	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	No	F
Lead	NA	NA	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	NA	NA	No	H
Manganese	NA	NA	NA	NA	NA	NA	No	F
Mercury	NA	NA	NA	NA	NA	NA	No	F
Nickel	NA	NA	NA	NA	NA	NA	Yes	D
Potassium	NA	NA	NA	NA	NA	NA	No	H
Selenium	NA	NA	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	NA	NA	No	A
Sodium	NA	NA	NA	NA	NA	NA	No	H
Thallium	NA	NA	NA	NA	NA	NA	No	A
Vanadium	NA	NA	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	NA	NA	No	F
Explosives								
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	No	A
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	No	A

TABLE 24-6, AUS-0064
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	No	C
2-Nitrotoluene (ONT)	NA	NA	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	No	A
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	NA	NA	No	A
HMX	NA	NA	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	NA	NA	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 24-7, AUS-0064
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA
N-Hexane	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA
Tetrachloroethylene (PCE)	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA
total Xylenes	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA
Trichloroethylene (TCE)	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA

TABLE 24-7, AUS-0064
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA
Diethyl phthalate	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA

TABLE 24-7, AUS-0064
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA
Metals and Inorganics						
Aluminum	NA	NA	NA	NA	Uncertainty	I
Antimony	NA	NA	NA	NA	No	A
Arsenic	NA	NA	NA	NA	No	F
Barium	NA	NA	NA	NA	No	F
Beryllium	NA	NA	NA	NA	No	F
Boron	NA	NA	NA	NA	Yes	D
Cadmium	NA	NA	NA	NA	No	F
Calcium	NA	NA	NA	NA	Uncertainty	G,H
Chromium	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	Yes	E
Lead	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	Uncertainty	G,H
Manganese	NA	NA	NA	NA	Yes	D
Mercury	NA	NA	NA	NA	Yes	E
Nickel	NA	NA	NA	NA	No	F
Potassium	NA	NA	NA	NA	Uncertainty	G,H
Selenium	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	No	A
Sodium	NA	NA	NA	NA	Uncertainty	G,H
Thallium	NA	NA	NA	NA	Uncertainty	B
Vanadium	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	Yes	E
Explosives						
1,3,5-Trinitrobenzene	NA	NA	NA	NA	No	A
1,3-Dinitrobenzene	NA	NA	NA	NA	No	A

TABLE 24-7, AUS-0064
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	No	A
2,6-Dinitrotoluene	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	No	A
2-Nitrotoluene (ONT)	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	No	C
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	No	C
HMX	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	No	C

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

AUS-0064-FORMER COC-13

NOTE:

1. SITE MAP NOT AVAILABLE FOR THIS SITE.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-0064-002	Units	Result: 0 - 6 In	Reference Code
Explosives			
All Explosives	UG/KG	ND	
Metals			
Aluminum	MG/KG	11100	
Arsenic	MG/KG	7.9	h1,h5,h7
Barium	MG/KG	197	b1,h5
Beryllium	MG/KG	0.73	
Boron	MG/KG	1.1	e1
Cadmium	MG/KG	0.88	b1,h5
Calcium	MG/KG	2200	
Chromium	MG/KG	13.9	e1,h5
Cobalt	MG/KG	11.9	
Copper	MG/KG	17.5	b1
Iron	MG/KG	16400	e1
Lead	MG/KG	82.8	b1
Magnesium	MG/KG	1500	
Manganese	MG/KG	1770	e1
Mercury	MG/KG	0.11	b1,h5
Nickel	MG/KG	12.7	h5
Potassium	MG/KG	1220	b1
Selenium	MG/KG	0.68	e5,h5
Sodium	MG/KG	54.4	
Vanadium	MG/KG	27.3	
Zinc	MG/KG	144	b1,e1

AUS-0064-001	Units	Result: 2 R	Reference Code
Explosives			
All Explosives	UG/KG	ND	
Metals			
Aluminum	MG/KG	15100	
Arsenic	MG/KG	8.8	h1,h5,h7
Barium	MG/KG	125	h5
Beryllium	MG/KG	0.48	
Boron	MG/KG	0.57	e1
Calcium	MG/KG	1150	
Chromium	MG/KG	16.9	e1,h5
Cobalt	MG/KG	11.4	
Copper	MG/KG	10.9	
Iron	MG/KG	20300	b1,e1
Lead	MG/KG	14.6	
Magnesium	MG/KG	2190	b1
Manganese	MG/KG	745	e1
Mercury	MG/KG	0.056	e5
Nickel	MG/KG	13.8	h5
Potassium	MG/KG	850	b1
Selenium	MG/KG	0.58	e5,h5
Sodium	MG/KG	46.3	
Vanadium	MG/KG	34.7	
Zinc	MG/KG	43.2	

0064-001
⊕
0064-002

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

376300
765600

LEGEND

⊕ HAND AUGER LOCATION



PA/SI REPORT-AUS OU
CRAB ORCHARD NWR
MARION, ILLINOIS

PROJECT NO.
2320000026.00

URS

DRN. BY: djd 12/2/00
DSGN. BY: are
CHKD. BY: mch/cmw

AUS-0064 Sample Locations and
Detections in Soils

FIG. NO.
24-1

See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC Area. AUS-0065 is located at the northeast corner of the intersection of the COC Area Road and another unnamed roadway that leads northward towards Crab Orchard Lake (Figure 22-1).

AUS-0065 is made up of foundations that are located to the northeast of former COC-1 and it has suspect debris at the site.

AUS Original Site Designations

AUS-0065 is one of the original AUS OU sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS).

25.1 HISTORIC SEARCH INFORMATION

25.1.1 Site Description

AUS-0065 was originally described as “foundations northeast of COC-1.” Figure 25-1 is a site map of AUS-0065.

25.1.2 Operational History and Waste Characteristics

There have been no known industrial lessees of this property.

25.1.3 AUS-0065 Previous Sampling Results

USEPA Sampling, 1998

In 1998, the United States Environmental Protection Agency (USEPA) collected two samples (65-01 and 65-02) and one duplicate sample (65-02 DUP) at AUS-0065. Sample locations are shown in Figures 25-1 and 25-2. The results for all detected constituents are listed in Table 25-1A. The following SVOC compounds were detected above USEPA (Soil Screening Levels) SSLs: carbazole (0.23 mg/kg), benzo[a]anthracene (0.75 mg/kg), benzo[b]fluoranthene (1.1 mg/kg), benzo[a]pyrene (0.62 mg/kg), and dibenz[a,h]anthracene (0.11 mg/kg). Mercury (0.23 mg/kg) exceeded USEPA SSL and Refuge background level.¹ Zinc (150 mg/kg) exceeded New Dutchlist Soil Optimum Levels (DSOL) and the Refuge background level.

25.1.4 Observations During Site Visit

The site was observed to have two visible concrete foundations falling into depressions that partially surround the foundations. One of the depressions contained water. Numerous soil mounds were observed. A brick structure resembling a well was observed on the eastern side of the site. The site was well vegetated with trees and grasses. A fence to the south separates the COC Area Road from the site.

¹ See Table 1-11 of this report for Refuge background soil values used for the PA.

25.1.5 Recommendations Based on Preliminary Assessment

Site AUS-0065 was retained in the Site Investigation (SI) primarily because of suspect debris on site, and because the 1998 USEPA analytical results exceeded Preliminary Assessment (PA) screening criteria.

25.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0065 on May 8, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)² for the AUS OU PA/SI. AUS OU SI sample locations are shown on Figures 25-1 and 25-2. Survey coordinates for all sample locations in AUS-0065 are listed in Table 25-1. Table 25-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples.

25.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted.

Depressions

Six soil samples were collected from the three major depressions that were identified in this area during the site reconnaissance (Figure 25-1). Samples 0065-001 and 0065-005 were collected from within the depression located east of the foundation on the west side of the site. Samples 0065-003 and 0065-007 were collected from the depression located south of the east foundation. Two samples were collected from the third depression located to the northeast of the west foundation (0065-002 and 0065-006). The third depression also contained water during the site reconnaissance.

Mounded Areas

There were numerous mounded areas present on site (Figure 25-1). Three samples were collected from mounded areas: 0065-004, 0065-008 and 0065-009.

25.2.2 Field Results**25.2.2.1 Site Conditions**

The majority of the site is wooded. It is bounded to the north and east by a grassy field, and to the south by a fence line.

25.2.2.1.1 *Geologic Conditions*

There were no test pits or monitoring wells installed at AUS-0065. The soil from hand auger borings, which extended to a maximum depth of 4 feet (ft), was described as silty clay fill. The soil at locations 0065-008 and 0065-009 (mounded areas) included 2-inch gravel.

² U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

25.2.2.1.2 Hydrogeologic Conditions

No hydrogeological information is available for this site.

25.2.2.1.3 Hydrologic Conditions

As shown on Figure 25-1, there are three depressions in the middle of the site. Only one of the depressions contained water at the time of the SI.

25.2.2.2 Chemical Results

Table 25-3 lists the chemicals detected in AUS-0065 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report.

Sample results are presented on the following figures:

- Figure 25-1 – organic results for soil samples, and
- Figure 25-2 – inorganic results for soil samples at this site.

25.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 25-4 and 25-5 as follows:

- Table 25-4--human health risk screening for soils, and
- Table 25-5--ecological risk screening for soils.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0065. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level “cancer risk” is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a “U” qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 25-1 and 25-2, the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are

qualified as estimated (coded with “J”) are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 25-6 (human health risk) and 25-7 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 25-6) and COPECs (Table 25-7) are shaded in the tables.

25.3.1 Human Health Risk

25.3.1.1 Soil

Human health screening results for soil samples are presented in Table 25-4. For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

25.3.2 Ecological Risk

25.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 25-5. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)³
- Environment Canada (1995)⁴
- Talmage *et al.* (1999)⁵
- Efrogmson *et al.* (1997a, 1997b)⁶

³ USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

⁴ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

⁵ Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

⁶ Efrogmson, 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, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efrogmson, 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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

- CCME (1999)⁷
- MHSPE (1994)⁸
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)⁹ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

25.4 SCIENTIFIC MANAGEMENT DECISION POINT

A Remedial Investigation (RI) is recommended for Site AUS-0065, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not necessarily be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 25-6; and on the COPEC list, Table 25-7. The COPCs in this category include antimony, arsenic, barium, chromium, nickel and selenium in soil. COPECs that were detected below Refuge background levels include arsenic, chromium, iron, manganese and selenium in soil. Soil was the only media investigated. These chemicals may later be included in the RI for other reasons, but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs on Tables 25-6 and 25-7 should be investigated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 25-8.

Note that a number of the human health COPCs exceed migration to groundwater screening criteria. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site, media, and contaminants in addition to those

⁷ Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

⁸ Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

⁹ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

addressed in this study may warrant investigation in the RI. These issues will be addressed in the Work Plan for the RI.

**TABLE 25-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0065**

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0065-001	377480.8	769125.3	448.00	NA	
0065-002	377497.5	769148.3	449.39	NA	
0065-003	377477.8	769222.3	452.27	NA	
0065-004	377464.8	769214.0	455.82	NA	
0065-005	377486.0	769138.6	445.73	NA	
0065-006	377502.7	769160.0	448.49	NA	
0065-007	377477.7	769193.5	447.93	NA	
0065-008	377464.0	769170.5	455.53	NA	
0065-009	377477.9	769167.2	453.92	NA	

Sheet 1 of 1

NA = Not Applicable

TABLE 25-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
65-01	2-Methylnaphthalene	0.13J
	Bis(2-Ethylhexyl)phthalate	0.14J
	Dibenzofuran	0.11J
	Phenanthrene	0.096J
	Aluminum	7,700
	Barium	72
	Beryllium	0.5
	Calcium	66,000
	Chromium	12
	Cobalt	6.6
	Copper	7.8
	Iron	14,000
	Magnesium	5,800
	Manganese	480
	Mercury	0.04
	Nickel	13
	Potassium	1,200
	Vanadium	23
	Zinc	49
	65-02	2-Methylnaphthalene
Acenaphthylene		0.24J
Anthracene		0.17J
Benzo[a]anthracene		0.75
Benzo[a]pyrene		0.62
Benzo[b]fluoranthene		1.1
Benzo[k]fluoranthene		0.35J
Carbazole		0.23J
Chrysene		1.2
Dibenzofuran		0.19J
Fluorene		0.32J
Fluoranthene		2.1
Phenanthrene		2.6
Pyrene		1.4
Aluminum		11,000
Barium		110
Beryllium		0.6
Calcium		3,200
Chromium		15
Cobalt		12
Copper		11
Iron		18,000
Lead		21
Magnesium		1,700
Manganese		970
Nickel		14
Potassium		1,200
Silver		1.3
Vanadium		27

Sheet 1 of 2

TABLE 25-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
65-02	Zinc	140
65-02 DUP	Benzo[a]anthracene	0.24J
	Benzo[b]fluoranthene	0.25J
	Chrysene	0.33J
	Fluoranthene	0.59J
	Phenanthrene	0.66J
	Pyrene	0.47J
	Aluminum	13,000
	Barium	120
	Beryllium	0.6
	Calcium	3,500
	Chromium	17
	Cobalt	11
	Copper	12
	Iron	18,000
	Lead	21
	Magnesium	2,000
	Manganese	960
	Mercury	0.23
	Nickel	15
	Potassium	1,500
Silver	1.2	
Vanadium	32	
Zinc	150	

Sheet 2 of 2

mg/kg = milligrams per kilogram
J = Estimated

TABLE 25-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0065

Soil
AUS-0065-001
AUS-0065-002
AUS-0065-003
AUS-0065-004
AUS-0065-005
AUS-0065-006
AUS-0065-007
AUS-0065-008
AUS-0065-009

Sheet 1 of 1

TABLE 25-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2,4-Dimethylphenol	1/12	1,100 ug/kg
2-Methylnaphthalene	9/12	45 ug/kg to 3,500 ug/kg
2-Methylphenol (o-Cresol)	1/12	760 ug/kg
4-Methylphenol (p-Cresol)	3/12	71 ug/kg to 2,600 ug/kg
Acenaphthene	1/12	850 ug/kg
Acenaphthylene	4/12	78 ug/kg to 7,200 ug/kg
Anthracene	4/12	49 ug/kg to 5,900 ug/kg
Benzo(a)Anthracene	6/12	47 ug/kg to 11,000 ug/kg
Benzo(a)Pyrene	6/12	56 ug/kg to 12,000 ug/kg
Benzo(b)Fluoranthene	7/12	52 ug/kg to 11,000 ug/kg
Benzo(g,h,i)Perylene	6/12	67 ug/kg to 12,000 ug/kg
Benzo(k)Fluoranthene	6/12	51 ug/kg to 9,200 ug/kg
Bis(2-ethylhexyl) Phthalate	1/12	1,400 ug/kg
Carbazole	3/12	65 ug/kg of 5,600 ug/kg
Chrysene	10/12	57 ug/kg to 14,000 ug/kg
Dibenz(a,h)Anthracene	3/12	120 ug/kg to 4,700 ug/kg
Dibenzofuran	8/12	42 ug/kg to 3,100 ug/kg
Fluoranthene	11/12	42 ug/kg to 21,000 ug/kg
Fluorene	2/12	180 ug/kg to 5,100 ug/kg
Indeno(1,2,3-c,d)Pyrene	5/12	88 ug/kg to 9,900 ug/kg
Naphthalene	5/12	120 ug/kg to 4,700 ug/kg
Phenanthrene	11/12	93 ug/kg to 27,000 ug/kg
Phenol	1/12	940 ug/kg
Pyrene	11/12	44 ug/kg to 17,000 ug/kg
Explosives		
4-Nitrotoluene (PNT)	1/7	1700 ug/kg
Other Inorganics		
Total Organic Carbon	1/1	27,900 mg/kg
Metals		
Aluminum	12/12	6,480 mg/kg to 12,700 mg/kg
Antimony	8/12	0.22 mg/kg to 0.76 mg/kg
Arsenic	12/12	4.6 mg/kg to 9.7 mg/kg
Barium	12/12	46 mg/kg to 164 mg/kg
Beryllium	12/12	0.32 mg/kg to 0.86 mg/kg
Boron	12/12	1.6 mg/kg to 11.7 mg/kg
Cadmium	4/12	0.69 mg/kg to 1.1 mg/kg
Calcium	12/12	2,320 mg/kg to 106,000 mg/kg
Chromium	12/12	9.2 mg/kg to 20.6 mg/kg
Cobalt	12/12	3.9 mg/kg to 11.6 mg/kg
Copper	12/12	6.8 mg/kg to 33.4 mg/kg
Iron	12/12	11,200 mg/kg to 19,300 mg/kg
Lead	12/12	13.5 mg/kg to 212 mg/kg

Sheet 1 of 2

TABLE 25-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Magnesium	12/12	1,170 mg/kg to 11,100 mg/kg
Manganese	12/12	295 mg/kg to 1,140 mg/kg
Mercury	12/12	0.023 mg/kg to 0.47 mg/kg
Nickel	12/12	9.5 mg/kg to 14.1 mg/kg
Potassium	12/12	690 mg/kg to 1,340 mg/kg
Selenium	9/12	0.47 mg/kg to 1.4 mg/kg
Sodium	12/12	49.4 mg/kg to 143 mg/kg
Vanadium	12/12	17 mg/kg to 37.9 mg/kg
Zinc	12/12	42.5 mg/kg to 351 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

**TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	570	U	UG/KG			7.48E-05	1.90E+00
95-50-1	1,2-Dichlorobenzene	570	U	UG/KG			1.72E-04	6.33E-01
541-73-1	1,3-Dichlorobenzene	570	U	UG/KG			1.10E-02	
106-46-7	1,4-Dichlorobenzene	570	U	UG/KG		7.01E-08	2.97E-04	5.70E+00
95-95-4	2,4,5-Trichlorophenol	2900	U	UG/KG			3.29E-05	2.90E-01
88-06-2	2,4,6-Trichlorophenol	570	U	UG/KG		2.54E-09		7.13E+01
120-83-2	2,4-Dichlorophenol	570	U	UG/KG			2.16E-04	1.14E+01
105-67-9	2,4-Dimethylphenol	1100		UG/KG			6.24E-05	2.75E+00
51-28-5	2,4-Dinitrophenol	2900	U	UG/KG			1.65E-03	2.90E+02
91-58-7	2-Chloronaphthalene	570	U	UG/KG			2.09E-05	
95-57-8	2-Chlorophenol	570	U	UG/KG			2.36E-03	2.85E+00
91-57-6	2-Methylnaphthalene	3500	J	UG/KG			6.45E-05	1.75E-02
95-48-7	2-Methylphenol	760		UG/KG			1.73E-05	9.50E-01
88-74-4	2-Nitroaniline	2900	U	UG/KG			5.76E-02	
88-75-5	2-Nitrophenol	570	U	UG/KG			8.09E-05	
91-94-1	3,3'-Dichlorobenzidine	570	U	UG/KG		1.04E-07		1.90E+03
99-09-2	3-Nitroaniline	2900	U	UG/KG			5.76E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2900	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	570	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	570	U	UG/KG			1.29E-05	
106-47-8	4-Chloroaniline	1100	U	UG/KG			3.12E-04	3.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	570	U	UG/KG				
106-44-5	4-Methylphenol	2600	J	UG/KG			5.90E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
100-01-6	4-Nitroaniline	2900	U	UG/KG			5.76E-02	
100-02-7	4-Nitrophenol	2900	U	UG/KG			4.12E-04	
83-32-9	Acenaphthene	850		UG/KG			2.22E-05	2.83E-02
208-96-8	Acenaphthylene	7200		UG/KG			1.33E-04	3.60E-02
120-12-7	Anthracene	5900		UG/KG			1.51E-05	9.83E-03
56-55-3	Benzo(a)anthracene	11000		UG/KG		3.81E-06		1.38E+02
50-32-8	Benzo(a)pyrene	12000		UG/KG		4.16E-05		3.00E+01
205-99-2	Benzo(b)fluoranthene	11000		UG/KG		3.81E-06		5.50E+01
191-24-2	Benzo(g,h,i)perylene	12000		UG/KG			2.21E-04	6.00E-02
207-08-9	Benzo(k)fluoranthene	9200		UG/KG		3.19E-07		4.60E+00
111-91-1	bis(2-Chloroethoxy)methane	570	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	570	U	UG/KG		9.20E-07		2.85E+04
108-60-1	bis(2-Chloroisopropyl) ether	570	U	UG/KG		7.06E-08	1.34E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1400		UG/KG		7.95E-09	7.95E-05	
85-68-7	Butyl benzyl phthalate	570	U	UG/KG			3.24E-06	7.13E-04
86-74-8	Carbazole	5600		UG/KG		4.54E-08		1.87E+02
218-01-9	Chrysene	14000		UG/KG		4.85E-08		1.75E+00
84-74-2	Di-n-butyl phthalate	570	U	UG/KG			6.47E-06	1.90E-03
117-84-0	Di-n-octyl phthalate	570	U	UG/KG			3.24E-05	5.70E-05
53-70-3	Dibenz(a,h)anthracene	4700		UG/KG		1.63E-05		5.88E+01
132-64-9	Dibenzofuran	3100		UG/KG			6.12E-04	
84-66-2	Diethyl phthalate	570	U	UG/KG			8.09E-07	
131-11-3	Dimethyl phthalate	570	U	UG/KG			6.47E-08	
206-44-0	Fluoranthene	21000		UG/KG			6.98E-04	1.05E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 25-4

HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
86-73-7	Fluorene	5100		UG/KG			1.54E-04	1.70E-01
118-74-1	Hexachlorobenzene	570	U	UG/KG		3.70E-07	8.09E-04	5.70E+00
87-68-3	Hexachlorobutadiene	570	U	UG/KG		1.80E-08	3.24E-03	5.70E+00
77-47-4	Hexachlorocyclopentadiene	570	U	UG/KG			9.67E-05	2.85E-02
67-72-1	Hexachloroethane	570	U	UG/KG		3.24E-09	6.47E-04	2.85E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	9900		UG/KG		3.43E-06		1.41E+01
78-59-1	Isophorone	570	U	UG/KG		2.20E-10	3.24E-06	1.90E+01
621-64-7	N-Nitroso-di-n-propylamine	570	U	UG/KG		1.62E-06		2.85E+05
86-30-6	N-Nitrosodiphenylamine	570	U	UG/KG		1.13E-09		9.50E+00
91-20-3	Naphthalene	4700		UG/KG			2.49E-02	1.18E+00
87-86-5	Pentachlorophenol	2900	U	UG/KG		2.61E-07	2.03E-04	2.90E+03
85-01-8	Phenanthrene	27000		UG/KG			4.98E-04	1.35E-01
108-95-2	Phenol	940		UG/KG			1.78E-06	1.88E-01
129-00-0	Pyrene	17000		UG/KG			3.14E-04	8.50E-02
Explosives								
99-35-4	1,3,5-Trinitrobenzene	430	U	UG/KG			1.63E-05	
99-65-0	1,3-Dinitrobenzene	430	U	UG/KG			4.88E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	860	U	UG/KG		1.05E-08	1.95E-03	
121-14-2	2,4-Dinitrotoluene	430	U	UG/KG			2.44E-04	1.08E+04
606-20-2	2,6-Dinitrotoluene	570	U	UG/KG			6.47E-04	1.90E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	860	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	860	U	UG/KG				
99-08-1	3-Nitrotoluene	860	U	UG/KG			4.23E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	860	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
99-99-0	4-Nitrotoluene (PNT)	1700		UG/KG			8.37E-04	
2691-41-0	HMX	860	U	UG/KG			1.95E-05	
98-95-3	Nitrobenzene	430	U	UG/KG			3.76E-03	
121-82-4	RDX	860	U	UG/KG		3.84E-08	3.25E-04	
479-45-8	Tetryl	1300	U	UG/KG			1.48E-04	
Metals								
7429-90-5	Aluminum	12700		MG/KG	4.41E-01		7.57E-03	
7440-36-0	Antimony	0.76	J	MG/KG	9.16E-01		9.30E-04	2.53E+00
7440-38-2	Arsenic	9.7		MG/KG	7.19E-01	3.56E-06	2.21E-02	9.70E+00
7440-39-3	Barium	164		MG/KG	8.41E-01		1.32E-03	2.05E+00
7440-41-7	Beryllium	0.86		MG/KG	1.13E+00	3.84E-10	2.33E-04	2.87E-01
7440-42-8	Boron	11.7	J	MG/KG	2.21E+00		1.48E-04	
7440-43-9	Cadmium	1.3		MG/KG	6.84E+00	4.35E-10	1.60E-03	3.25E+00
7440-70-2	Calcium	106000		MG/KG	4.25E+01			
7440-47-3	Chromium	20.6		MG/KG	8.17E-01	4.59E-08		1.03E+01
7440-48-4	Cobalt	11.6		MG/KG	5.35E-01		9.46E-05	
7440-50-8	Copper	33.4		MG/KG	2.96E+00		4.40E-04	
7439-89-6	Iron	19300		MG/KG	1.00E+00		3.15E-02	
7439-92-1	Lead	212		MG/KG	9.06E+00			
7439-95-4	Magnesium	11100		MG/KG	7.15E+00			
7439-96-5	Manganese	1140		MG/KG	3.13E-01		3.53E-02	
7439-97-6	Mercury	0.48		MG/KG	8.00E+00			
7440-02-0	Nickel	14.1		MG/KG	7.46E-01		3.45E-04	2.01E+00
2023695	Potassium	1340		MG/KG	2.14E+00			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 25-4

HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7782-49-2	Selenium	1.4		MG/KG	5.98E-01		1.37E-04	4.67E+00
7440-22-4	Silver	1.7	U	MG/KG	2.93E+00		1.66E-04	8.50E-01
7440-23-5	Sodium	143		MG/KG	8.41E-01			
7440-28-0	Thallium	3.2	U	MG/KG	7.80E+00		2.24E-05	
7440-62-2	Vanadium	37.9		MG/KG	8.03E-01		2.65E-03	1.26E-01
7440-66-6	Zinc	351		MG/KG	6.83E+00		5.73E-04	5.85E-01
Other Parameters								
TOC	TOC	27900		MG/KG	8.89E-01			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	570	U	UG/KG	2.85E-05	2.85E-04	1.14E-01
95-50-1	1,2-Dichlorobenzene	570	U	UG/KG	3.17E-06	3.17E-05	3.35E-02
541-73-1	1,3-Dichlorobenzene	570	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	570	U	UG/KG			2.85E-01
95-95-4	2,4,5-Trichlorophenol	2900	U	UG/KG	1.45E-05	1.45E-05	1.07E-02
88-06-2	2,4,6-Trichlorophenol	570	U	UG/KG	1.10E-03	5.18E-05	2.85E+00
120-83-2	2,4-Dichlorophenol	570	U	UG/KG	9.34E-05	9.34E-04	5.70E-01
105-67-9	2,4-Dimethylphenol	1100		UG/KG	2.68E-05	2.68E-05	1.22E-01
51-28-5	2,4-Dinitrophenol	2900	U	UG/KG	7.07E-04	7.07E-03	1.45E+01
91-58-7	2-Chloronaphthalene	570	U	UG/KG			
95-57-8	2-Chlorophenol	570	U	UG/KG	5.70E-05	5.70E-05	1.43E-01
91-57-6	2-Methylnaphthalene	3500	J	UG/KG	5.74E-05	5.74E-05	8.33E-04
95-48-7	2-Methylphenol	760		UG/KG	7.60E-06	7.60E-06	5.07E-02
88-74-4	2-Nitroaniline	2900	U	UG/KG			
88-75-5	2-Nitrophenol	570	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	570	U	UG/KG	4.38E-02	2.04E-03	8.14E+01
99-09-2	3-Nitroaniline	2900	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2900	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	570	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	570	U	UG/KG			
106-47-8	4-Chloroaniline	1100	U	UG/KG	1.34E-04	1.34E-03	1.57E+00
7005-72-3	4-Chlorophenyl phenyl ether	570	U	UG/KG			
106-44-5	4-Methylphenol	2600	J	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
100-01-6	4-Nitroaniline	2900	U	UG/KG			
100-02-7	4-Nitrophenol	2900	U	UG/KG			
83-32-9	Acenaphthene	850		UG/KG	7.08E-06	7.08E-06	1.49E-03
208-96-8	Acenaphthylene	7200		UG/KG	1.18E-04	1.18E-04	1.71E-03
120-12-7	Anthracene	5900		UG/KG	9.67E-06	9.67E-06	4.92E-04
56-55-3	Benzo(a)anthracene	11000		UG/KG	1.38E+00	6.47E-02	5.50E+00
50-32-8	Benzo(a)pyrene	12000		UG/KG	1.50E+01	7.06E-01	1.50E+00
205-99-2	Benzo(b)fluoranthene	11000		UG/KG	1.38E+00	6.47E-02	2.20E+00
191-24-2	Benzo(g,h,i)perylene	12000		UG/KG	1.97E-04	1.97E-04	2.86E-03
207-08-9	Benzo(k)fluoranthene	9200		UG/KG	1.18E-01	5.41E-03	1.88E-01
111-91-1	bis(2-Chloroethoxy)methane	570	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	570	U	UG/KG	1.14E-01	7.60E-03	1.43E+03
108-60-1	bis(2-Chloroisopropyl) ether	570	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1400		UG/KG	3.41E-03	3.41E-04	3.89E-04
85-68-7	Butyl benzyl phthalate	570	U	UG/KG	1.39E-06	1.39E-06	6.13E-04
86-74-8	Carbazole	5600		UG/KG	1.93E-02	9.03E-04	9.33E+00
218-01-9	Chrysene	14000		UG/KG	1.79E-02	8.24E-04	8.75E-02
84-74-2	Di-n-butyl phthalate	570	U	UG/KG	2.85E-06	2.85E-06	2.48E-04
117-84-0	Di-n-octyl phthalate	570	U	UG/KG	1.39E-05	1.39E-04	5.70E-05
53-70-3	Dibenz(a,h)anthracene	4700		UG/KG	5.88E+00	2.76E-01	2.35E+00
132-64-9	Dibenzofuran	3100		UG/KG			
84-66-2	Diethyl phthalate	570	U	UG/KG	5.70E-07	5.70E-07	1.21E-03
131-11-3	Dimethyl phthalate	570	U	UG/KG			
206-44-0	Fluoranthene	21000		UG/KG	2.56E-04	2.56E-04	4.88E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
 J = Estimated U = Nondetect

**TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
86-73-7	Fluorene	5100		UG/KG	6.22E-05	6.22E-05	9.11E-03
118-74-1	Hexachlorobenzene	570	U	UG/KG	1.43E-01	7.31E-03	2.85E-01
87-68-3	Hexachlorobutadiene	570	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	570	U	UG/KG	4.07E-05	4.07E-05	1.43E-03
67-72-1	Hexachloroethane	570	U	UG/KG	2.85E-04	2.85E-04	1.14E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	9900		UG/KG	1.24E+00	5.82E-02	7.07E-01
78-59-1	Isophorone	570	U	UG/KG	1.39E-06	1.39E-06	7.13E-02
621-64-7	N-Nitroso-di-n-propylamine	570	U	UG/KG	7.13E-01	3.17E-02	1.14E+04
86-30-6	N-Nitrosodiphenylamine	570	U	UG/KG	4.75E-04	2.28E-05	5.70E-01
91-20-3	Naphthalene	4700		UG/KG	5.73E-05	5.73E-04	5.60E-02
87-86-5	Pentachlorophenol	2900	U	UG/KG	1.21E-01	5.58E-03	9.67E+01
85-01-8	Phenanthrene	27000		UG/KG	4.43E-04	4.43E-04	6.43E-03
108-95-2	Phenol	940		UG/KG	9.40E-07	7.83E-06	9.40E-03
129-00-0	Pyrene	17000		UG/KG	2.79E-04	2.79E-04	4.05E-03
Explosives							
99-35-4	1,3,5-Trinitrobenzene	430	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	430	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	860	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	430	U	UG/KG	5.12E-02	2.39E-03	5.38E+02
606-20-2	2,6-Dinitrotoluene	570	U	UG/KG	6.79E-02	3.17E-03	8.14E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	860	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	860	U	UG/KG			
99-08-1	3-Nitrotoluene	860	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	860	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
99-99-0	4-Nitrotoluene (PNT)	1700		UG/KG			
2691-41-0	HMX	860	U	UG/KG			
98-95-3	Nitrobenzene	430	U	UG/KG	4.30E-04	4.30E-04	4.30E+00
121-82-4	RDX	860	U	UG/KG			
479-45-8	Tetryl	1300	U	UG/KG			
Metals							
7429-90-5	Aluminum	12700		MG/KG			
7440-36-0	Antimony	0.76	J	MG/KG	9.27E-04	9.27E-03	1.52E-01
7440-38-2	Arsenic	9.7		MG/KG	3.23E+00	1.59E-01	3.46E-01
7440-39-3	Barium	164		MG/KG	1.17E-03	1.17E-02	1.37E-01
7440-41-7	Beryllium	0.86		MG/KG	8.60E-01	2.97E-02	1.30E-01
7440-42-8	Boron	11.7	J	MG/KG	6.50E-05	6.50E-04	
7440-43-9	Cadmium	1.3		MG/KG	6.50E-04	6.50E-03	3.51E-01
7440-70-2	Calcium	106000		MG/KG			
7440-47-3	Chromium	20.6		MG/KG	2.06E-03	5.02E-03	7.36E-01
7440-48-4	Cobalt	11.6		MG/KG	9.67E-05	9.67E-04	
7440-50-8	Copper	33.4		MG/KG	4.07E-04	4.07E-03	3.04E-03
7439-89-6	Iron	19300		MG/KG			
7439-92-1	Lead	212		MG/KG	5.30E-01	5.30E-01	
7439-95-4	Magnesium	11100		MG/KG			
7439-96-5	Manganese	1140		MG/KG	1.19E-02	1.19E-01	
7439-97-6	Mercury	0.48		MG/KG	7.87E-04	7.87E-03	3.20E+00
7440-02-0	Nickel	14.1		MG/KG	3.44E-04	3.44E-03	1.86E-01
2023695	Potassium	1340		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7782-49-2	Selenium	1.4		MG/KG	1.40E-04	1.40E-03	5.83E-01
7440-22-4	Silver	1.7	U	MG/KG	1.70E-04	1.70E-03	1.13E+00
7440-23-5	Sodium	143		MG/KG			
7440-28-0	Thallium	3.2	U	MG/KG	2.00E-02	2.00E-02	1.33E+00
7440-62-2	Vanadium	37.9		MG/KG	2.71E-03	2.71E-02	3.87E-02
7440-66-6	Zinc	351		MG/KG	5.75E-04	5.75E-03	9.75E-02
Other Parameters							
TOC	TOC	27900		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		570	U	UG/KG	2.85E-02	
95-50-1	1,2-Dichlorobenzene		570	U	UG/KG	1.93E-01	
541-73-1	1,3-Dichlorobenzene		570	U	UG/KG	1.51E-02	
106-46-7	1,4-Dichlorobenzene		570	U	UG/KG	2.85E-02	
95-95-4	2,4,5-Trichlorophenol		2900	U	UG/KG	7.25E-01	
88-06-2	2,4,6-Trichlorophenol		570	U	UG/KG	5.70E-02	
120-83-2	2,4-Dichlorophenol		570	U	UG/KG	6.51E-03	
105-67-9	2,4-Dimethylphenol		1100		UG/KG	1.10E+02	
51-28-5	2,4-Dinitrophenol		2900	U	UG/KG	1.45E-01	
91-58-7	2-Chloronaphthalene		570	U	UG/KG	4.68E+01	
95-57-8	2-Chlorophenol		570	U	UG/KG	2.35E+00	
91-57-6	2-Methylnaphthalene		3500	J	UG/KG	1.08E+00	YES
95-48-7	2-Methylphenol		760		UG/KG	1.88E-02	
88-74-4	2-Nitroaniline		2900	U	UG/KG	3.91E-02	
88-75-5	2-Nitrophenol		570	U	UG/KG	3.56E-01	
91-94-1	3,3'-Dichlorobenzidine		570	U	UG/KG	8.82E-01	
99-09-2	3-Nitroaniline		2900	U	UG/KG	9.18E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2900	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		570	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		570	U	UG/KG	7.17E-02	
106-47-8	4-Chloroaniline		1100	U	UG/KG	1.00E+00	
7005-72-3	4-Chlorophenyl phenyl ether		570	U	UG/KG		
106-44-5	4-Methylphenol		2600	J	UG/KG	1.60E-02	
100-01-6	4-Nitroaniline		2900	U	UG/KG	1.32E-01	
100-02-7	4-Nitrophenol		2900	U	UG/KG	4.14E-01	
83-32-9	Acenaphthene		850		UG/KG	1.25E-03	YES
208-96-8	Acenaphthylene		7200		UG/KG	1.05E-02	
120-12-7	Anthracene		5900		UG/KG	3.99E-03	YES
56-55-3	Benzo(a)anthracene		11000		UG/KG	2.11E+00	YES
50-32-8	Benzo(a)pyrene		12000		UG/KG	2.73E-03	YES
205-99-2	Benzo(b)fluoranthene		11000		UG/KG	1.84E-01	YES
191-24-2	Benzo(g,h,i)perylene		12000		UG/KG	1.01E-01	YES
207-08-9	Benzo(k)fluoranthene		9200		UG/KG	1.54E-01	YES
111-91-1	bis(2-Chloroethoxy)methane		570	U	UG/KG	1.88E+00	
111-44-4	bis(2-Chloroethyl) ether		570	U	UG/KG	2.41E-02	
108-60-1	bis(2-Chloroisopropyl) ether		570	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1400		UG/KG	1.51E+00	YES
85-68-7	Butyl benzyl phthalate		570	U	UG/KG	2.39E+00	
86-74-8	Carbazole		5600		UG/KG		YES
218-01-9	Chrysene		14000		UG/KG	2.96E+00	YES
84-74-2	Di-n-butyl phthalate		570	U	UG/KG	2.85E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
117-84-0	Di-n-octyl phthalate		570	U	UG/KG	8.04E-04	
53-70-3	Dibenz(a,h)anthracene		4700		UG/KG	2.55E-01	YES
132-64-9	Dibenzofuran		3100		UG/KG		YES
84-66-2	Diethyl phthalate		570	U	UG/KG	5.70E-03	
131-11-3	Dimethyl phthalate		570	U	UG/KG	2.85E-03	
206-44-0	Fluoranthene		21000		UG/KG	1.72E-01	YES
86-73-7	Fluorene		5100		UG/KG	1.70E-01	YES
118-74-1	Hexachlorobenzene		570	U	UG/KG	5.70E-04	
87-68-3	Hexachlorobutadiene		570	U	UG/KG	1.43E+01	
77-47-4	Hexachlorocyclopentadiene		570	U	UG/KG	5.70E-02	
67-72-1	Hexachloroethane		570	U	UG/KG	9.56E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		9900		UG/KG	9.08E-02	YES
78-59-1	Isophorone		570	U	UG/KG	4.10E-03	
621-64-7	N-Nitroso-di-n-propylamine		570	U	UG/KG	1.05E+00	
86-30-6	N-Nitrosodiphenylamine		570	U	UG/KG	2.85E-02	
91-20-3	Naphthalene		4700		UG/KG	1.89E-02	
87-86-5	Pentachlorophenol		2900	U	UG/KG	4.83E-01	
85-01-8	Phenanthrene		27000		UG/KG	5.91E-01	YES
108-95-2	Phenol		940		UG/KG	2.35E-02	
129-00-0	Pyrene		17000		UG/KG	2.17E-01	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		430	U	UG/KG	1.14E+00	
99-65-0	1,3-Dinitrobenzene		430	U	UG/KG	6.57E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		860	U	UG/KG	2.87E-02	
121-14-2	2,4-Dinitrotoluene		430	U	UG/KG	3.36E-01	
606-20-2	2,6-Dinitrotoluene		570	U	UG/KG	1.74E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		860	U	UG/KG	1.08E-02	
88-72-2	2-Nitrotoluene (ONT)		860	U	UG/KG		
99-08-1	3-Nitrotoluene		860	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		860	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		1700		UG/KG		
2691-41-0	HMX		860	U	UG/KG	3.44E-02	
98-95-3	Nitrobenzene		430	U	UG/KG	1.08E-02	
121-82-4	RDX		860	U	UG/KG	8.60E-03	
479-45-8	Tetryl		1300	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	12700		MG/KG		
7440-36-0	Antimony	0.83	0.76	J	MG/KG	1.52E-01	
7440-38-2	Arsenic	13.5	9.7		MG/KG	1.08E+00	
7440-39-3	Barium	195	164		MG/KG	3.28E-01	
7440-41-7	Beryllium	0.76	0.86		MG/KG	8.60E-02	
7440-42-8	Boron	5.3	11.7	J	MG/KG	2.34E+01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0065**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-43-9	Cadmium	0.19	1.3		MG/KG	4.48E-02	
7440-70-2	Calcium	2497	106000		MG/KG		
7440-47-3	Chromium	25.2	20.6		MG/KG	4.12E+00	
7440-48-4	Cobalt	21.7	11.6		MG/KG	5.80E-01	
7440-50-8	Copper	11.3	33.4		MG/KG	1.08E+00	
7439-89-6	Iron	19306	19300		MG/KG	9.65E+01	
7439-92-1	Lead	23.4	212		MG/KG	4.90E-01	
7439-95-4	Magnesium	1552	11100		MG/KG		
7439-96-5	Manganese	3640	1140		MG/KG	1.14E+01	
7439-97-6	Mercury	0.06	0.48		MG/KG	6.86E-02	YES
7440-02-0	Nickel	18.9	14.1		MG/KG	4.70E-01	
2023695	Potassium	625	1340		MG/KG		
7782-49-2	Selenium	2.34	1.4		MG/KG	1.40E+00	YES
7440-22-4	Silver	0.58	1.7	U	MG/KG	8.50E-01	
7440-23-5	Sodium	170	143		MG/KG		
7440-28-0	Thallium	0.41	3.2	U	MG/KG	3.20E+00	
7440-62-2	Vanadium	47.2	37.9		MG/KG	8.24E-01	
7440-66-6	Zinc	51.4	351		MG/KG	2.93E+00	
Other Parameters							
TOC	TOC	31393	27900		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 25-6, AUS-0065
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
N-Hexane	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethylene (PCE)	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
total Xylenes	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethylene (TCE)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	No	A
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	No	A
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	No	A

TABLE 25-6, AUS-0065
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	Yes	E
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	No	A
2-Chlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	No	F
2-Methylphenol	NA	NA	NA	NA	NA	NA	No	F
2-Nitroaniline	NA	NA	NA	NA	NA	NA	No	A
2-Nitrophenol	NA	NA	NA	NA	NA	NA	No	A
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	Uncertainty	B
3-Nitroaniline	NA	NA	NA	NA	NA	NA	No	A
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	No	C
4-Bromophenyl phenyl ether	NA	NA	NA	NA	NA	NA	No	C
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	No	A
4-Chloroaniline	NA	NA	NA	NA	NA	NA	Uncertainty	B
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA	No	C
4-Methylphenol	NA	NA	NA	NA	NA	NA	No	F
4-Nitroaniline	NA	NA	NA	NA	NA	NA	No	A
4-Nitrophenol	NA	NA	NA	NA	NA	NA	No	A
Acenaphthene	NA	NA	NA	NA	NA	NA	No	F
Acenaphthylenc	NA	NA	NA	NA	NA	NA	No	F
Anthracene	NA	NA	NA	NA	NA	NA	No	F
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	Yes	E
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	Yes	E
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	Yes	E
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	No	F
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	Yes	E
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	No	C
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	Uncertainty	B
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	No	A
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	No	F
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Carbazole	NA	NA	NA	NA	NA	NA	Yes	E
Chrysene	NA	NA	NA	NA	NA	NA	Yes	E
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	Yes	E
Dibenzofuran	NA	NA	NA	NA	NA	NA	No	F
Diethyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Fluoranthene	NA	NA	NA	NA	NA	NA	No	F

**TABLE 25-6, AUS-0065
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	NA	NA	No	F
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	No	A
Hexachloroethane	NA	NA	NA	NA	NA	NA	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	NA	NA	Yes	E
Isophorone	NA	NA	NA	NA	NA	NA	Uncertainty	B
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	Uncertainty	B
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	Uncertainty	B
Naphthalene	NA	NA	NA	NA	NA	NA	Yes	E
Pentachlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
Phenanthrene	NA	NA	NA	NA	NA	NA	No	F
Phenol	NA	NA	NA	NA	NA	NA	No	F
Pyrene	NA	NA	NA	NA	NA	NA	No	F
Metals and Inorganics								
Aluminum	NA	NA	NA	NA	NA	NA	No	F
Antimony	NA	NA	NA	NA	NA	NA	Yes	D
Arsenic	NA	NA	NA	NA	NA	NA	Yes	D
Barium	NA	NA	NA	NA	NA	NA	Yes	D
Beryllium	NA	NA	NA	NA	NA	NA	No	F
Boron	NA	NA	NA	NA	NA	NA	No	F
Cadmium	NA	NA	NA	NA	NA	NA	Yes	E
Calcium	NA	NA	NA	NA	NA	NA	No	H
Chromium	NA	NA	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	No	F
Lead	NA	NA	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	NA	NA	No	H
Manganese	NA	NA	NA	NA	NA	NA	No	F
Mercury	NA	NA	NA	NA	NA	NA	Yes	E
Nickel	NA	NA	NA	NA	NA	NA	Yes	D
Potassium	NA	NA	NA	NA	NA	NA	No	H
Selenium	NA	NA	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	NA	NA	Uncertainty	B
Sodium	NA	NA	NA	NA	NA	NA	No	H
Thallium	NA	NA	NA	NA	NA	NA	Uncertainty	B
Vanadium	NA	NA	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	NA	NA	No	F
Explosives								
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	No	A
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	No	A

TABLE 25-6, AUS-0065
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	No	C
2-Nitrotoluene (ONT)	NA	NA	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	No	A
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	NA	NA	No	F
HMX	NA	NA	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	NA	NA	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 25-7, AUS-0065
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA
N-Hexane	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA
Tetrachloroethylene (PCE)	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA
total Xylenes	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA
Trichloroethylene (TCE)	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	NA	NA	NA	NA	No	A
1,2-Dichlorobenzene	NA	NA	NA	NA	No	A
1,3-Dichlorobenzene	NA	NA	NA	NA	No	A
1,4-Dichlorobenzene	NA	NA	NA	NA	No	A
2,4,5-Trichlorophenol	NA	NA	NA	NA	No	A

TABLE 25-7, AUS-0065
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	No	A
2,4-Dichlorophenol	NA	NA	NA	NA	No	A
2,4-Dimethylphenol	NA	NA	NA	NA	Yes	E
2,4-Dinitrophenol	NA	NA	NA	NA	No	A
2-Chloronaphthalene	NA	NA	NA	NA	Uncertainty	B
2-Chlorophenol	NA	NA	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	Yes	E
2-Methylphenol	NA	NA	NA	NA	No	F
2-Nitroaniline	NA	NA	NA	NA	No	A
2-Nitrophenol	NA	NA	NA	NA	No	A
3,3'-Dichlorobenzidine	NA	NA	NA	NA	No	A
3-Nitroaniline	NA	NA	NA	NA	No	A
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	No	C
4-Bromophenyl phenyl ether	NA	NA	NA	NA	No	C
4-Chloro-3-methylphenol	NA	NA	NA	NA	No	A
4-Chloroaniline	NA	NA	NA	NA	Uncertainty	B
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	No	C
4-Methylphenol	NA	NA	NA	NA	No	F
4-Nitroaniline	NA	NA	NA	NA	No	A
4-Nitrophenol	NA	NA	NA	NA	No	A
Acenaphthene	NA	NA	NA	NA	Yes	E
Acenaphthylene	NA	NA	NA	NA	No	F
Anthracene	NA	NA	NA	NA	Yes	E
Benzo(a)anthracene	NA	NA	NA	NA	Yes	E
Benzo(a)pyrene	NA	NA	NA	NA	Yes	E
Benzo(b)fluoranthene	NA	NA	NA	NA	Yes	E
Benzo(g,h,i)perylene	NA	NA	NA	NA	Yes	E
Benzo(k)fluoranthene	NA	NA	NA	NA	Yes	E
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	Uncertainty	B
bis(2-Chloroethyl) ether	NA	NA	NA	NA	No	A
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	No	C
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	Yes	E
Butyl benzyl phthalate	NA	NA	NA	NA	Uncertainty	B
Carbazole	NA	NA	NA	NA	Yes	E
Chrysene	NA	NA	NA	NA	Yes	E
Di-n-butyl phthalate	NA	NA	NA	NA	No	A
Di-n-octyl phthalate	NA	NA	NA	NA	No	A
Dibenz(a,h)anthracene	NA	NA	NA	NA	Yes	E
Dibenzofuran	NA	NA	NA	NA	Yes	E
Diethyl phthalate	NA	NA	NA	NA	No	A
Dimethyl phthalate	NA	NA	NA	NA	No	A
Fluoranthene	NA	NA	NA	NA	Yes	E

TABLE 25-7, AUS-0065
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	Yes	E
Hexachlorobenzene	NA	NA	NA	NA	No	A
Hexachlorobutadiene	NA	NA	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	NA	NA	No	A
Hexachloroethane	NA	NA	NA	NA	No	A
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	Yes	E
Isophorone	NA	NA	NA	NA	No	A
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	Uncertainty	B
N-Nitrosodiphenylamine	NA	NA	NA	NA	No	A
Naphthalene	NA	NA	NA	NA	No	F
Pentachlorophenol	NA	NA	NA	NA	No	A
Phenanthrene	NA	NA	NA	NA	Yes	E
Phenol	NA	NA	NA	NA	No	F
Pyrene	NA	NA	NA	NA	Yes	E
Metals and Inorganics						
Aluminum	NA	NA	NA	NA	Uncertainty	I
Antimony	NA	NA	NA	NA	No	F
Arsenic	NA	NA	NA	NA	Yes	D
Barium	NA	NA	NA	NA	No	F
Beryllium	NA	NA	NA	NA	No	F
Boron	NA	NA	NA	NA	Yes	E
Cadmium	NA	NA	NA	NA	No	F
Calcium	NA	NA	NA	NA	Uncertainty	G,H
Chromium	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	Yes	D
Lead	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	Uncertainty	G,H
Manganese	NA	NA	NA	NA	Yes	D
Mercury	NA	NA	NA	NA	Yes	E
Nickel	NA	NA	NA	NA	No	F
Potassium	NA	NA	NA	NA	Uncertainty	G,H
Selenium	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	No	A
Sodium	NA	NA	NA	NA	Uncertainty	G,H
Thallium	NA	NA	NA	NA	Uncertainty	B
Vanadium	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	Yes	E
Explosives						
1,3,5-Trinitrobenzene	NA	NA	NA	NA	Uncertainty	B
1,3-Dinitrobenzene	NA	NA	NA	NA	No	A

**TABLE 25-7, AUS-0065
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	No	A
2,6-Dinitrotoluene	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	No	A
2-Nitrotoluene (ONT)	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	No	C
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	Uncertainty	G
HMX	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	No	C

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 25-8
AUS-0065 - FOUNDATIONS NORTHEAST OF FORMER COC-1
CHEMICALS THAT EXCEEDED SCREENING CRITERIA AND REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum ¹	Soil	Sediment	Ground Water	Surface Water
SVOCs					
2,4-Dimethylphenol		H,E	NA	NA	NA
2-Methylnaphthalene		E	NA	NA	NA
Acenaphthene		E	NA	NA	NA
Anthracene		E	NA	NA	NA
Benzo(a)anthracene		H,E	NA	NA	NA
Benzo(a)pyrene		H,E	NA	NA	NA
Benzo(b)fluoranthene		H,E	NA	NA	NA
Benzo(g,h,i)perylene		E	NA	NA	NA
Benzo(k)fluoranthene		H,E	NA	NA	NA
bis(2-Ethylhexyl)phthalate (DEHP)		E	NA	NA	NA
Carbazole		H,E	NA	NA	NA
Chrysene		H,E	NA	NA	NA
Dibenz(a,h)anthracene		H,E	NA	NA	NA
Dibenzofuran		E	NA	NA	NA
Fluoranthene		E	NA	NA	NA
Fluorene		E	NA	NA	NA
Indeno(1,2,3-c,d)pyrene		H,E	NA	NA	NA
Naphthalene		H	NA	NA	NA
Phenanthrene		E	NA	NA	NA
Pyrene		E	NA	NA	NA
Metals					
Boron		E	NA	NA	NA
Cadmium		H	NA	NA	NA
Copper		E	NA	NA	NA
Mercury		H,E	NA	NA	NA
Zinc		E	NA	NA	NA

Key:

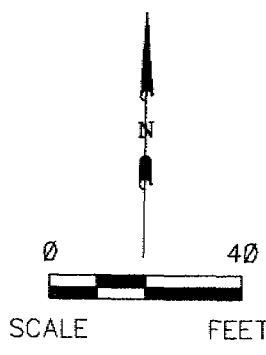
¹ Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-0065\FIG25-1.DWG Last edited: 09/24/01 @ 08:34 a.m. WC-ST. LOUIS, MO

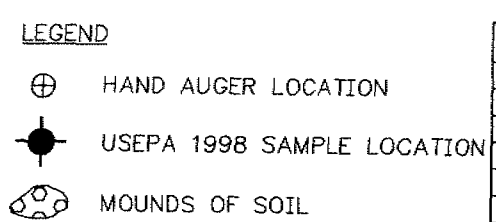


AUS-0065-001	Units	Result:	Reference
		0 - 6 in	Code
Semivolatile Organic Compounds			
Acenaphthylene	UG/KG	78	
Anthracene	UG/KG	58	e5
Benzo(a)anthracene	UG/KG	180	e5, h5
Benzo(a)pyrene	UG/KG	220	e5
Benzo(b)fluoranthene	UG/KG	230	e5, h5
Benzo(g,h,i)perylene	UG/KG	180	e5
Benzo(k)fluoranthene	UG/KG	230	e5
Carbazole	UG/KG	65	e5, h5
Chrysene	UG/KG	270	e5
Fluoranthene	UG/KG	360	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	150	e5
Phenanthrene	UG/KG	350	e5
Pyrene	UG/KG	330	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0065-005	Units	Result:	Reference
		0 - 6 in	Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	110	e5
4-Methylphenol	UG/KG	71	
Acenaphthylene	UG/KG	280	
Anthracene	UG/KG	250	e5
Benzo(a)anthracene	UG/KG	660	e5, h5
Benzo(a)pyrene	UG/KG	560	e5, h1, h5
Benzo(b)fluoranthene	UG/KG	570	e5, h5
Benzo(g,h,i)perylene	UG/KG	540	e5
Benzo(k)fluoranthene	UG/KG	670	e5
Carbazole	UG/KG	240	e5, h5
Chrysene	UG/KG	830	e5
Dibenz(a,h)anthracene	UG/KG	220	e5, h5
Dibenzofuran	UG/KG	120	e5
Fluoranthene	UG/KG	1200	e5
Fluorene	UG/KG	180	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	420	e5
Naphthalene	UG/KG	140	
Phenanthrene	UG/KG	1300	e5
Pyrene	UG/KG	1100	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0065-002	Units	Result:	Reference
		0 - 6 in	Code
Semivolatile Organic Compounds			
2,4-Dimethylphenol	UG/KG	1100	e1, h5
2-Methylnaphthalene	UG/KG	3500	e1, e5
2-Methylphenol	UG/KG	760	
4-Methylphenol	UG/KG	2600	
Acenaphthylene	UG/KG	850	e5
Acenaphthylene	UG/KG	7200	
Anthracene	UG/KG	5900	e5
Benzo(a)anthracene	UG/KG	11000	e1, e5, h1, h5, h7, h9
Benzo(a)pyrene	UG/KG	12000	e5, h1, h5, h7, h9
Benzo(b)fluoranthene	UG/KG	11000	e5, h1, h5, h7, h9
Benzo(g,h,i)perylene	UG/KG	12000	e5
Benzo(k)fluoranthene	UG/KG	9200	e5, h5
Carbazole	UG/KG	5600	e5, h5, h9
Chrysene	UG/KG	14000	e1, e5, h5
Dibenz(a,h)anthracene	UG/KG	4700	e5, h1, h5, h7, h9
Dibenzofuran	UG/KG	3100	e5
Fluoranthene	UG/KG	21000	e5
Fluorene	UG/KG	5100	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	9600	e5, h1, h5, h7, h9
Naphthalene	UG/KG	4700	e5
Phenanthrene	UG/KG	27000	e5
Phenol	UG/KG	940	
Pyrene	UG/KG	17000	e5
Explosives			
4-Nitrotoluene (PNT) (duplicate)	UG/KG	1700	

AUS-0065-006	Units	Result:	Reference
		0 - 6 in	Code
Semivolatile Organic Compounds			
4-Methylphenol	UG/KG	150	
Benzo(b)fluoranthene	UG/KG	83	e5
Chrysene	UG/KG	83	e5
Fluoranthene	UG/KG	92	e5
Phenanthrene	UG/KG	93	e5
Pyrene	UG/KG	96	e5
Explosives			
All Explosives	UG/KG	ND	



Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulators)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0065-007	Units	Result:	Reference
		0 - 6 in	Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0065-003	Units	Result:	Reference
		0 - 6 in	Code
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	62	e5
Acenaphthylene	UG/KG	170	
Anthracene	UG/KG	49	e5
Benzo(a)anthracene	UG/KG	59	e5
Benzo(a)pyrene	UG/KG	250	e5
Benzo(b)fluoranthene	UG/KG	170	e5
Benzo(g,h,i)perylene	UG/KG	520	e5
Benzo(k)fluoranthene	UG/KG	110	e5
Chrysene	UG/KG	150	e5
Dibenz(a,h)anthracene	UG/KG	120	e5, h5
Fluoranthene	UG/KG	78	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	330	e5
Phenanthrene	UG/KG	99	e5
Pyrene	UG/KG	92	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0065-008	Units	Result:	Reference	Result:	Reference
		0 - 6 in	Code	3 ft	Code
Semivolatile Organic Compounds					
2-Methylnaphthalene	UG/KG	200	e5	220	e5
Benzo(b)fluoranthene	UG/KG	ND		52	e5
Benzo(k)fluoranthene	UG/KG	ND		51	e5
Chrysene	UG/KG	57	e5	76	e5
Dibenzofuran	UG/KG	190	e5	260	e5
Fluoranthene	UG/KG	42	e5	52	e5
Naphthalene	UG/KG	120		130	
Phenanthrene	UG/KG	140	e5	210	e5
Pyrene	UG/KG	50	e5	56	e5

AUS-0065-009	Units	Result:	Reference	Result:	Reference
		0 - 6 in	Code	3 ft	Code
Semivolatile Organic Compounds					
2-Methylnaphthalene	UG/KG	690	e5	130	e5
Benzo(a)anthracene	UG/KG	71	e5	ND	
Benzo(a)pyrene	UG/KG	56	e5	79	e5
Benzo(b)fluoranthene	UG/KG	ND		87	e5
Benzo(g,h,i)perylene	UG/KG	67	e5	120	e5
Benzo(k)fluoranthene	UG/KG	ND		61	e5
Chrysene	UG/KG	91	e5	88	e5
Dibenzofuran	UG/KG	200	e5	43	e5
Fluoranthene	UG/KG	70	e5	77	e5
Indeno(1,2,3-c,d)pyrene	UG/KG	ND		88	e5
Naphthalene	UG/KG	380		ND	
Phenanthrene	UG/KG	320	e5	130	e5
Pyrene	UG/KG	100	e5	67	e5

AUS-0065-004	Units	Result:	Reference	Result:	Reference
		0 - 6 in	Code	4 ft	Code
Semivolatile Organic Compounds					
2-Methylnaphthalene	UG/KG	55	e5	45	e5
Benzo(a)anthracene	UG/KG	47	e5	ND	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	1400	e1, e5	ND	
Chrysene	UG/KG	70	e5	ND	
Dibenzofuran	UG/KG	59	e5	42	e5
Fluoranthene	UG/KG	61	e5	45	e5
Phenanthrene	UG/KG	160	e5	95	e5
Pyrene	UG/KG	70	e5	44	e5
Explosives					
All Explosives	UG/KG	NA		ND	

- NOTES:**
1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
 2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
 3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 232000026.00
URS	
DRN. BY:djd 12/10/00 DSGN. BY:mam CHKD. BY:mch/cmw	AUS-0065 Sample Locations and Detections of Organic Compounds in Soils
	FIG. NO. 25-1

AUS-0065-FOUNDATIONS NORTHEAST OF FORMER COC-1

AUS-0065-005			
Units	Result:	Reference	
	0 - 6 in	Code	
Metals			
Aluminum	MG/KG	10400	
Antimony	MG/KG	0.76	h5
Arsenic	MG/KG	6.4	h1,h5,h7
Barium	MG/KG	120	h5
Beryllium	MG/KG	0.34	
Boron	MG/KG	7.9	b1,e1
Cadmium	MG/KG	1.1	b1,h5
Calcium	MG/KG	9100	b1
Chromium	MG/KG	15.3	e1,h5
Cobalt	MG/KG	6.6	
Copper	MG/KG	33.3	b1,e1
Iron	MG/KG	19100	e1
Lead	MG/KG	212	b1
Magnesium	MG/KG	2160	b1
Manganese	MG/KG	456	e1
Mercury	MG/KG	0.12	b1,e5
Nickel	MG/KG	11.7	h5
Potassium	MG/KG	1250	b1
Selenium	MG/KG	1.4	e1,e5,h5
Sodium	MG/KG	49.4	
Vanadium	MG/KG	23.8	
Zinc	MG/KG	351	b1,e1

AUS-0065-002			
Units	Result:	Reference	
	0 - 6 in	Code	
Metals			
Aluminum	MG/KG	11700	
Antimony	MG/KG	0.34	h5
Arsenic	MG/KG	8.7	h1,h5,h7
Barium	MG/KG	162	h5
Beryllium	MG/KG	0.5	
Boron	MG/KG	2.4	e1
Cadmium	MG/KG	1.1	b1,h5
Calcium	MG/KG	4340	b1
Chromium	MG/KG	20.2	e1,h5
Cobalt	MG/KG	9.3	
Copper	MG/KG	33.4	b1,e1
Iron	MG/KG	17900	e1
Lead	MG/KG	148	b1
Magnesium	MG/KG	1880	b1
Manganese	MG/KG	835	e1
Mercury	MG/KG	0.47	b1,e5,h5
Nickel	MG/KG	11.4	h5
Potassium	MG/KG	1180	b1
Selenium	MG/KG	0.95	e5,h5
Sodium	MG/KG	49.6	
Vanadium	MG/KG	31.2	
Zinc	MG/KG	278	b1,e1
Other Parameters			
TOC	MG/KG	27900	

AUS-0065-006			
Units	Result:	Reference	
	0 - 6 in	Code	
Metals			
Aluminum	MG/KG	12700	
Arsenic	MG/KG	5.9	h1,h5,h7
Barium	MG/KG	116	h5
Beryllium	MG/KG	0.43	
Boron	MG/KG	2.8	e1
Calcium	MG/KG	2320	
Chromium	MG/KG	16.6	e1,h5
Cobalt	MG/KG	6.5	
Copper	MG/KG	12.7	b1
Iron	MG/KG	14400	e1
Lead	MG/KG	27.2	b1
Magnesium	MG/KG	1910	b1
Manganese	MG/KG	334	e1
Mercury	MG/KG	0.085	b1,e5
Nickel	MG/KG	11.9	h5
Potassium	MG/KG	1250	b1
Selenium	MG/KG	0.86	e5,h5
Sodium	MG/KG	55.7	
Vanadium	MG/KG	30.5	
Zinc	MG/KG	107	b1

AUS-0065-009			
Units	Result:	Reference	
	0 - 6 in	Code	3 ft
Metals			
Aluminum	MG/KG	9000	9160
Antimony	MG/KG	0.22	0.22
Arsenic	MG/KG	5.8	h1,h5,h7
Barium	MG/KG	79.1	120
Beryllium	MG/KG	0.86	b1
Boron	MG/KG	11.7	b1,e1
Cadmium	MG/KG	0.73	b1,h5
Calcium	MG/KG	8630	b1
Chromium	MG/KG	13.4	e1,h5
Cobalt	MG/KG	5.7	6.8
Copper	MG/KG	10.6	9.9
Iron	MG/KG	19300	e1
Lead	MG/KG	20.3	34.6
Magnesium	MG/KG	1640	b1
Manganese	MG/KG	461	e1
Mercury	MG/KG	0.029	e5
Nickel	MG/KG	13.2	h5
Potassium	MG/KG	1110	b1
Selenium	MG/KG	0.53	e5,h5
Sodium	MG/KG	76	58.3
Vanadium	MG/KG	37.9	25.2
Zinc	MG/KG	233	b1,e1

AUS-0065-007			
Units	Result:	Reference	
	0 - 6 in	Code	
Metals			
Aluminum	MG/KG	10900	
Antimony	MG/KG	0.24	
Arsenic	MG/KG	7	h1,h5,h7
Barium	MG/KG	116	h5
Beryllium	MG/KG	0.43	
Boron	MG/KG	2.2	e1
Calcium	MG/KG	5660	b1
Chromium	MG/KG	14.5	e1,h5
Cobalt	MG/KG	7.4	
Copper	MG/KG	13.2	b1
Iron	MG/KG	16500	e1
Lead	MG/KG	25.5	b1
Magnesium	MG/KG	2090	b1
Manganese	MG/KG	831	e1
Mercury	MG/KG	0.052	e5
Nickel	MG/KG	11.5	h5
Potassium	MG/KG	1250	b1
Selenium	MG/KG	0.55	e5,h5
Sodium	MG/KG	53.9	
Vanadium	MG/KG	26.4	
Zinc	MG/KG	78	b1

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TR V - Soil	e1
Ecological Direct Exposure Pathway TR V - Sediment	e2
Ecological Direct Exposure Pathway TR V - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulation)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class 1 Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

LEGEND

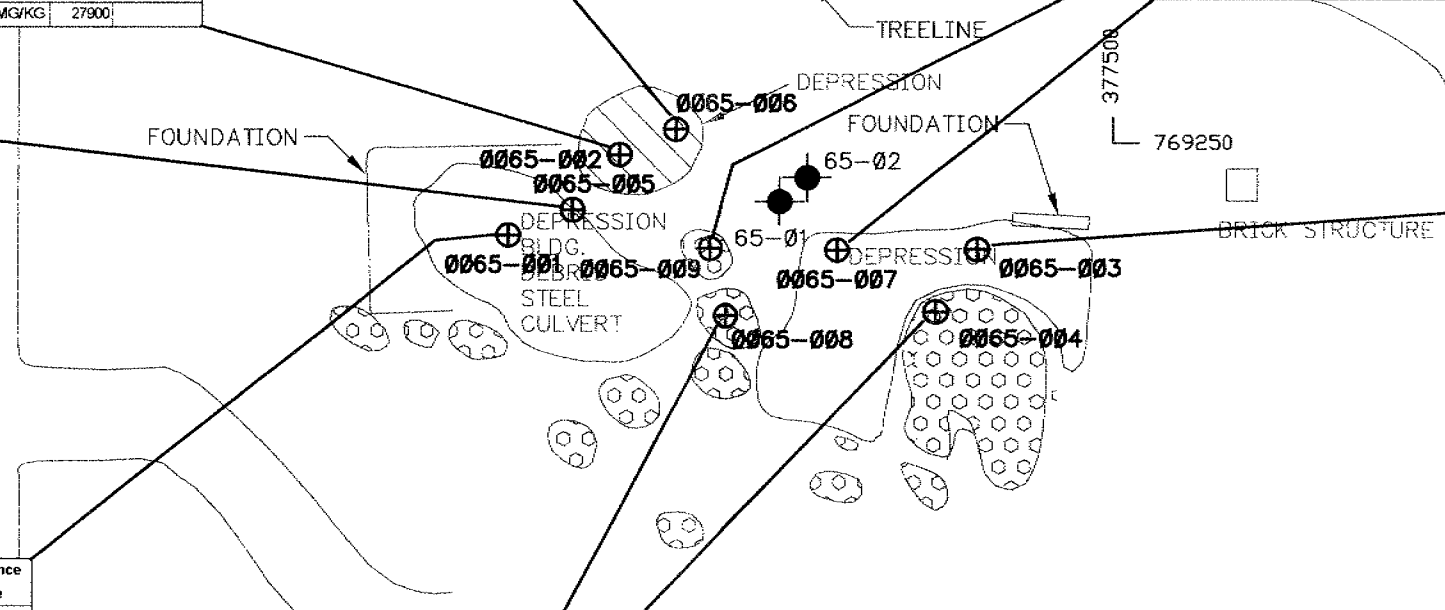
- ⊕ HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATION
- ☉ MOUNDS OF SOIL

AUS-0065-003			
Units	Result:	Reference	
	0 - 6 in	Code	
Metals			
Aluminum	MG/KG	10100	
Antimony	MG/KG	0.28	
Arsenic	MG/KG	9.7	e1,h1,h5,h7
Barium	MG/KG	160	h5
Beryllium	MG/KG	0.65	
Boron	MG/KG	6.5	b1,e1
Cadmium	MG/KG	0.69	b1,h5
Calcium	MG/KG	4340	b1
Chromium	MG/KG	13.1	e1,h5
Cobalt	MG/KG	10.7	
Copper	MG/KG	24.1	b1
Iron	MG/KG	19300	e1
Lead	MG/KG	80	b1
Magnesium	MG/KG	1170	
Manganese	MG/KG	1140	e1
Mercury	MG/KG	0.086	b1,e5
Nickel	MG/KG	14	h5
Potassium	MG/KG	1290	b1
Selenium	MG/KG	0.6	e5,h5
Sodium	MG/KG	74.5	
Vanadium	MG/KG	27.9	
Zinc	MG/KG	257	b1,e1

AUS-0065-001			
Units	Result:	Reference	
	0 - 6 in	Code	
Metals			
Aluminum	MG/KG	10700	
Antimony	MG/KG	0.33	h5
Arsenic	MG/KG	8	h1,h5,h7
Barium	MG/KG	164	h5
Beryllium	MG/KG	0.46	
Boron	MG/KG	5.1	e1
Calcium	MG/KG	8420	b1
Chromium	MG/KG	20.6	e1,h5
Cobalt	MG/KG	11.6	
Copper	MG/KG	14.3	b1
Iron	MG/KG	17400	e1
Lead	MG/KG	73.2	b1
Magnesium	MG/KG	2330	b1
Manganese	MG/KG	767	e1
Mercury	MG/KG	0.084	b1,e5
Nickel	MG/KG	14.1	h5
Potassium	MG/KG	1340	b1
Selenium	MG/KG	1.1	e1,e5,h5
Sodium	MG/KG	56.4	
Vanadium	MG/KG	28.6	
Zinc	MG/KG	98.2	b1

AUS-0065-008			
Units	Result:	Reference	
	0 - 6 in	Code	3 ft
Metals			
Aluminum	MG/KG	8830	6480
Antimony	MG/KG	ND	0.67
Arsenic	MG/KG	7.4	h1,h5,h7
Barium	MG/KG	72.1	46
Beryllium	MG/KG	0.51	0.32
Boron	MG/KG	4.8	e1
Calcium	MG/KG	73700	b1
Chromium	MG/KG	13.7	e1,h5
Cobalt	MG/KG	4.5	3.9
Copper	MG/KG	10.6	6.8
Iron	MG/KG	15400	e1
Lead	MG/KG	17.1	13.5
Magnesium	MG/KG	7250	b1
Manganese	MG/KG	444	e1
Mercury	MG/KG	0.029	e5
Nickel	MG/KG	11.6	h5
Potassium	MG/KG	929	b1
Sodium	MG/KG	92.5	143
Vanadium	MG/KG	25.1	17
Zinc	MG/KG	67.2	42.5

AUS-0065-004			
Units	Result:	Reference	
	0 - 6 in	Code	4 ft
Metals			
Aluminum	MG/KG	7820	7640
Arsenic	MG/KG	5.6	h1,h5,h7
Barium	MG/KG	99	h5
Beryllium	MG/KG	0.37	0.46
Boron	MG/KG	2	e1
Calcium	MG/KG	4090	b1
Chromium	MG/KG	11.5	e1,h5
Cobalt	MG/KG	5.5	5.5
Copper	MG/KG	11.3	9.3
Iron	MG/KG	12700	e1
Lead	MG/KG	18.7	19.2
Magnesium	MG/KG	1230	2710
Manganese	MG/KG	549	e1
Mercury	MG/KG	0.045	e5
Nickel	MG/KG	9.5	h5
Potassium	MG/KG	701	b1
Selenium	MG/KG	0.63	e5,h5
Sodium	MG/KG	51.3	63.4
Vanadium	MG/KG	18.9	19.6
Zinc	MG/KG	44.5	49.6



NOTES:

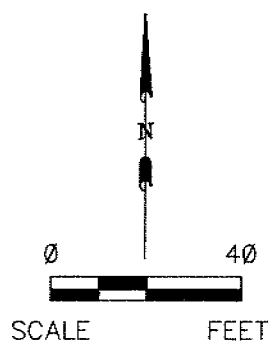
1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 232000026.00
-------------------------------------------------------------	-----------------------------



DRN. By:djd 12/10/00 DSGN. BY:mam CHKD. BY:mch/cmw	AUS-0065 Sample Locations and Detections of Inorganic Compounds in Soils	FIG. NO. 25-2
----------------------------------------------------------	--------------------------------------------------------------------------------	------------------

AUS-0065-FOUNDATIONS NORTHEAST OF FORMER COC-1



See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC area. AUS-0066 is located approximately 1.4 miles west of the intersection of Wolf Creek Road and the COC Area Road, on the north side of the COC Area Road (Figure 22-1).

AUS-0066 was included in the AUS OU because of suspect debris and signage on site and because it is also COC-14, one of the COC sites investigated only for unexploded ordnance (UXO)¹.

AUS Original Site Designations

AUS-0066 is one of the original AUS OU sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS).

26.1 HISTORIC SEARCH INFORMATION

26.1.1 Site Description

AUS-0066 was originally described as “berm with red brick rubble” with a “Danger Contaminated Area” sign to the west, and it was identified by USFWS as COC-14 of the Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU). COC-14 measures approximately 50 feet (ft) (in an east-west direction) by 50 ft (in a north-south direction).² Figure 26-1 is a site map of AUS-0066.

26.1.2 Operational History and Waste Characteristics

There have been no known industrial lessees of this property.

The location in the COC Area, the danger sign, and the presence of the red brick rubble suggest that this may have been a site used by the Army for detonation of ordnance during and/or after World War II (see introductory text in Section 22).

26.1.3 AUS-0066 Previous Sampling Results

Parsons Engineering, 1997

Under contract to the Department of Army, Parsons Engineering conducted an ordnance and explosive waste (OEW) investigation at this site (COC-14) in 1997. There was no chemical investigation done in this area at that time. The entire site was investigated for OEW and a total of 20 magnetic anomalies were identified.³ All twenty of these anomalies were investigated and

¹ Note that according to Leanne Moore of the USFWS, we should assume that the Parsons Engineering report incorrectly identified the location of COC-14 to the south of the COC Area Road, instead of to the north where it was located during the site reconnaissance (See Figure 22-2 for COC area sites).

² Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-27.

³ Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis – Final Report, Former Illinois Ordnance Plant - Marion, Illinois, Page 2-27.

all twenty were identified as ordnance scrap.⁴ No unexploded ordnance (UXO) items were recovered.

USEPA Sampling, 1998

In 1998, the United States Environmental Protection Agency (USEPA) collected a sample (66-01) from this site. According to USEPA field notes, this site was 0.5 miles west of the intersection (likely referring to the intersection that is just northeast of former COC-1) with red brick rubble. The sample location is shown in Figures 26-1, 26-2, and 26-3. The results for all detected constituents are listed in Table 26-1A. The sample was analyzed for semi-volatile organic compounds (SVOCs) and metals. No metals exceeded USEPA soil screening levels (SSLs) and Refuge background values.⁵

26.1.4 Observations During Site Visit

AUS-0066 is a wooded area along an abandoned road. The site is very close to Crab Orchard Lake. A creek runs through the site, to the northwest, and discharges to the Lake. The sediment in this creek was observed to have a reddish-orange color in places. A small bermed area created from brick rubble and a “Danger Contaminated Area” sign, approximately 100 feet to the west of the brick rubble, were observed. There is also some construction debris and some small soil mounds present on site.

26.1.5 Recommendations Based on Preliminary Assessment

AUS-0066 was included in the SI because observations made at the site during the site reconnaissance indicated that there was potential for contamination in this area (i.e., “Contaminated Area” sign, and discoloration in creek).

26.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0066 on May 9, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)⁶ for the AUS OU PA/SI. AUS OU SI sample locations are shown on Figures 26-1, 26-2, and 26-3. Survey coordinates for all sample locations in AUS-0066 are listed in Table 26-1. Table 26-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples unless otherwise noted.

26.2.1 Field Investigation

Eight locations were sampled. Sampling was done in accordance with the FSP, except as noted.

⁴ Parsons Engineering Science, Inc., 1997, Engineering Evaluation and Cost Analysis – Final Report. Former Illinois Ordnance Plant - Marion, Illinois, Page 2-31.

⁵ See Table 1-11 of this report for Refuge background soil values used for the PA.

⁶ U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

Sample locations 0066-003 and 0066-004 (for both sediment and surface water) were in the creek.

Sample locations 0066-001, 0066-002 and 0066-008 (soil) are on a hillside northeast of the “Contaminated Area” sign. The surface runoff from this hillside drains into the creek.

Sample locations 0066-006 and 0066-007 (for both sediment and surface water) were in a ponded area inside the red-brick berm.

Sample location 0066-005 (soil) was southwest of the red-brick berm and north of the creek.

26.2.2 Field Results

26.2.2.1 Site Conditions

26.2.2.1.1 *Geologic Conditions*

There were no test pits or monitoring wells installed at AUS-0066. The soil from hand auger borings, which extended to depths of two feet, was described as silty clay fill.

26.2.2.1.2 *Hydrogeologic Conditions*

No hydrogeological information is available for this site.

26.2.2.1.3 *Hydrologic Conditions*

As shown on Figure 26-1, there is a creek that runs north through the middle southern portion of the site and then turns northwest toward Crab Orchard Lake. There is also a ponded area within a berm in the middle of the site.

26.2.2.2 Chemical Results

The sample analytical results are summarized in the following tables:

- Table 26-3 – soil samples results,
- Table 26-4 – sediment samples results, and
- Table 26-5 – surface water samples results.

These tables list all the chemicals detected in AUS-0066 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report.

Sample results are presented on the following figures:

- Figure 26-1 – organic results for soil and sediment samples,
- Figure 26-2 – inorganic results for soil and sediment samples, and
- Figure 26-3 – all results for surface water samples at this site.

26.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 26-6 through 26-11 as follows:

- Table 26-6 – human health risk screening for soils,
- Table 26-7 – human health risk screening for sediment,
- Table 26-8 – human health risk screening for surface water,
- Table 26-9 – ecological risk screening for soils,
- Table 26-10 – ecological risk screening for sediment, and
- Table 26-11 – ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0066. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level “cancer risk” is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs for human health risk and COPECs for ecological risk). The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a “U” qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 26-1 through 26-3, the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with “J”) are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 26-12 (human health risk) and 26-13 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 26-12) and COPECs (Table 26-13) are shaded in the tables.

26.3.1 Human Health Risk**26.3.1.1 Soil/Sediment**

Human health screening results for soil and sediment samples are presented in Tables 26-6 and 26-7, respectively. Soil screening values were used to screen the sediment samples.

For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil PRGs as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (DAF=1), the Illinois TACO Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

26.3.1.2 Surface Water

Human health risk screening results for chemicals in surface water at AUS-0066 are presented in Table 26-8. The maximum concentrations from AUS-0066 were screened against the State of Illinois General Use Surface Water Quality Criteria – Human Health.

26.3.2 Ecological Risk

26.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 26-9. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)⁷
- Environment Canada (1995)⁸
- Talmage *et al.* (1999)⁹
- Efroymson *et al.* (1997a, 1997b)¹⁰
- CCME (1999)¹¹
- MHSPE (1994)¹²
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

⁷ USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

⁸ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

⁹ Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

¹⁰ 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, Oak Ridge, Tennessee. 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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

¹¹ Canadian Council of Ministers of the Environment. 1999. *Canadian Environmental Quality Guidelines*.

¹² Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)¹³ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

26.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 26-10. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)¹⁴
- USEPA (1996 – summarized by Ingersoll et al. 1996)¹⁵
- Ontario Ministry of the Environment and Energy (1995)¹⁶
- NOAA (1999)¹⁷
- Ecotox (USEPA 1996)¹⁸
- Long et al. (1995)¹⁹
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th

¹³ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

¹⁴ MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems*. MacDonald Environmental Services Ltd., British Columbia, Canada.

¹⁵ Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfield, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyaella azteca* and the midge *Chironomus riparius*. *J. Great Lakes Res.* 22(3):602-623.

¹⁶ Ontario Ministry of Environment and Energy. 1995. *Ontario's Approach to Sediment Assessment and Remediation*. Second SETAC World Congress (16th Annual Meeting). Vancouver, British Columbia, Canada.

¹⁷ NOAA. 1999. *Screening quick Reference Tables*. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

¹⁸ USEPA. 1996. *ECO Update: Ecotox Thresholds*. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

¹⁹ Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environ. Management.* 19(1): 81-97.

percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed “consensus-based” freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (UETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the “equilibrium-partitioning” (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 26.3.2.1.

26.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 26-11. TRVs for direct exposure by aquatic organisms in surface water were obtained from:

- Illinois water quality standards
- National Recommended Ambient Water Quality Criteria (USEPA 1999a)²⁰
- EcoTox (USEPA 1996²¹)
- USEPA Region IV Freshwater Screening Values (1999b)²²
- Maximum Acceptable Toxicant Concentrations (MATCs) or lowest observed effect concentrations (LOECs) obtained from the USEPA Assessment Tools for the Evaluation of Risk database (ASTER 2000)²³
- Other sources

The Illinois water quality standards are believed to be the most relevant, followed by national recommended ambient water quality criteria. EcoTox reports values based on ambient water

²⁰ USEPA. 1999a. National Recommended Water Quality Criteria--Correction. Office of Water. EPA 822-Z-99-001. April.

²¹ USEPA. 1996. ECO Update: Ecotox Thresholds. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

²² USEPA. 1999b. Region IV Ecological Risk Assessment Bulletins – Supplement to RAGS. Available at <http://www.epa.gov/region4/waste/oftecser/ecolbul.htm>.

²³ ASTER. 2000. Assessment Tools for Evaluation of Risk Database. United States Environmental Protection Agency, Office of Research and Development.

quality criteria, and Tier II water quality criteria have been developed in the absence of sufficient information to support a national recommended water quality criterion using guidelines outlined in the Great Lakes Water Quality Initiative. Remaining sources were prioritized based on relevance to the area and professional judgment. The detailed discussion of the approach for selecting a single ESV from among the multiple sources is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 26.3.2.1.

26.4 SCIENTIFIC MANAGEMENT DECISION POINT

A Remedial Investigation (RI) is recommended for Site AUS-0066, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not necessarily be retained as COPCs/COPECs for further evaluation. These are the constituents coded with “D” on the COPC list, Table 26-12; and on the COPEC list, Table 26-13. COPCs in this category include mercury in surface water; arsenic and selenium in sediment; and arsenic, barium, chromium, nickel and selenium in soil. COPECs coded with “D” on Table 26-13 include mercury in surface water, sediment and soil; plus chromium, manganese, and selenium in soil. These chemicals may later be included in the RI for other reasons, but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be investigated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 26-14.

Note that a number of the human health COPCs exceed migration to groundwater screening criteria. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site, media, and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

**TABLE 26-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0066**

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0066-001	377485.9	766642.4	412.03	NA	
0066-002	377466.3	766675.6	412.40	NA	
0066-003	377488.3	766677.9	409.36	NA	
0066-004	377467.1	766718.3	409.46	NA	
0066-005	377496.2	766714.7	411.87	NA	
0066-006	377479.7	766758.9	411.51	NA	
0066-007	377492.8	766778.9	411.80	NA	
0066-008	377472.6	766613.6	413.08	NA	

Sheet 1 of 1

NA = Not Applicable

TABLE 26-1A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
66-01	Di-n-butylphthalate	0.23JB
	Aluminum	11,000
	Barium	100
	Beryllium	0.6
	Calcium	600
	Chromium	19
	Cobalt	7
	Copper	10
	Iron	19,000
	Magnesium	1,700
	Manganese	240
	Mercury	0.05
	Nickel	14
	Potassium	1,100
	Silver	1.5
	Vanadium	32
Zinc	44	

Sheet 1 of 1

mg/kg = milligrams per kilogram

J = Estimated

B = No explanation of "B" qualifier in report

TABLE 26-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0066

Soil	Sediment	Surface Water
AUS-0066-001	AUS-0066-003	AUS-0066-003
AUS-0066-002	AUS-0066-004	AUS-0066-004
AUS-0066-005	AUS-0066-006	AUS-0066-006
AUS-0066-008	AUS-0066-007	AUS-0066-007

Sheet 1 of 1

TABLE 26-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	1/4	84 ug/kg
Bis(2-Ethylhexyl) Phthalate	2/4	49 ug/kg to 50 ug/kg
Phenanthrene	1/4	49 ug/kg
Metals		
Aluminum	4/4	7,250 mg/kg to 14,400 mg/kg
Arsenic	4/4	4.2 mg/kg to 6.9 mg/kg
Barium	4/4	70.7 mg/kg to 132 mg/kg
Beryllium	4/4	0.42 mg/kg to 0.67 mg/kg
Cadmium	1/4	0.59 ug/kg
Calcium	4/4	246 mg/kg to 799 mg/kg
Chromium, Total	4/4	10.6 mg/kg to 20.7 mg/kg
Cobalt	4/4	7.4 mg/kg to 22.8 mg/kg
Copper	4/4	5.6 mg/kg to 11.3 mg/kg
Iron	4/4	11,500 mg/kg to 21,800 mg/kg
Lead	4/4	13.4 mg/kg to 26.1 mg/kg
Magnesium	4/4	882 mg/kg to 1,970 mg/kg
Manganese	4/4	1,160 mg/kg to 1,700 mg/kg
Mercury	4/4	0.028 mg/kg to 0.038 mg/kg
Nickel	4/4	10 mg/kg to 17.3 mg/kg
Potassium	4/4	559 mg/kg to 818 mg/kg
Selenium	2/4	0.39 mg/kg to 0.52 mg/kg
Sodium	4/4	30.9 mg/kg to 52.8 mg/kg
Thallium	1/4	0.57 mg/kg
Vanadium	4/4	20.9 mg/kg to 33.2 mg/kg
Zinc	4/4	31.6 mg/kg to 56.7 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

TABLE 26-4
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	2/4	210 ug/kg to 370 ug/kg
Benzo(a)Anthracene	1/4	160 ug/kg
Benzo(a)Pyrene	1/4	140 ug/kg
Benzo(b)Fluoranthene	1/4	220 ug/kg
Benzo(g,h,i)Perylene	1/4	71 ug/kg
Benzo(k)Fluoranthene	1/4	73 ug/kg
Bis(2-ethylhexyl) Phthalate	3/4	55 ug/kg to 100 ug/kg
Chrysene	1/4	180 ug/kg
Dibenzofuran	2/4	58 ug/kg to 76 ug/kg
Fluoranthene	1/4	150 ug/kg
Indeno(1,2,3-c,d)Pyrene	1/4	76 ug/kg
Naphthalene	2/4	86 ug/kg to 170 ug/kg
Phenanthrene	2/4	110 ug/kg to 160 ug/kg
Pyrene	2/4	65 ug/kg to 190 ug/kg
Metals		
Aluminum	4/4	13,500 mg/kg to 20,500 mg/kg
Arsenic	4/4	2.5 mg/kg to 10.3 mg/kg
Barium	4/4	73.5 mg/kg to 241 mg/kg
Beryllium	4/4	0.57 mg/kg to 2.8 mg/kg
Boron	4/4	1.6 mg/kg to 2.5 mg/kg
Cadmium	2/4	3.8 mg/kg to 35.7 mg/kg
Calcium	4/4	940 mg/kg to 12,900 mg/kg
Chromium, Total	4/4	17.9 mg/kg to 32.8 mg/kg
Cobalt	4/4	4.2 mg/kg to 39 mg/kg
Copper	4/4	9.8 mg/kg to 19.4 mg/kg
Iron	4/4	9,590 mg/kg to 86,300 mg/kg
Lead	4/4	20.8 mg/kg to 28.7 mg/kg
Magnesium	4/4	1,380 mg/kg to 8,270 mg/kg
Manganese	4/4	115 mg/kg to 505 mg/kg
Mercury	4/4	0.025 mg/kg to 0.048 mg/kg
Nickel	4/4	17.9 mg/kg to 65.6 mg/kg
Potassium	4/4	505 mg/kg to 1,640 mg/kg
Selenium	2/4	0.45 mg/kg to 0.64 mg/kg
Sodium	4/4	77.5 mg/kg to 107 mg/kg
Thallium	1/4	0.77 mg/kg

Sheet 1 of 2

**TABLE 26-4
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY**

Constituent	Number of Detections	Range of Detections
Vanadium	4/4	24.7 mg/kg to 41.1 mg/kg
Zinc	4/4	66.8 mg/kg to 447 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

TABLE 26-5
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Other Inorganics		
Alkalinity, Total (As CaCO ₃)	2/2	23 mg/L to 44.1 mg/L
Nitrogen, Ammonia (As N)	1/2	0.28 mg/L
Nitrogen, Nitrate-Nitrite	1/2	0.2 mg/L
Metals		
Aluminum	4/4	1,490 ug/L to 55,500 ug/L
Arsenic	3/4	5.5 ug/L to 18.3 ug/L
Barium	4/4	51.4 ug/L to 261 ug/L
Beryllium	1/4	16.5 ug/L
Cadmium	2/4	7.1 ug/L to 33.9 ug/L
Calcium	4/4	19,200 ug/L to 76,700 ug/L
Chromium, Total	3/4	6 ug/L to 29.1 ug/L
Cobalt	4/4	19.6 ug/L to 278 ug/L
Copper	4/4	1.4 ug/L to 40.1 ug/L
Iron	4/4	4,060 ug/L to 346,000 ug/L
Lead	3/4	7.8 ug/L to 48.4 ug/L
Magnesium	4/4	18,800 ug/L to 64,300 ug/L
Manganese	4/4	2,480 ug/L to 6,850 ug/L
Mercury	2/4	0.069 ug/L to 0.073 ug/L
Nickel	4/4	77.3 ug/L to 425 ug/L
Potassium	4/4	1,990 ug/L to 5,070 ug/L
Selenium	1/4	7.6 ug/L
Sodium	4/4	8,130 ug/L to 27,500 ug/L
Vanadium	3/4	15 ug/L to 76.8 ug/L
Zinc	4/4	112 ug/L to 2,240 ug/L

Sheet 1 of 1

mg/L = milligrams per Liter

ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			1.80E-06	6.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG		6.68E-09	1.54E-06	3.00E+01
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG		3.16E-09	3.94E-05	6.67E+00
75-34-3	1,1-Dichloroethane	6	U	UG/KG			2.91E-06	6.00E-03
75-35-4	1,1-Dichloroethene	6	U	UG/KG		5.05E-08	8.91E-05	2.00E+00
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG		7.85E-09	1.70E-04	6.00E+00
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	6	U	UG/KG		7.81E-09	2.82E-04	6.00E+00
78-93-3	2-Butanone (MEK)	12	U	UG/KG			4.33E-07	
591-78-6	2-Hexanone	12	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			4.16E-06	
67-64-1	Acetone	18	U	UG/KG			2.89E-06	2.25E-02
71-43-2	Benzene	6	U	UG/KG		4.10E-09	2.48E-04	3.00E+00
75-27-4	Bromodichloromethane	6	U	UG/KG		2.55E-09	5.75E-06	2.00E-01
75-25-2	Bromoform	6	U	UG/KG		1.92E-11	3.41E-07	1.50E-01
74-83-9	Bromomethane	6	U	UG/KG			4.57E-04	6.00E-01
75-15-0	Carbon disulfide	6	U	UG/KG			4.96E-06	3.00E-03
56-23-5	Carbon tetrachloride	6	U	UG/KG		1.13E-08	8.58E-04	2.00E+00
108-90-7	Chlorobenzene	6	U	UG/KG			1.11E-05	8.57E-02
75-00-3	Chloroethane	6	U	UG/KG		9.22E-10	3.18E-07	
67-66-3	Chloroform	6	U	UG/KG		1.15E-08	4.66E-03	2.00E-01
74-87-3	Chloromethane	6	U	UG/KG		2.25E-09		
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG			4.07E-05	3.00E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
124-48-1	Dibromochloromethane	6	U	UG/KG		2.26E-09	3.77E-06	3.00E-01
100-41-4	Ethylbenzene	6	U	UG/KG			1.00E-06	8.57E-03
75-09-2	Methylene chloride	15	U	UG/KG		7.31E-10	1.53E-06	1.50E+01
110-54-3	N-Hexane	6	U	UG/KG			1.49E-05	
100-42-5	Styrene	6	U	UG/KG			2.94E-07	3.00E-02
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG		3.21E-10	3.52E-06	2.00E+00
108-88-3	Toluene	6	U	UG/KG			3.02E-06	1.00E-02
1330-20-7	total Xylenes	6	U	UG/KG			1.35E-06	6.00E-04
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG			2.80E-05	2.00E-01
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG		9.81E-10	7.59E-05	2.00E+00
75-01-4	Vinyl chloride	6	U	UG/KG		1.23E-07		8.57E+00
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	430	U	UG/KG			5.64E-05	1.43E+00
95-50-1	1,2-Dichlorobenzene	430	U	UG/KG			1.30E-04	4.78E-01
541-73-1	1,3-Dichlorobenzene	430	U	UG/KG			8.31E-03	
106-46-7	1,4-Dichlorobenzene	430	U	UG/KG		5.29E-08	2.24E-04	4.30E+00
95-95-4	2,4,5-Trichlorophenol	2100	U	UG/KG			2.38E-05	2.10E-01
88-06-2	2,4,6-Trichlorophenol	430	U	UG/KG		1.92E-09		5.38E+01
120-83-2	2,4-Dichlorophenol	430	U	UG/KG			1.63E-04	8.60E+00
105-67-9	2,4-Dimethylphenol	430	U	UG/KG			2.44E-05	1.08E+00
51-28-5	2,4-Dinitrophenol	2100	U	UG/KG			1.19E-03	2.10E+02
91-58-7	2-Chloronaphthalene	430	U	UG/KG			1.58E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-57-8	2-Chlorophenol	430	U	UG/KG			1.78E-03	2.15E+00
91-57-6	2-Methylnaphthalene	84	J	UG/KG			1.55E-06	4.20E-04
95-48-7	2-Methylphenol	430	U	UG/KG			9.76E-06	5.38E-01
88-74-4	2-Nitroaniline	2100	U	UG/KG			4.17E-02	
88-75-5	2-Nitrophenol	430	U	UG/KG			6.10E-05	
91-94-1	3,3'-Dichlorobenzidine	430	U	UG/KG		7.84E-08		1.43E+03
99-09-2	3-Nitroaniline	2100	U	UG/KG			4.17E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2100	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	430	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	430	U	UG/KG			9.76E-06	
106-47-8	4-Chloroaniline	850	U	UG/KG			2.41E-04	2.83E+01
7005-72-3	4-Chlorophenyl phenyl ether	430	U	UG/KG				
106-44-5	4-Methylphenol	430	U	UG/KG			9.76E-05	
100-01-6	4-Nitroaniline	2100	U	UG/KG			4.17E-02	
100-02-7	4-Nitrophenol	2100	U	UG/KG			2.98E-04	
83-32-9	Acenaphthene	430	U	UG/KG			1.12E-05	1.43E-02
208-96-8	Acenaphthylene	430	U	UG/KG			7.93E-06	2.15E-03
120-12-7	Anthracene	430	U	UG/KG			1.10E-06	7.17E-04
56-55-3	Benzo(a)anthracene	430	U	UG/KG		1.49E-07		5.38E+00
50-32-8	Benzo(a)pyrene	430	U	UG/KG		1.49E-06		1.08E+00
205-99-2	Benzo(b)fluoranthene	430	U	UG/KG		1.49E-07		2.15E+00
191-24-2	Benzo(g,h,i)perylene	430	U	UG/KG			7.93E-06	2.15E-03
207-08-9	Benzo(k)fluoranthene	430	U	UG/KG		1.49E-08		2.15E-01
111-91-1	bis(2-Chloroethoxy)methane	430	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
111-44-4	bis(2-Chloroethyl) ether	430	U	UG/KG		6.94E-07		2.15E+04
108-60-1	bis(2-Chloroisopropyl) ether	430	U	UG/KG		5.32E-08	1.01E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	50	J	UG/KG		2.84E-10	2.84E-06	
85-68-7	Butyl benzyl phthalate	430	U	UG/KG			2.44E-06	5.38E-04
86-74-8	Carbazole	430	U	UG/KG		3.49E-09		1.43E+01
218-01-9	Chrysene	430	U	UG/KG		1.49E-09		5.38E-02
84-74-2	Di-n-butyl phthalate	430	U	UG/KG			4.88E-06	1.43E-03
117-84-0	Di-n-octyl phthalate	430	U	UG/KG			2.44E-05	4.30E-05
53-70-3	Dibenz(a,h)anthracene	430	U	UG/KG		1.49E-06		5.38E+00
132-64-9	Dibenzofuran	430	U	UG/KG			8.49E-05	
84-66-2	Diethyl phthalate	430	U	UG/KG			6.10E-07	
131-11-3	Dimethyl phthalate	430	U	UG/KG			4.88E-08	
206-44-0	Fluoranthene	430	U	UG/KG			1.43E-05	2.15E-03
86-73-7	Fluorene	430	U	UG/KG			1.30E-05	1.43E-02
118-74-1	Hexachlorobenzene	430	U	UG/KG		2.79E-07	6.10E-04	4.30E+00
87-68-3	Hexachlorobutadiene	430	U	UG/KG		1.36E-08	2.44E-03	4.30E+00
77-47-4	Hexachlorocyclopentadiene	430	U	UG/KG			7.29E-05	2.15E-02
67-72-1	Hexachloroethane	430	U	UG/KG		2.44E-09	4.88E-04	2.15E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	430	U	UG/KG		1.49E-07		6.14E-01
78-59-1	Isophorone	430	U	UG/KG		1.66E-10	2.44E-06	1.43E+01
621-64-7	N-Nitroso-di-n-propylamine	430	UJ	UG/KG		1.22E-06		2.15E+05
86-30-6	N-Nitrosodiphenylamine	430	U	UG/KG		8.54E-10		7.17E+00
91-20-3	Naphthalene	430	U	UG/KG			2.28E-03	1.08E-01
87-86-5	Pentachlorophenol	2100	U	UG/KG		1.89E-07	1.47E-04	2.10E+03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066

**ADDITIONAL AND UNCHARACTERIZED SITES OU
 CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-01-8	Phenanthrene	49	J	UG/KG			9.04E-07	2.45E-04
108-95-2	Phenol	430	U	UG/KG			8.14E-07	8.60E-02
129-00-0	Pyrene	430	U	UG/KG			7.93E-06	2.15E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	320	U	UG/KG			1.21E-05	
99-65-0	1,3-Dinitrobenzene	320	U	UG/KG			3.63E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	640	U	UG/KG		7.78E-09	1.45E-03	
121-14-2	2,4-Dinitrotoluene	320	U	UG/KG			1.82E-04	8.00E+03
606-20-2	2,6-Dinitrotoluene	620	U	UG/KG			7.04E-04	2.07E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	640	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	640	U	UG/KG				
99-08-1	3-Nitrotoluene	640	U	UG/KG			3.15E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	640	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	640	U	UG/KG			3.15E-04	
2691-41-0	HMX	640	U	UG/KG			1.45E-05	
98-95-3	Nitrobenzene	320	U	UG/KG			2.80E-03	
121-82-4	RDX	640	U	UG/KG		2.85E-08	2.42E-04	
479-45-8	Tetryl	960	UJ	UG/KG			1.09E-04	
Metals								
7429-90-5	Aluminum	14400		MG/KG	5.00E-01		8.59E-03	
7440-36-0	Antimony	0.76	U	MG/KG	9.16E-01		9.30E-04	2.53E+00
7440-38-2	Arsenic	6.9		MG/KG	5.11E-01	2.53E-06	1.57E-02	6.90E+00
7440-39-3	Barium	132		MG/KG	6.77E-01		1.06E-03	1.65E+00
7440-41-7	Beryllium	0.67		MG/KG	8.82E-01	2.99E-10	1.81E-04	2.23E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
 J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-42-8	Boron	13	U	MG/KG	2.45E+00		1.64E-04	
7440-43-9	Cadmium	0.59	J	MG/KG	3.11E+00	1.97E-10	7.28E-04	1.48E+00
7440-70-2	Calcium	799		MG/KG	3.20E-01			
7440-47-3	Chromium	20.7		MG/KG	8.21E-01	4.62E-08		1.04E+01
7440-48-4	Cobalt	22.8		MG/KG	1.05E+00		1.86E-04	
7440-50-8	Copper	11.3		MG/KG	1.00E+00		1.49E-04	
7439-89-6	Iron	21800		MG/KG	1.13E+00		3.56E-02	
7439-92-1	Lead	26.1		MG/KG	1.12E+00			
7439-95-4	Magnesium	1970		MG/KG	1.27E+00			
7439-96-5	Manganese	1700		MG/KG	4.67E-01		5.27E-02	
7439-97-6	Mercury	0.038	J	MG/KG	6.33E-01			
7440-02-0	Nickel	17.3		MG/KG	9.15E-01		4.23E-04	2.47E+00
2023695	Potassium	818		MG/KG	1.31E+00			
7782-49-2	Selenium	0.52	J	MG/KG	2.22E-01		5.09E-05	1.73E+00
7440-22-4	Silver	1.3	U	MG/KG	2.24E+00		1.27E-04	6.50E-01
7440-23-5	Sodium	52.8	J	MG/KG	3.11E-01			
7440-28-0	Thallium	0.57	J	MG/KG	1.39E+00		3.98E-06	
7440-62-2	Vanadium	33.2		MG/KG	7.03E-01		2.32E-03	1.11E-01
7440-66-6	Zinc	56.7		MG/KG	1.10E+00		9.26E-05	9.45E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			3.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG	7.32E-07	7.32E-07	3.00E-01
75-34-3	1,1-Dichloroethane	6	U	UG/KG	3.00E-08	3.00E-08	2.61E-04
75-35-4	1,1-Dichloroethene	6	U	UG/KG	3.33E-07	3.33E-06	1.00E-01
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG	9.52E-05	4.29E-06	3.00E-01
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	6	U	UG/KG	7.14E-05	3.33E-06	2.00E-01
78-93-3	2-Butanone (MEK)	12	U	UG/KG			
591-78-6	2-Hexanone	12	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			
67-64-1	Acetone	18	U	UG/KG	9.00E-08	9.00E-08	1.13E-03
71-43-2	Benzene	6	U	UG/KG	3.00E-05	1.40E-06	2.00E-01
75-27-4	Bromodichloromethane	6	U	UG/KG	6.52E-05	3.00E-06	1.00E-02
75-25-2	Bromoform	6	U	UG/KG	8.33E-06	3.75E-07	7.50E-03
74-83-9	Bromomethane	6	U	UG/KG	2.07E-06	6.00E-06	3.00E-02
75-15-0	Carbon disulfide	6	U	UG/KG	3.00E-08	3.00E-07	1.88E-04
56-23-5	Carbon tetrachloride	6	U	UG/KG	1.36E-04	1.46E-05	8.57E-02
108-90-7	Chlorobenzene	6	U	UG/KG	1.46E-07	1.46E-06	6.00E-03
75-00-3	Chloroethane	6	U	UG/KG			
67-66-3	Chloroform	6	U	UG/KG	6.38E-06	3.00E-06	1.00E-02
74-87-3	Chloromethane	6	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
 J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG			
124-48-1	Dibromochloromethane	6	U	UG/KG	1.46E-07	1.46E-07	1.50E-02
100-41-4	Ethylbenzene	6	U	UG/KG	3.00E-08	3.00E-07	4.62E-04
75-09-2	Methylene chloride	15	U	UG/KG	1.97E-05	1.25E-06	7.50E-01
110-54-3	N-Hexane	6	U	UG/KG			
100-42-5	Styrene	6	U	UG/KG	1.46E-08	1.46E-07	1.50E-03
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG	5.45E-05	2.50E-06	1.00E-01
108-88-3	Toluene	6	U	UG/KG	1.46E-08	1.46E-08	5.00E-04
1330-20-7	total Xylenes	6	U	UG/KG	6.00E-09	1.46E-08	4.00E-05
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG	1.46E-07	1.46E-07	8.57E-03
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG	1.15E-05	5.00E-06	1.00E-01
75-01-4	Vinyl chloride	6	U	UG/KG	2.00E-03	9.23E-05	6.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	430	U	UG/KG	2.15E-05	2.15E-04	8.60E-02
95-50-1	1,2-Dichlorobenzene	430	U	UG/KG	2.39E-06	2.39E-05	2.53E-02
541-73-1	1,3-Dichlorobenzene	430	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	430	U	UG/KG			2.15E-01
95-95-4	2,4,5-Trichlorophenol	2100	U	UG/KG	1.05E-05	1.05E-05	7.78E-03
88-06-2	2,4,6-Trichlorophenol	430	U	UG/KG	8.27E-04	3.91E-05	2.15E+00
120-83-2	2,4-Dichlorophenol	430	U	UG/KG	7.05E-05	7.05E-04	4.30E-01
105-67-9	2,4-Dimethylphenol	430	U	UG/KG	1.05E-05	1.05E-05	4.78E-02
51-28-5	2,4-Dinitrophenol	2100	U	UG/KG	5.12E-04	5.12E-03	1.05E+01
91-58-7	2-Chloronaphthalene	430	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-57-8	2-Chlorophenol	430	U	UG/KG	4.30E-05	4.30E-05	1.08E-01
91-57-6	2-Methylnaphthalene	84	J	UG/KG	1.38E-06	1.38E-06	2.00E-05
95-48-7	2-Methylphenol	430	U	UG/KG	4.30E-06	4.30E-06	2.87E-02
88-74-4	2-Nitroaniline	2100	U	UG/KG			
88-75-5	2-Nitrophenol	430	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	430	U	UG/KG	3.31E-02	1.54E-03	6.14E+01
99-09-2	3-Nitroaniline	2100	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2100	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	430	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	430	U	UG/KG			
106-47-8	4-Chloroaniline	850	U	UG/KG	1.04E-04	1.04E-03	1.21E+00
7005-72-3	4-Chlorophenyl phenyl ether	430	U	UG/KG			
106-44-5	4-Methylphenol	430	U	UG/KG			
100-01-6	4-Nitroaniline	2100	U	UG/KG			
100-02-7	4-Nitrophenol	2100	U	UG/KG			
83-32-9	Acenaphthene	430	U	UG/KG	3.58E-06	3.58E-06	7.54E-04
208-96-8	Acenaphthylene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04
120-12-7	Anthracene	430	U	UG/KG	7.05E-07	7.05E-07	3.58E-05
56-55-3	Benzo(a)anthracene	430	U	UG/KG	5.38E-02	2.53E-03	2.15E-01
50-32-8	Benzo(a)pyrene	430	U	UG/KG	5.38E-01	2.53E-02	5.38E-02
205-99-2	Benzo(b)fluoranthene	430	U	UG/KG	5.38E-02	2.53E-03	8.60E-02
191-24-2	Benzo(g,h,i)perylene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04
207-08-9	Benzo(k)fluoranthene	430	U	UG/KG	5.51E-03	2.53E-04	8.78E-03
111-91-1	bis(2-Chloroethoxy)methane	430	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
111-44-4	bis(2-Chloroethyl) ether	430	U	UG/KG	8.60E-02	5.73E-03	1.08E+03
108-60-1	bis(2-Chloroisopropyl) ether	430	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	50	J	UG/KG	1.22E-04	1.22E-05	1.39E-05
85-68-7	Butyl benzyl phthalate	430	U	UG/KG	1.05E-06	1.05E-06	4.62E-04
86-74-8	Carbazole	430	U	UG/KG	1.48E-03	6.94E-05	7.17E-01
218-01-9	Chrysene	430	U	UG/KG	5.51E-04	2.53E-05	2.69E-03
84-74-2	Di-n-butyl phthalate	430	U	UG/KG	2.15E-06	2.15E-06	1.87E-04
117-84-0	Di-n-octyl phthalate	430	U	UG/KG	1.05E-05	1.05E-04	4.30E-05
53-70-3	Dibenz(a,h)anthracene	430	U	UG/KG	5.38E-01	2.53E-02	2.15E-01
132-64-9	Dibenzofuran	430	U	UG/KG			
84-66-2	Diethyl phthalate	430	U	UG/KG	4.30E-07	4.30E-07	9.15E-04
131-11-3	Dimethyl phthalate	430	U	UG/KG			
206-44-0	Fluoranthene	430	U	UG/KG	5.24E-06	5.24E-06	1.00E-04
86-73-7	Fluorene	430	U	UG/KG	5.24E-06	5.24E-06	7.68E-04
118-74-1	Hexachlorobenzene	430	U	UG/KG	1.08E-01	5.51E-03	2.15E-01
87-68-3	Hexachlorobutadiene	430	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	430	U	UG/KG	3.07E-05	3.07E-05	1.08E-03
67-72-1	Hexachloroethane	430	U	UG/KG	2.15E-04	2.15E-04	8.60E-01
193-39-5	Indeno(1,2,3-c,d)pyrene	430	U	UG/KG	5.38E-02	2.53E-03	3.07E-02
78-59-1	Isophorone	430	U	UG/KG	1.05E-06	1.05E-06	5.38E-02
621-64-7	N-Nitroso-di-n-propylamine	430	UJ	UG/KG	5.38E-01	2.39E-02	8.60E+03
86-30-6	N-Nitrosodiphenylamine	430	U	UG/KG	3.58E-04	1.72E-05	4.30E-01
91-20-3	Naphthalene	430	U	UG/KG	5.24E-06	5.24E-05	5.12E-03
87-86-5	Pentachlorophenol	2100	U	UG/KG	8.75E-02	4.04E-03	7.00E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-6

HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-01-8	Phenanthrene	49	J	UG/KG	8.03E-07	8.03E-07	1.17E-05
108-95-2	Phenol	430	U	UG/KG	4.30E-07	3.58E-06	4.30E-03
129-00-0	Pyrene	430	U	UG/KG	7.05E-06	7.05E-06	1.02E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	320	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	320	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	640	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	320	U	UG/KG	3.81E-02	1.78E-03	4.00E+02
606-20-2	2,6-Dinitrotoluene	620	U	UG/KG	7.38E-02	3.44E-03	8.86E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	640	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	640	U	UG/KG			
99-08-1	3-Nitrotoluene	640	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	640	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	640	U	UG/KG			
2691-41-0	HMX	640	U	UG/KG			
98-95-3	Nitrobenzene	320	U	UG/KG	3.20E-04	3.20E-04	3.20E+00
121-82-4	RDX	640	U	UG/KG			
479-45-8	Tetryl	960	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	14400		MG/KG			
7440-36-0	Antimony	0.76	U	MG/KG	9.27E-04	9.27E-03	1.52E-01
7440-38-2	Arsenic	6.9		MG/KG	2.30E+00	1.13E-01	2.46E-01
7440-39-3	Barium	132		MG/KG	9.43E-04	9.43E-03	1.10E-01
7440-41-7	Beryllium	0.67		MG/KG	6.70E-01	2.31E-02	1.02E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-42-8	Boron	13	U	MG/KG	7.22E-05	7.22E-04	
7440-43-9	Cadmium	0.59	J	MG/KG	2.95E-04	2.95E-03	1.59E-01
7440-70-2	Calcium	799		MG/KG			
7440-47-3	Chromium	20.7		MG/KG	2.07E-03	5.05E-03	7.39E-01
7440-48-4	Cobalt	22.8		MG/KG	1.90E-04	1.90E-03	
7440-50-8	Copper	11.3		MG/KG	1.38E-04	1.38E-03	1.03E-03
7439-89-6	Iron	21800		MG/KG			
7439-92-1	Lead	26.1		MG/KG	6.53E-02	6.53E-02	
7439-95-4	Magnesium	1970		MG/KG			
7439-96-5	Manganese	1700		MG/KG	1.77E-02	1.77E-01	
7439-97-6	Mercury	0.038	J	MG/KG	6.23E-05	6.23E-04	2.53E-01
7440-02-0	Nickel	17.3		MG/KG	4.22E-04	4.22E-03	2.28E-01
2023695	Potassium	818		MG/KG			
7782-49-2	Selenium	0.52	J	MG/KG	5.20E-05	5.20E-04	2.17E-01
7440-22-4	Silver	1.3	U	MG/KG	1.30E-04	1.30E-03	8.67E-01
7440-23-5	Sodium	52.8	J	MG/KG			
7440-28-0	Thallium	0.57	J	MG/KG	3.56E-03	3.56E-03	2.38E-01
7440-62-2	Vanadium	33.2		MG/KG	2.37E-03	2.37E-02	3.39E-02
7440-66-6	Zinc	56.7		MG/KG	9.30E-05	9.30E-04	1.58E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	640	U	UG/KG			8.40E-05	2.13E+00
95-50-1	1,2-Dichlorobenzene	640	U	UG/KG			1.93E-04	7.11E-01
541-73-1	1,3-Dichlorobenzene	640	U	UG/KG			1.24E-02	
106-46-7	1,4-Dichlorobenzene	640	U	UG/KG		7.87E-08	3.33E-04	6.40E+00
95-95-4	2,4,5-Trichlorophenol	3200	U	UG/KG			3.63E-05	3.20E-01
88-06-2	2,4,6-Trichlorophenol	640	U	UG/KG		2.85E-09		8.00E+01
120-83-2	2,4-Dichlorophenol	640	U	UG/KG			2.42E-04	1.28E+01
105-67-9	2,4-Dimethylphenol	640	U	UG/KG			3.63E-05	1.60E+00
51-28-5	2,4-Dinitrophenol	3200	U	UG/KG			1.82E-03	3.20E+02
91-58-7	2-Chloronaphthalene	640	U	UG/KG			2.35E-05	
95-57-8	2-Chlorophenol	640	U	UG/KG			2.65E-03	3.20E+00
91-57-6	2-Methylnaphthalene	370	J	UG/KG			6.82E-06	1.85E-03
95-48-7	2-Methylphenol	640	U	UG/KG			1.45E-05	8.00E-01
88-74-4	2-Nitroaniline	3200	U	UG/KG			6.36E-02	
88-75-5	2-Nitrophenol	640	U	UG/KG			9.08E-05	
91-94-1	3,3'-Dichlorobenzidine	640	U	UG/KG		1.17E-07		2.13E+03
99-09-2	3-Nitroaniline	3200	U	UG/KG			6.36E-02	
534-52-1	4,6-Dinitro-2-methylphenol	3200	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	640	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	640	U	UG/KG			1.45E-05	
106-47-8	4-Chloroaniline	1300	U	UG/KG			3.69E-04	4.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	640	U	UG/KG				
106-44-5	4-Methylphenol	640	U	UG/KG			1.45E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
100-01-6	4-Nitroaniline	3200	U	UG/KG			6.36E-02	
100-02-7	4-Nitrophenol	3200	U	UG/KG			4.54E-04	
83-32-9	Acenaphthene	640	U	UG/KG			1.67E-05	2.13E-02
208-96-8	Acenaphthylene	640	U	UG/KG			1.18E-05	3.20E-03
120-12-7	Anthracene	640	U	UG/KG			1.64E-06	1.07E-03
56-55-3	Benzo(a)anthracene	160	J	UG/KG		5.54E-08		2.00E+00
50-32-8	Benzo(a)pyrene	140	J	UG/KG		4.85E-07		3.50E-01
205-99-2	Benzo(b)fluoranthene	220	J	UG/KG		7.62E-08		1.10E+00
191-24-2	Benzo(g,h,i)perylene	71	J	UG/KG			1.31E-06	3.55E-04
207-08-9	Benzo(k)fluoranthene	73	J	UG/KG		2.53E-09		3.65E-02
111-91-1	bis(2-Chloroethoxy)methane	640	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	640	U	UG/KG		1.03E-06		3.20E+04
108-60-1	bis(2-Chloroisopropyl) ether	640	U	UG/KG		7.92E-08	1.51E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	100	J	UG/KG		5.68E-10	5.68E-06	
85-68-7	Butyl benzyl phthalate	640	U	UG/KG			3.63E-06	8.00E-04
86-74-8	Carbazole	640	U	UG/KG		5.19E-09		2.13E+01
218-01-9	Chrysene	180	J	UG/KG		6.24E-10		2.25E-02
84-74-2	Di-n-butyl phthalate	640	U	UG/KG			7.27E-06	2.13E-03
117-84-0	Di-n-octyl phthalate	640	U	UG/KG			3.63E-05	6.40E-05
53-70-3	Dibenz(a,h)anthracene	640	U	UG/KG		2.22E-06		8.00E+00
132-64-9	Dibenzofuran	76	J	UG/KG			1.50E-05	
84-66-2	Diethyl phthalate	640	U	UG/KG			9.08E-07	
131-11-3	Dimethyl phthalate	640	U	UG/KG			7.27E-08	
206-44-0	Fluoranthene	150	J	UG/KG			4.98E-06	7.50E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-7

HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration Criteria (DAF-1)
86-73-7	Fluorene	640	U	UG/KG			1.93E-05	2.13E-02
118-74-1	Hexachlorobenzene	640	U	UG/KG		4.15E-07	9.08E-04	6.40E+00
87-68-3	Hexachlorobutadiene	640	U	UG/KG		2.02E-08	3.63E-03	6.40E+00
77-47-4	Hexachlorocyclopentadiene	640	U	UG/KG			1.09E-04	3.20E-02
67-72-1	Hexachloroethane	640	U	UG/KG		3.63E-09	7.27E-04	3.20E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	76	J	UG/KG		2.63E-08		1.09E-01
78-59-1	Isophorone	640	U	UG/KG		2.46E-10	3.63E-06	2.13E+01
621-64-7	N-Nitroso-di-n-propylamine	640	UJ	UG/KG		1.82E-06		3.20E+05
86-30-6	N-Nitrosodiphenylamine	640	U	UG/KG		1.27E-09		1.07E+01
91-20-3	Naphthalene	170	J	UG/KG			9.02E-04	4.25E-02
87-86-5	Pentachlorophenol	3200	U	UG/KG		2.89E-07	2.24E-04	3.20E+03
85-01-8	Phenanthrene	160	J	UG/KG			2.95E-06	8.00E-04
108-95-2	Phenol	640	U	UG/KG			1.21E-06	1.28E-01
129-00-0	Pyrene	190	J	UG/KG			3.50E-06	9.50E-04
Explosives								
99-35-4	1,3,5-Trinitrobenzene	480	U	UG/KG			1.82E-05	
99-65-0	1,3-Dinitrobenzene	480	U	UG/KG			5.45E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	960	U	UG/KG		1.17E-08	2.18E-03	
121-14-2	2,4-Dinitrotoluene	480	U	UG/KG			2.72E-04	1.20E+04
606-20-2	2,6-Dinitrotoluene	640	U	UG/KG			7.27E-04	2.13E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	960	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	960	U	UG/KG				
99-08-1	3-Nitrotoluene	960	U	UG/KG			4.73E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	960	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
99-99-0	4-Nitrotoluene (PNT)	960	U	UG/KG			4.73E-04	
2691-41-0	HMX	960	U	UG/KG			2.18E-05	
98-95-3	Nitrobenzene	480	U	UG/KG			4.19E-03	
121-82-4	RDX	960	U	UG/KG		4.28E-08	3.63E-04	
479-45-8	Tetryl	1400	UJ	UG/KG			1.59E-04	
Metals								
7429-90-5	Aluminum	20500		MG/KG	1.82E+00		1.22E-02	
7440-36-0	Antimony	2.3	U	MG/KG	1.21E+00		2.81E-03	7.67E+00
7440-38-2	Arsenic	10.3		MG/KG	1.00E+00	3.78E-06	2.34E-02	1.03E+01
7440-39-3	Barium	241		MG/KG	1.23E+00		1.94E-03	3.01E+00
7440-41-7	Beryllium	2.8		MG/KG	1.75E+00	1.25E-09	7.58E-04	9.33E-01
7440-42-8	Boron	2.5	J	MG/KG			3.16E-05	
7440-43-9	Cadmium	35.7		MG/KG	2.23E+01	1.19E-08	4.41E-02	8.93E+01
7440-70-2	Calcium	12900		MG/KG	8.91E+00			
7440-47-3	Chromium	32.8		MG/KG	1.91E+00	7.32E-08		1.64E+01
7440-48-4	Cobalt	39		MG/KG	4.29E+00		3.18E-04	
7440-50-8	Copper	19.4		MG/KG	1.15E+00		2.56E-04	
7439-89-6	Iron	86300		MG/KG	4.16E+00		1.41E-01	
7439-92-1	Lead	28.7	J	MG/KG	1.20E+00			
7439-95-4	Magnesium	8270		MG/KG	4.33E+00			
7439-96-5	Manganese	505		MG/KG	4.84E-01		1.57E-02	
7439-97-6	Mercury	0.048	J	MG/KG	3.20E-01			
7440-02-0	Nickel	65.6		MG/KG	3.88E+00		1.60E-03	9.37E+00
2023695	Potassium	1640		MG/KG	1.15E+00			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7782-49-2	Selenium	0.64	J	MG/KG	1.00E+00		6.26E-05	2.13E+00
7440-22-4	Silver	1.9	U	MG/KG	6.33E-01		1.86E-04	9.50E-01
7440-23-5	Sodium	107	J	MG/KG	7.38E-02			
7440-28-0	Thallium	0.77	J	MG/KG	2.48E+00		5.38E-06	
7440-62-2	Vanadium	41.1		MG/KG	1.47E+00		2.87E-03	1.37E-01
7440-66-6	Zinc	447		MG/KG	7.83E+00		7.30E-04	7.45E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	640	U	UG/KG	3.20E-05	3.20E-04	1.28E-01
95-50-1	1,2-Dichlorobenzene	640	U	UG/KG	3.56E-06	3.56E-05	3.76E-02
541-73-1	1,3-Dichlorobenzene	640	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	640	U	UG/KG			3.20E-01
95-95-4	2,4,5-Trichlorophenol	3200	U	UG/KG	1.60E-05	1.60E-05	1.19E-02
88-06-2	2,4,6-Trichlorophenol	640	U	UG/KG	1.23E-03	5.82E-05	3.20E+00
120-83-2	2,4-Dichlorophenol	640	U	UG/KG	1.05E-04	1.05E-03	6.40E-01
105-67-9	2,4-Dimethylphenol	640	U	UG/KG	1.56E-05	1.56E-05	7.11E-02
51-28-5	2,4-Dinitrophenol	3200	U	UG/KG	7.80E-04	7.80E-03	1.60E+01
91-58-7	2-Chloronaphthalene	640	U	UG/KG			
95-57-8	2-Chlorophenol	640	U	UG/KG	6.40E-05	6.40E-05	1.60E-01
91-57-6	2-Methylnaphthalene	370	J	UG/KG	6.07E-06	6.07E-06	8.81E-05
95-48-7	2-Methylphenol	640	U	UG/KG	6.40E-06	6.40E-06	4.27E-02
88-74-4	2-Nitroaniline	3200	U	UG/KG			
88-75-5	2-Nitrophenol	640	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	640	U	UG/KG	4.92E-02	2.29E-03	9.14E+01
99-09-2	3-Nitroaniline	3200	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	3200	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	640	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	640	U	UG/KG			
106-47-8	4-Chloroaniline	1300	U	UG/KG	1.59E-04	1.59E-03	1.86E+00
7005-72-3	4-Chlorophenyl phenyl ether	640	U	UG/KG			
106-44-5	4-Methylphenol	640	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
 J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
100-01-6	4-Nitroaniline	3200	U	UG/KG			
100-02-7	4-Nitrophenol	3200	U	UG/KG			
83-32-9	Acenaphthene	640	U	UG/KG	5.33E-06	5.33E-06	1.12E-03
208-96-8	Acenaphthylene	640	U	UG/KG	1.05E-05	1.05E-05	1.52E-04
120-12-7	Anthracene	640	U	UG/KG	1.05E-06	1.05E-06	5.33E-05
56-55-3	Benzo(a)anthracene	160	J	UG/KG	2.00E-02	9.41E-04	8.00E-02
50-32-8	Benzo(a)pyrene	140	J	UG/KG	1.75E-01	8.24E-03	1.75E-02
205-99-2	Benzo(b)fluoranthene	220	J	UG/KG	2.75E-02	1.29E-03	4.40E-02
191-24-2	Benzo(g,h,i)perylene	71	J	UG/KG	1.16E-06	1.16E-06	1.69E-05
207-08-9	Benzo(k)fluoranthene	73	J	UG/KG	9.36E-04	4.29E-05	1.49E-03
111-91-1	bis(2-Chloroethoxy)methane	640	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	640	U	UG/KG	1.28E-01	8.53E-03	1.60E+03
108-60-1	bis(2-Chloroisopropyl) ether	640	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	100	J	UG/KG	2.44E-04	2.44E-05	2.78E-05
85-68-7	Butyl benzyl phthalate	640	U	UG/KG	1.56E-06	1.56E-06	6.88E-04
86-74-8	Carbazole	640	U	UG/KG	2.21E-03	1.03E-04	1.07E+00
218-01-9	Chrysene	180	J	UG/KG	2.31E-04	1.06E-05	1.13E-03
84-74-2	Di-n-butyl phthalate	640	U	UG/KG	3.20E-06	3.20E-06	2.78E-04
117-84-0	Di-n-octyl phthalate	640	U	UG/KG	1.56E-05	1.56E-04	6.40E-05
53-70-3	Dibenz(a,h)anthracene	640	U	UG/KG	8.00E-01	3.76E-02	3.20E-01
132-64-9	Dibenzofuran	76	J	UG/KG			
84-66-2	Diethyl phthalate	640	U	UG/KG	6.40E-07	6.40E-07	1.36E-03
131-11-3	Dimethyl phthalate	640	U	UG/KG			
206-44-0	Fluoranthene	150	J	UG/KG	1.83E-06	1.83E-06	3.49E-05

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
86-73-7	Fluorene	640	U	UG/KG	7.80E-06	7.80E-06	1.14E-03
118-74-1	Hexachlorobenzene	640	U	UG/KG	1.60E-01	8.21E-03	3.20E-01
87-68-3	Hexachlorobutadiene	640	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	640	U	UG/KG	4.57E-05	4.57E-05	1.60E-03
67-72-1	Hexachloroethane	640	U	UG/KG	3.20E-04	3.20E-04	1.28E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	76	J	UG/KG	9.50E-03	4.47E-04	5.43E-03
78-59-1	Isophorone	640	U	UG/KG	1.56E-06	1.56E-06	8.00E-02
621-64-7	N-Nitroso-di-n-propylamine	640	UJ	UG/KG	8.00E-01	3.56E-02	1.28E+04
86-30-6	N-Nitrosodiphenylamine	640	U	UG/KG	5.33E-04	2.56E-05	6.40E-01
91-20-3	Naphthalene	170	J	UG/KG	2.07E-06	2.07E-05	2.02E-03
87-86-5	Pentachlorophenol	3200	U	UG/KG	1.33E-01	6.15E-03	1.07E+02
85-01-8	Phenanthrene	160	J	UG/KG	2.62E-06	2.62E-06	3.81E-05
108-95-2	Phenol	640	U	UG/KG	6.40E-07	5.33E-06	6.40E-03
129-00-0	Pyrene	190	J	UG/KG	3.11E-06	3.11E-06	4.52E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	480	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	480	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	960	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	480	U	UG/KG	5.71E-02	2.67E-03	6.00E+02
606-20-2	2,6-Dinitrotoluene	640	U	UG/KG	7.62E-02	3.56E-03	9.14E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	960	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	960	U	UG/KG			
99-08-1	3-Nitrotoluene	960	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	960	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
99-99-0	4-Nitrotoluene (PNT)	960	U	UG/KG			
2691-41-0	HMX	960	U	UG/KG			
98-95-3	Nitrobenzene	480	U	UG/KG	4.80E-04	4.80E-04	4.80E+00
121-82-4	RDX	960	U	UG/KG			
479-45-8	Tetryl	1400	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	20500		MG/KG			
7440-36-0	Antimony	2.3	U	MG/KG	2.80E-03	2.80E-02	4.60E-01
7440-38-2	Arsenic	10.3		MG/KG	3.43E+00	1.69E-01	3.68E-01
7440-39-3	Barium	241		MG/KG	1.72E-03	1.72E-02	2.01E-01
7440-41-7	Beryllium	2.8		MG/KG	2.80E+00	9.66E-02	4.24E-01
7440-42-8	Boron	2.5	J	MG/KG	1.39E-05	1.39E-04	
7440-43-9	Cadmium	35.7		MG/KG	1.79E-02	1.79E-01	9.65E+00
7440-70-2	Calcium	12900		MG/KG			
7440-47-3	Chromium	32.8		MG/KG	3.28E-03	8.00E-03	1.17E+00
7440-48-4	Cobalt	39		MG/KG	3.25E-04	3.25E-03	
7440-50-8	Copper	19.4		MG/KG	2.37E-04	2.37E-03	1.76E-03
7439-89-6	Iron	86300		MG/KG			
7439-92-1	Lead	28.7	J	MG/KG	7.18E-02	7.18E-02	
7439-95-4	Magnesium	8270		MG/KG			
7439-96-5	Manganese	505		MG/KG	5.26E-03	5.26E-02	
7439-97-6	Mercury	0.048	J	MG/KG	7.87E-05	7.87E-04	3.20E-01
7440-02-0	Nickel	65.6		MG/KG	1.60E-03	1.60E-02	8.63E-01
2023695	Potassium	1640		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7782-49-2	Selenium	0.64	J	MG/KG	6.40E-05	6.40E-04	2.67E-01
7440-22-4	Silver	1.9	U	MG/KG	1.90E-04	1.90E-03	1.27E+00
7440-23-5	Sodium	107	J	MG/KG			
7440-28-0	Thallium	0.77	J	MG/KG	4.81E-03	4.81E-03	3.21E-01
7440-62-2	Vanadium	41.1		MG/KG	2.94E-03	2.94E-02	4.19E-02
7440-66-6	Zinc	447		MG/KG	7.33E-04	7.33E-03	1.24E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-8
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AUS-0066

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
Volatile Organic Compounds						
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L		
79-00-5	1,1,2-Trichloroethane	1	U	UG/L		
75-34-3	1,1-Dichloroethane	1	U	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L		
78-87-5	1,2-Dichloropropane	1	U	UG/L		
78-93-3	2-Butanone (MEK)	5	U	UG/L		
591-78-6	2-Hexanone	5	U	UG/L		
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		
67-64-1	Acetone	9	U	UG/L		
71-43-2	Benzene	1	U	UG/L		4.76E-02
75-27-4	Bromodichloromethane	1	U	UG/L		
75-25-2	Bromoform	1	U	UG/L		
74-83-9	Bromomethane	1	U	UG/L		
75-15-0	Carbon disulfide	1	U	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	U	UG/L		
67-66-3	Chloroform	1	U	UG/L		
74-87-3	Chloromethane	1	U	UG/L		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L		
124-48-1	Dibromochloromethane	1	U	UG/L		
100-41-4	Ethylbenzene	1	U	UG/L		1.08E-04
75-09-2	Methylene chloride	1	U	UG/L		2.94E-03
110-54-3	N-Hexane	1	U	UG/L		
100-42-5	Styrene	1	U	UG/L		
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L		
108-88-3	Toluene	1	U	UG/L		1.61E-05
1330-20-7	total Xylenes	1	U	UG/L		1.61E-05
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L		
79-01-6	Trichloroethylene (TCE)	1	U	UG/L		
75-01-4	Vinyl chloride	1	U	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-8
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AUS-0066

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		
106-46-7	1,4-Dichlorobenzene	10	U	UG/L		
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		
105-67-9	2,4-Dimethylphenol	10	U	UG/L		
51-28-5	2,4-Dinitrophenol	50	U	UG/L		
91-58-7	2-Chloronaphthalene	10	U	UG/L		
95-57-8	2-Chlorophenol	10	U	UG/L		
91-57-6	2-Methylnaphthalene	10	U	UG/L		2.86E-03
95-48-7	2-Methylphenol	10	U	UG/L		
88-74-4	2-Nitroaniline	50	U	UG/L		
88-75-5	2-Nitrophenol	10	U	UG/L		
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L		
99-09-2	3-Nitroaniline	50	U	UG/L		
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L		
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L		
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		
106-47-8	4-Chloroaniline	20	U	UG/L		
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L		
106-44-5	4-Methylphenol	10	U	UG/L		
100-01-6	4-Nitroaniline	50	U	UG/L		
100-02-7	4-Nitrophenol	50	U	UG/L		
83-32-9	Acenaphthene	10	U	UG/L		
208-96-8	Acenaphthylene	10	U	UG/L		2.86E-03
120-12-7	Anthracene	10	U	UG/L		2.86E-04
56-55-3	Benzo(a)anthracene	10	U	UG/L		1.00E+02
50-32-8	Benzo(a)pyrene	10	U	UG/L		1.00E+03
205-99-2	Benzo(b)fluoranthene	10	U	UG/L		1.00E+02
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		2.86E-03
207-08-9	Benzo(k)fluoranthene	10	U	UG/L		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L		
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	U	UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-8
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
218-01-9	Chrysene	10	U	UG/L		1.00E+00
84-74-2	Di-n-butyl phthalate	10	U	UG/L		
117-84-0	Di-n-octyl phthalate	10	U	UG/L		
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L		
132-64-9	Dibenzofuran	10	U	UG/L		
84-66-2	Diethyl phthalate	10	U	UG/L		
131-11-3	Dimethyl phthalate	10	U	UG/L		
206-44-0	Fluoranthene	10	U	UG/L		8.33E-02
86-73-7	Fluorene	10	U	UG/L		2.22E-03
118-74-1	Hexachlorobenzene	10	U	UG/L		
87-68-3	Hexachlorobutadiene	10	U	UG/L		
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		
67-72-1	Hexachloroethane	10	U	UG/L		
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L		1.00E+02
78-59-1	Isophorone	10	U	UG/L		
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L		
91-20-3	Naphthalene	10	U	UG/L		
87-86-5	Pentachlorophenol	50	U	UG/L		
85-01-8	Phenanthrene	10	U	UG/L		2.86E-03
108-95-2	Phenol	10	U	UG/L	1.00E+00	1.00E-01
129-00-0	Pyrene	10	U	UG/L		2.86E-03
Explosives						
99-35-4	1,3,5-Trinitrobenzene	0.25	U	UG/L		
99-65-0	1,3-Dinitrobenzene	0.25	U	UG/L		
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	U	UG/L		
121-14-2	2,4-Dinitrotoluene	0.25	U	UG/L		
606-20-2	2,6-Dinitrotoluene	0.5	U	UG/L		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	U	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L		
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L		
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		
2691-41-0	HMX	0.5	U	UG/L		
98-95-3	Nitrobenzene	0.25	UJ	UG/L		
121-82-4	RDX	0.5	U	UG/L		
479-45-8	Tetryl	0.75	U	UG/L		
Metals						

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-8
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (Surface Water)	Ratio of Max Concentration (or Max RL) to IEPA General Use Surface Water Quality Criteria - Human Health
7429-90-5	Aluminum	55500		UG/L	2.78E+02	
7440-36-0	Antimony	6	U	UG/L	1.00E+00	
7440-38-2	Arsenic	18.3		UG/L	1.83E+00	
7440-39-3	Barium	261		UG/L	1.15E+01	5.22E-02
7440-41-7	Beryllium	16.5		UG/L	3.30E+00	
7440-42-8	Boron	100	U	UG/L		1.00E-01
7440-43-9	Cadmium	33.9		UG/L	6.78E+00	
7440-70-2	Calcium	76700		UG/L	1.07E+01	
7440-47-3	Chromium	29.1		UG/L	2.91E+00	
7440-48-4	Cobalt	278		UG/L	5.56E+00	
7440-50-8	Copper	40.1		UG/L	4.01E+00	
7439-89-6	Iron	346000		UG/L	3.46E+03	3.46E+02
7439-92-1	Lead	48.4		UG/L	2.42E+01	
7439-95-4	Magnesium	64300		UG/L	2.54E+01	
7439-96-5	Manganese	6850		UG/L	1.18E+01	6.85E+00
7439-97-6	Mercury	0.073	J	UG/L	3.65E-01	6.08E+00
7440-02-0	Nickel	425		UG/L	4.25E+01	4.25E-01
2023695	Potassium	5070		UG/L	3.14E+00	
7782-49-2	Selenium	7.6		UG/L	2.81E+00	7.60E-03
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	27500		UG/L	8.68E+00	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	76.8		UG/L	1.54E+00	
7440-66-6	Zinc	2240		UG/L	1.12E+02	2.24E+00
Other Parameters						
ALK	Alkalinity, Total (as CaCO3)	44.1		MG/L	1.44E+00	
7664-41-7	Nitrogen, Ammonia (as N)	0.28		MG/L	1.08E+00	
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.2		MG/L	4.00E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		6	U	UG/KG	2.01E-04	
79-34-5	1,1,2,2-Tetrachloroethane		6	U	UG/KG	4.72E-02	
79-00-5	1,1,2-Trichloroethane		6	U	UG/KG	2.10E-04	
75-34-3	1,1-Dichloroethane		6	U	UG/KG	2.99E-04	
75-35-4	1,1-Dichloroethene		6	U	UG/KG	7.25E-04	
107-06-2	1,2-Dichloroethane (EDC)		6	U	UG/KG	2.83E-04	
540-59-0	1,2-Dichloroethene (total)		6	U	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		6	U	UG/KG	8.57E-06	
78-93-3	2-Butanone (MEK)		12	U	UG/KG	1.34E-04	
591-78-6	2-Hexanone		12	U	UG/KG	9.52E-04	
108-10-1	4-Methyl-2-pentanone (MIBK)		12	U	UG/KG	2.71E-05	
67-64-1	Acetone		18	U	UG/KG	7.20E-03	
71-43-2	Benzene		6	U	UG/KG	3.75E-04	
75-27-4	Bromodichloromethane		6	U	UG/KG	1.11E-02	
75-25-2	Bromoform		6	U	UG/KG	3.77E-04	
74-83-9	Bromomethane		6	U	UG/KG	2.55E-02	
75-15-0	Carbon disulfide		6	U	UG/KG	6.37E-02	
56-23-5	Carbon tetrachloride		6	U	UG/KG	6.00E-06	
108-90-7	Chlorobenzene		6	U	UG/KG	1.50E-04	
75-00-3	Chloroethane		6	U	UG/KG		
67-66-3	Chloroform		6	U	UG/KG	5.04E-03	
74-87-3	Chloromethane		6	U	UG/KG	5.77E-04	
156-59-2	cis-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-01-5	cis-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
124-48-1	Dibromochloromethane		6	U	UG/KG	2.93E-03	
100-41-4	Ethylbenzene		6	U	UG/KG	1.20E-03	
75-09-2	Methylene chloride		15	U	UG/KG	3.70E-03	
110-54-3	N-Hexane		6	U	UG/KG		
100-42-5	Styrene		6	U	UG/KG	2.00E-05	
127-18-4	Tetrachloroethylene (PCE)		6	U	UG/KG	4.62E-04	
108-88-3	Toluene		6	U	UG/KG	2.00E-03	
1330-20-7	total Xylenes		6	U	UG/KG	1.00E-02	
156-60-5	trans-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-02-6	trans-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
79-01-6	Trichloroethylene (TCE)		6	U	UG/KG	6.67E-04	
75-01-4	Vinyl chloride		6	U	UG/KG	9.29E-03	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		430	U	UG/KG	2.15E-02	
95-50-1	1,2-Dichlorobenzene		430	U	UG/KG	1.45E-01	
541-73-1	1,3-Dichlorobenzene		430	U	UG/KG	1.14E-02	
106-46-7	1,4-Dichlorobenzene		430	U	UG/KG	2.15E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2100	U	UG/KG	5.25E-01	
88-06-2	2,4,6-Trichlorophenol		430	U	UG/KG	4.30E-02	
120-83-2	2,4-Dichlorophenol		430	U	UG/KG	4.91E-03	
105-67-9	2,4-Dimethylphenol		430	U	UG/KG	4.30E+01	
51-28-5	2,4-Dinitrophenol		2100	U	UG/KG	1.05E-01	
91-58-7	2-Chloronaphthalene		430	U	UG/KG	3.53E+01	
95-57-8	2-Chlorophenol		430	U	UG/KG	1.77E+00	
91-57-6	2-Methylnaphthalene		84	J	UG/KG	2.59E-02	YES
95-48-7	2-Methylphenol		430	U	UG/KG	1.06E-02	
88-74-4	2-Nitroaniline		2100	U	UG/KG	2.83E-02	
88-75-5	2-Nitrophenol		430	U	UG/KG	2.69E-01	
91-94-1	3,3'-Dichlorobenzidine		430	U	UG/KG	6.65E-01	
99-09-2	3-Nitroaniline		2100	U	UG/KG	6.65E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2100	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		430	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		430	U	UG/KG	5.41E-02	
106-47-8	4-Chloroaniline		850	U	UG/KG	7.73E-01	
7005-72-3	4-Chlorophenyl phenyl ether		430	U	UG/KG		
106-44-5	4-Methylphenol		430	U	UG/KG	2.64E-03	
100-01-6	4-Nitroaniline		2100	U	UG/KG	9.59E-02	
100-02-7	4-Nitrophenol		2100	U	UG/KG	3.00E-01	
83-32-9	Acenaphthene		430	U	UG/KG	6.30E-04	
208-96-8	Acenaphthylene		430	U	UG/KG	6.30E-04	
120-12-7	Anthracene		430	U	UG/KG	2.91E-04	
56-55-3	Benzo(a)anthracene		430	U	UG/KG	8.25E-02	
50-32-8	Benzo(a)pyrene		430	U	UG/KG	9.77E-05	
205-99-2	Benzo(b)fluoranthene		430	U	UG/KG	7.19E-03	
191-24-2	Benzo(g,h,i)perylene		430	U	UG/KG	3.61E-03	
207-08-9	Benzo(k)fluoranthene		430	U	UG/KG	7.19E-03	
111-91-1	bis(2-Chloroethoxy)methane		430	U	UG/KG	1.42E+00	
111-44-4	bis(2-Chloroethyl) ether		430	U	UG/KG	1.81E-02	
108-60-1	bis(2-Chloroisopropyl) ether		430	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		50	J	UG/KG	5.40E-02	YES
85-68-7	Butyl benzyl phthalate		430	U	UG/KG	1.80E+00	
86-74-8	Carbazole		430	U	UG/KG		
218-01-9	Chrysene		430	U	UG/KG	9.09E-02	
84-74-2	Di-n-butyl phthalate		430	U	UG/KG	2.15E-03	
117-84-0	Di-n-octyl phthalate		430	U	UG/KG	6.06E-04	
53-70-3	Dibenz(a,h)anthracene		430	U	UG/KG	2.34E-02	
132-64-9	Dibenzofuran		430	U	UG/KG		
84-66-2	Diethyl phthalate		430	U	UG/KG	4.30E-03	
131-11-3	Dimethyl phthalate		430	U	UG/KG	2.15E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		430	U	UG/KG	3.52E-03	
86-73-7	Fluorene		430	U	UG/KG	1.43E-02	
118-74-1	Hexachlorobenzene		430	U	UG/KG	4.30E-04	
87-68-3	Hexachlorobutadiene		430	U	UG/KG	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		430	U	UG/KG	4.30E-02	
67-72-1	Hexachloroethane		430	U	UG/KG	7.21E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		430	U	UG/KG	3.94E-03	
78-59-1	Isophorone		430	U	UG/KG	3.09E-03	
621-64-7	N-Nitroso-di-n-propylamine		430	UJ	UG/KG	7.91E-01	
86-30-6	N-Nitrosodiphenylamine		430	U	UG/KG	2.15E-02	
91-20-3	Naphthalene		430	U	UG/KG	1.73E-03	
87-86-5	Pentachlorophenol		2100	U	UG/KG	3.50E-01	
85-01-8	Phenanthrene		49	J	UG/KG	1.07E-03	YES
108-95-2	Phenol		430	U	UG/KG	1.08E-02	
129-00-0	Pyrene		430	U	UG/KG	5.48E-03	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		320	U	UG/KG	8.51E-01	
99-65-0	1,3-Dinitrobenzene		320	U	UG/KG	4.89E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		640	U	UG/KG	2.13E-02	
121-14-2	2,4-Dinitrotoluene		320	U	UG/KG	2.50E-01	
606-20-2	2,6-Dinitrotoluene		620	U	UG/KG	1.89E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		640	U	UG/KG	8.00E-03	
88-72-2	2-Nitrotoluene (ONT)		640	U	UG/KG		
99-08-1	3-Nitrotoluene		640	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		640	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		640	U	UG/KG		
2691-41-0	HMX		640	U	UG/KG	2.56E-02	
98-95-3	Nitrobenzene		320	U	UG/KG	8.00E-03	
121-82-4	RDX		640	U	UG/KG	6.40E-03	
479-45-8	Tetryl		960	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	14400		MG/KG		
7440-36-0	Antimony	0.83	0.76	U	MG/KG	1.52E-01	
7440-38-2	Arsenic	13.5	6.9		MG/KG	7.67E-01	
7440-39-3	Barium	195	132		MG/KG	2.64E-01	
7440-41-7	Beryllium	0.76	0.67		MG/KG	6.70E-02	
7440-42-8	Boron	5.3	13	U	MG/KG	2.60E+01	
7440-43-9	Cadmium	0.19	0.59	J	MG/KG	2.03E-02	
7440-70-2	Calcium	2497	799		MG/KG		
7440-47-3	Chromium	25.2	20.7		MG/KG	4.14E+00	
7440-48-4	Cobalt	21.7	22.8		MG/KG	1.14E+00	
7440-50-8	Copper	11.3	11.3		MG/KG	3.65E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7439-89-6	Iron	19306	21800		MG/KG	1.09E+02	
7439-92-1	Lead	23.4	26.1		MG/KG	6.03E-02	
7439-95-4	Magnesium	1552	1970		MG/KG		
7439-96-5	Manganese	3640	1700		MG/KG	1.70E+01	
7439-97-6	Mercury	0.06	0.038	J	MG/KG	5.43E-03	YES
7440-02-0	Nickel	18.9	17.3		MG/KG	5.77E-01	
2023695	Potassium	625	818		MG/KG		
7782-49-2	Selenium	2.34	0.52	J	MG/KG	5.20E-01	YES
7440-22-4	Silver	0.58	1.3	U	MG/KG	6.50E-01	
7440-23-5	Sodium	170	52.8	J	MG/KG		
7440-28-0	Thallium	0.41	0.57	J	MG/KG	5.70E-01	
7440-62-2	Vanadium	47.2	33.2		MG/KG	7.22E-01	
7440-66-6	Zinc	51.4	56.7		MG/KG	4.73E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 26-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0066

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		640	U	UG/KG	6.96E-02	
95-50-1	1,2-Dichlorobenzene		640	U	UG/KG	1.88E+00	
541-73-1	1,3-Dichlorobenzene		640	U	UG/KG	3.76E-01	
106-46-7	1,4-Dichlorobenzene		640	U	UG/KG	1.83E+00	
95-95-4	2,4,5-Trichlorophenol		3200	U	UG/KG	2.21E+00	
88-06-2	2,4,6-Trichlorophenol		640	U	UG/KG	3.48E+01	
120-83-2	2,4-Dichlorophenol		640	U	UG/KG	1.75E+00	
105-67-9	2,4-Dimethylphenol		640	U	UG/KG	1.42E+01	
51-28-5	2,4-Dinitrophenol		3200	U	UG/KG	2.58E+02	
91-58-7	2-Chloronaphthalene		640	U	UG/KG	1.83E-01	
95-57-8	2-Chlorophenol		640	U	UG/KG	2.89E+00	
91-57-6	2-Methylnaphthalene		370	J	UG/KG	5.29E+00	YES
95-48-7	2-Methylphenol		640	U	UG/KG	1.40E+02	
88-74-4	2-Nitroaniline		3200	U	UG/KG	6.63E-02	
88-75-5	2-Nitrophenol		640	U	UG/KG	2.01E-01	
91-94-1	3,3'-Dichlorobenzidine		640	U	UG/KG	3.20E-01	
99-09-2	3-Nitroaniline		3200	U	UG/KG	5.38E-02	
534-52-1	4,6-Dinitro-2-methylphenol		3200	U	UG/KG	3.82E+02	
101-55-3	4-Bromophenyl phenyl ether		640	U	UG/KG	4.92E-01	
59-50-7	4-Chloro-3-methylphenol		640	U	UG/KG	4.27E+03	
106-47-8	4-Chloroaniline		1300	U	UG/KG	7.93E-02	
7005-72-3	4-Chlorophenyl phenyl ether		640	U	UG/KG	4.66E-01	
106-44-5	4-Methylphenol		640	U	UG/KG	1.60E-01	
100-01-6	4-Nitroaniline		3200	U	UG/KG	8.84E-02	
100-02-7	4-Nitrophenol		3200	U	UG/KG	7.71E+01	
83-32-9	Acenaphthene		640	U	UG/KG	4.00E+01	
208-96-8	Acenaphthylene		640	U	UG/KG	1.45E+01	
120-12-7	Anthracene		640	U	UG/KG	1.12E+01	
56-55-3	Benzo(a)anthracene		160	J	UG/KG	1.48E+00	YES
50-32-8	Benzo(a)pyrene		140	J	UG/KG	9.33E-01	YES
205-99-2	Benzo(b)fluoranthene		220	J	UG/KG	8.15E+00	YES
191-24-2	Benzo(g,h,i)perylene		71	J	UG/KG	4.44E+00	YES
207-08-9	Benzo(k)fluoranthene		73	J	UG/KG	2.70E+00	YES
111-91-1	bis(2-Chloroethoxy)methane		640	U	UG/KG	4.92E-01	
111-44-4	bis(2-Chloroethyl) ether		640	U	UG/KG	2.24E-01	
108-60-1	bis(2-Chloroisopropyl) ether		640	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		100	J	UG/KG	1.33E-01	YES
85-68-7	Butyl benzyl phthalate		640	U	UG/KG	5.82E-02	
86-74-8	Carbazole		640	U	UG/KG	1.94E-01	
218-01-9	Chrysene		180	J	UG/KG	1.08E+00	YES
84-74-2	Di-n-butyl phthalate		640	U	UG/KG	5.82E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
117-84-0	Di-n-octyl phthalate		640	U	UG/KG	9.04E-04	
53-70-3	Dibenz(a,h)anthracene		640	U	UG/KG	1.94E+01	
132-64-9	Dibenzofuran		76	J	UG/KG	3.80E-02	YES
84-66-2	Diethyl phthalate		640	U	UG/KG	1.02E+00	
131-11-3	Dimethyl phthalate		640	U	UG/KG	1.22E-03	
206-44-0	Fluoranthene		150	J	UG/KG	3.55E-01	YES
86-73-7	Fluorene		640	U	UG/KG	8.27E+00	
118-74-1	Hexachlorobenzene		640	U	UG/KG	6.40E+00	
87-68-3	Hexachlorobutadiene		640	U	UG/KG	1.34E+01	
77-47-4	Hexachlorocyclopentadiene		640	U	UG/KG	2.14E+02	
67-72-1	Hexachloroethane		640	U	UG/KG	9.41E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		76	J	UG/KG	4.47E+00	YES
78-59-1	Isophorone		640	U	UG/KG	5.58E-01	
621-64-7	N-Nitroso-di-n-propylamine		640	UJ	UG/KG		
86-30-6	N-Nitrosodiphenylamine		640	U	UG/KG	9.14E-01	
91-20-3	Naphthalene		170	J	UG/KG	9.66E-01	
87-86-5	Pentachlorophenol		3200	U	UG/KG	4.32E+01	
85-01-8	Phenanthrene		160	J	UG/KG	7.84E-01	YES
108-95-2	Phenol		640	U	UG/KG	1.33E+01	
129-00-0	Pyrene		190	J	UG/KG	9.74E-01	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		480	U	UG/KG	1.17E+01	
99-65-0	1,3-Dinitrobenzene		480	U	UG/KG	9.60E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		960	U	UG/KG	1.66E+00	
121-14-2	2,4-Dinitrotoluene		480	U	UG/KG	7.40E-01	
606-20-2	2,6-Dinitrotoluene		640	U	UG/KG	7.47E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		960	U	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		960	U	UG/KG	5.71E-02	
99-08-1	3-Nitrotoluene		960	U	UG/KG	8.07E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		960	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		960	U	UG/KG	5.13E-02	
2691-41-0	HMX		960	U	UG/KG	9.60E+01	
98-95-3	Nitrobenzene		480	U	UG/KG	8.20E-01	
121-82-4	RDX		960	U	UG/KG	4.80E+00	
479-45-8	Tetryl		1400	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	11241	20500		MG/KG	7.88E-01	
7440-36-0	Antimony	1.9	2.3	U	MG/KG	7.67E-01	
7440-38-2	Arsenic	10.3	10.3		MG/KG	1.05E+00	
7440-39-3	Barium	196	241		MG/KG		
7440-41-7	Beryllium	1.6	2.8		MG/KG		
7440-42-8	Boron		2.5	J	MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-43-9	Cadmium	1.6	35.7		MG/KG	3.61E+01	
7440-70-2	Calcium	1448	12900		MG/KG		
7440-47-3	Chromium	17.2	32.8		MG/KG	7.56E-01	
7440-48-4	Cobalt	9.1	39		MG/KG	7.80E-01	
7440-50-8	Copper	16.8	19.4		MG/KG	6.14E-01	
7439-89-6	Iron	20750	86300		MG/KG	4.54E-01	
7439-92-1	Lead	24	28.7	J	MG/KG	8.02E-01	
7439-95-4	Magnesium	1909	8270		MG/KG		
7439-96-5	Manganese	1043	505		MG/KG	8.02E-01	
7439-97-6	Mercury	0.15	0.048	J	MG/KG	2.67E-01	YES
7440-02-0	Nickel	16.9	65.6		MG/KG	2.89E+00	
2023695	Potassium	1421	1640		MG/KG		
7782-49-2	Selenium	0.64	0.64	J	MG/KG		YES
7440-22-4	Silver	3	1.9	U	MG/KG	1.90E+00	
7440-23-5	Sodium	1450	107	J	MG/KG		
7440-28-0	Thallium	0.31	0.77	J	MG/KG		
7440-62-2	Vanadium	28	41.1		MG/KG		
7440-66-6	Zinc	57.1	447		MG/KG	3.69E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-11
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		1	U	UG/L	9.09E-02	
79-34-5	1,1,2,2-Tetrachloroethane		1	U	UG/L	4.17E-03	
79-00-5	1,1,2-Trichloroethane		1	U	UG/L	1.06E-03	
75-34-3	1,1-Dichloroethane		1	U	UG/L	2.13E-02	
75-35-4	1,1-Dichloroethene		1	U	UG/L	4.00E-02	
107-06-2	1,2-Dichloroethane (EDC)		1	U	UG/L	1.10E-03	
78-87-5	1,2-Dichloropropane		1	U	UG/L	1.90E-03	
78-93-3	2-Butanone (MEK)		5	U	UG/L	3.57E-04	
591-78-6	2-Hexanone		5	U	UG/L	5.05E-02	
108-10-1	4-Methyl-2-pentanone (MIBK)		5	U	UG/L	2.94E-02	
67-64-1	Acetone		9	U	UG/L	1.78E-02	
71-43-2	Benzene		1	U	UG/L	2.17E-02	
75-27-4	Bromodichloromethane		1	U	UG/L	6.57E-05	
75-25-2	Bromoform		1	U	UG/L	3.41E-03	
74-83-9	Bromomethane		1	U	UG/L	1.48E-05	
75-15-0	Carbon disulfide		1	U	UG/L	1.09E+00	
56-23-5	Carbon tetrachloride		1	U	UG/L	1.02E-01	
108-90-7	Chlorobenzene		1	U	UG/L	1.56E-02	
75-00-3	Chloroethane		1	U	UG/L	4.75E-05	
67-66-3	Chloroform		1	U	UG/L	3.57E-02	
74-87-3	Chloromethane		1	U	UG/L	1.48E-05	
156-59-2	cis-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-01-5	cis-1,3-Dichloropropene		1	U	UG/L	1.82E+01	
124-48-1	Dibromochloromethane		1	U	UG/L	6.85E-05	
100-41-4	Ethylbenzene		1	U	UG/L	1.37E-01	
75-09-2	Methylene chloride		1	U	UG/L	5.18E-04	
110-54-3	N-Hexane		1	U	UG/L		
100-42-5	Styrene		1	U	UG/L	2.49E-04	
127-18-4	Tetrachloroethylene (PCE)		1	U	UG/L	1.19E-02	
108-88-3	Toluene		1	U	UG/L	1.02E-01	
1330-20-7	total Xylenes		1	U	UG/L	5.56E-01	
156-60-5	trans-1,2-Dichloroethene		1	U	UG/L	1.69E-03	
10061-02-6	trans-1,3-Dichloropropene		1	U	UG/L	4.10E-02	
79-01-6	Trichloroethylene (TCE)		1	U	UG/L	2.13E-02	
75-01-4	Vinyl chloride		1	U	UG/L	5.48E-05	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		10	U	UG/L	2.23E-01	
95-50-1	1,2-Dichlorobenzene		10	U	UG/L	7.14E-01	
541-73-1	1,3-Dichlorobenzene		10	U	UG/L	1.99E-01	
106-46-7	1,4-Dichlorobenzene		10	U	UG/L	8.93E-01	
95-95-4	2,4,5-Trichlorophenol		50	U	UG/L	7.94E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-11
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
88-06-2	2,4,6-Trichlorophenol		10	U	UG/L	3.13E+00	
120-83-2	2,4-Dichlorophenol		10	U	UG/L	2.74E-01	
105-67-9	2,4-Dimethylphenol		10	U	UG/L	4.72E-01	
51-28-5	2,4-Dinitrophenol		50	U	UG/L	8.06E+00	
91-58-7	2-Chloronaphthalene		10	U	UG/L	3.23E-02	
95-57-8	2-Chlorophenol		10	U	UG/L	2.28E-01	
91-57-6	2-Methylnaphthalene		10	U	UG/L	2.40E-02	
95-48-7	2-Methylphenol		10	U	UG/L	7.69E-01	
88-74-4	2-Nitroaniline		50	U	UG/L	2.16E-03	
88-75-5	2-Nitrophenol		10	U	UG/L	2.90E-03	
91-94-1	3,3'-Dichlorobenzidine		20	U	UG/L	1.90E-01	
99-09-2	3-Nitroaniline		50	U	UG/L	7.32E-04	
534-52-1	4,6-Dinitro-2-methylphenol		50	U	UG/L	2.17E+01	
101-55-3	4-Bromophenyl phenyl ether		10	U	UG/L	6.67E+00	
59-50-7	4-Chloro-3-methylphenol		10	U	UG/L	3.33E+01	
106-47-8	4-Chloroaniline		20	U	UG/L	8.89E-03	
7005-72-3	4-Chlorophenyl phenyl ether		10	U	UG/L	2.17E-01	
106-44-5	4-Methylphenol		10	U	UG/L	4.44E-03	
100-01-6	4-Nitroaniline		50	U	UG/L	1.08E-03	
100-02-7	4-Nitrophenol		50	U	UG/L	6.04E-01	
83-32-9	Acenaphthene		10	U	UG/L	5.88E-01	
208-96-8	Acenaphthylene		10	U	UG/L	1.50E-02	
120-12-7	Anthracene		10	U	UG/L	1.67E+00	
56-55-3	Benzo(a)anthracene		10	U	UG/L	3.70E+02	
50-32-8	Benzo(a)pyrene		10	U	UG/L	7.14E+02	
205-99-2	Benzo(b)fluoranthene		10	U	UG/L	1.79E+03	
191-24-2	Benzo(g,h,i)perylene		10	U	UG/L	1.31E+00	
207-08-9	Benzo(k)fluoranthene		10	U	UG/L	1.79E+03	
111-91-1	bis(2-Chloroethoxy)methane		10	U	UG/L	1.56E-03	
111-44-4	bis(2-Chloroethyl) ether		10	U	UG/L	4.20E-03	
108-60-1	bis(2-Chloroisopropyl) ether		10	U	UG/L		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		10	U	UG/L	3.33E+00	
85-68-7	Butyl benzyl phthalate		10	U	UG/L	5.26E-01	
86-74-8	Carbazole		10	U	UG/L	1.12E-02	
218-01-9	Chrysene		10	U	UG/L	6.25E-01	
84-74-2	Di-n-butyl phthalate		10	U	UG/L	1.06E+00	
117-84-0	Di-n-octyl phthalate		10	U	UG/L	1.41E-02	
53-70-3	Dibenz(a,h)anthracene		10	U	UG/L	6.25E+03	
132-64-9	Dibenzofuran		10	U	UG/L	2.70E+00	
84-66-2	Diethyl phthalate		10	U	UG/L	4.76E-02	
131-11-3	Dimethyl phthalate		10	U	UG/L	3.03E-02	
206-44-0	Fluoranthene		10	U	UG/L	1.23E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-11
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
86-73-7	Fluorene		10	U	UG/L	2.56E+00	
118-74-1	Hexachlorobenzene		10	U	UG/L	2.72E+00	
87-68-3	Hexachlorobutadiene		10	U	UG/L	1.08E+01	
77-47-4	Hexachlorocyclopentadiene		10	U	UG/L	1.43E+02	
67-72-1	Hexachloroethane		10	U	UG/L	1.02E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		10	U	UG/L	2.32E+00	
78-59-1	Isophorone		10	U	UG/L	8.55E-03	
621-64-7	N-Nitroso-di-n-propylamine		10	U	UG/L		
86-30-6	N-Nitrosodiphenylamine		10	U	UG/L	1.71E-01	
91-20-3	Naphthalene		10	U	UG/L	8.33E-01	
87-86-5	Pentachlorophenol		50	U	UG/L	3.33E+00	
85-01-8	Phenanthrene		10	U	UG/L	1.59E+00	
108-95-2	Phenol	10	10	U	UG/L	1.00E-01	
129-00-0	Pyrene		10	U	UG/L	1.64E-01	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		0.25	U	UG/L	8.33E-03	
99-65-0	1,3-Dinitrobenzene		0.25	U	UG/L	1.25E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		0.5	U	UG/L	1.25E-02	
121-14-2	2,4-Dinitrotoluene		0.25	U	UG/L	1.09E-03	
606-20-2	2,6-Dinitrotoluene		0.5	U	UG/L	1.19E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene		0.5	U	UG/L	2.50E-02	
88-72-2	2-Nitrotoluene (ONT)		0.5	U	UG/L	6.85E-05	
99-08-1	3-Nitrotoluene		0.5	UJ	UG/L	6.02E-05	
19406-51-0	4-Amino-2,6-Dinitrotoluene		0.5	U	UG/L	9.26E-04	
99-99-0	4-Nitrotoluene (PNT)		0.5	U	UG/L	7.14E-05	
2691-41-0	HMX		0.5	U	UG/L	1.52E-03	
98-95-3	Nitrobenzene		0.25	UJ	UG/L	9.26E-04	
121-82-4	RDX		0.5	U	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	U	UG/L		
Metals							
7429-90-5	Aluminum	200	55500		UG/L	6.38E+02	
7440-36-0	Antimony	6	6	U	UG/L	2.00E-01	
7440-38-2	Arsenic	10	18.3		UG/L	9.63E-02	
7440-39-3	Barium	22.7	261		UG/L	5.22E-02	
7440-41-7	Beryllium	5	16.5		UG/L	3.11E+01	
7440-42-8	Boron		100	U	UG/L	1.00E-01	
7440-43-9	Cadmium	5	33.9		UG/L	3.08E+01	
7440-70-2	Calcium	7197	76700		UG/L	6.61E-01	
7440-47-3	Chromium	10	29.1		UG/L	1.41E-01	
7440-48-4	Cobalt	50	278		UG/L	1.21E+02	
7440-50-8	Copper	10	40.1		UG/L	3.40E+00	
7439-89-6	Iron	100	346000		UG/L	3.46E+02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-11
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AUS-0066**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (Surface Water)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ)	Retained as Potential Bioaccumulator
7439-92-1	Lead	2	48.4		UG/L	2.41E+00	
7439-95-4	Magnesium	2534	64300		UG/L	7.84E-01	
7439-96-5	Manganese	582	6850		UG/L	6.85E+00	
7439-97-6	Mercury	0.2	0.073	J	UG/L	5.62E-02	YES
7440-02-0	Nickel	10	425		UG/L	4.25E-01	
2023695	Potassium	1613	5070		UG/L	9.57E-02	
7782-49-2	Selenium	2.7	7.6		UG/L	7.60E-03	YES
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	27500		UG/L	4.04E-02	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	76.8		UG/L	4.04E+00	
7440-66-6	Zinc	20	2240		UG/L	2.24E+00	
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	30.7	44.1		MG/L		
7664-41-7	Nitrogen, Ammonia (as N)	0.26	0.28		MG/L		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	0.2		MG/L		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 26-12, AUS-0066
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	No	C	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	No	C	NA	NA	NA	NA	Uncertainty	B
1,1-Dichloroethane	No	C	NA	NA	NA	NA	No	A
1,1-Dichloroethene	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	C	NA	NA	NA	NA	Uncertainty	B
2-Butanone (MEK)	No	C	NA	NA	NA	NA	No	A
2-Hexanone	No	C	NA	NA	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	No	C	NA	NA	NA	NA	No	A
Acetone	No	C	NA	NA	NA	NA	No	A
Benzene	No	A	NA	NA	NA	NA	Uncertainty	B
Bromodichloromethane	No	C	NA	NA	NA	NA	No	A
Bromoform	No	C	NA	NA	NA	NA	No	A
Bromomethane	No	C	NA	NA	NA	NA	No	A
Carbon disulfide	No	C	NA	NA	NA	NA	No	A
Carbon tetrachloride	No	C	NA	NA	NA	NA	Uncertainty	B
Chlorobenzene	No	C	NA	NA	NA	NA	No	A
Chloroethane	No	C	NA	NA	NA	NA	No	A
Chloroform	No	C	NA	NA	NA	NA	No	A
Chloromethane	No	C	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	No	C	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	No	C	NA	NA	NA	NA	No	A
Dibromochloromethane	No	C	NA	NA	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	NA	NA	No	A
Methylene chloride	No	A	NA	NA	NA	NA	Uncertainty	B
n-Hexane	No	C	NA	NA	NA	NA	No	A
Styrene	No	C	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	No	C	NA	NA	NA	NA	Uncertainty	B
Toluene	No	A	NA	NA	NA	NA	No	A
total Xylenes	No	A	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	No	C	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	No	C	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	No	C	NA	NA	NA	NA	Uncertainty	B
Vinyl chloride	No	C	NA	NA	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	NA	NA	No	A	No	A
1,3-Dichlorobenzene	No	C	NA	NA	No	A	No	A
1,4-Dichlorobenzene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	NA	NA	No	A	No	A

**TABLE 26-12, AUS-0066
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	NA	NA	No	A	No	A
2-Chlorophenol	No	C	NA	NA	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	No	A	NA	NA	No	F	No	F
2-Methylphenol	No	C	NA	NA	No	A	No	A
2-Nitroaniline	No	C	NA	NA	No	A	No	A
2-Nitrophenol	No	C	NA	NA	No	A	No	A
3,3'-Dichlorobenzidine	No	C	NA	NA	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	NA	NA	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	NA	NA	No	C	No	C
4-Bromophenyl phenyl ether	No	C	NA	NA	No	C	No	C
4-Chloro-3-methylphenol	No	C	NA	NA	No	A	No	A
4-Chloroaniline	No	C	NA	NA	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	NA	NA	No	C	No	C
4-Methylphenol	No	C	NA	NA	No	A	No	A
4-Nitroaniline	No	C	NA	NA	No	A	No	A
4-Nitrophenol	No	C	NA	NA	No	A	No	A
Acenaphthene	No	C	NA	NA	No	A	No	A
Acenaphthylene	No	A	NA	NA	No	A	No	A
Anthracene	No	A	NA	NA	No	A	No	A
Benzo(a)anthracene	Uncertainty	B	NA	NA	Yes	E	Uncertainty	B
Benzo(a)pyrene	Uncertainty	B	NA	NA	No	F	Uncertainty	B
Benzo(b)fluoranthene	Uncertainty	B	NA	NA	Yes	E	Uncertainty	B
Benzo(g,h,i)perylene	No	A	NA	NA	No	F	No	A
Benzo(k)fluoranthene	No	C	NA	NA	No	F	No	A
bis(2-Chloroethoxy)methane	No	C	NA	NA	No	C	No	C
bis(2-Chloroethyl) ether	No	C	NA	NA	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	NA	NA	No	A	No	A
bis(2-Ethylhexyl) phthalate	No	C	NA	NA	No	F	No	F
Butyl benzyl phthalate	No	C	NA	NA	No	A	No	A
Carbazole	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Chrysene	Uncertainty	B	NA	NA	No	F	No	A
Di-n-butyl phthalate	No	C	NA	NA	No	A	No	A
Di-n-octyl phthalate	No	C	NA	NA	No	A	No	A
Dibenz(a,h)anthracene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Dibenzofuran	No	C	NA	NA	No	F	No	A
Diethyl phthalate	No	C	NA	NA	No	A	No	A
Dimethyl phthalate	No	C	NA	NA	No	A	No	A
Fluoranthene	No	A	NA	NA	No	F	No	A

**TABLE 26-12, AUS-0066
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	No	A	NA	NA	No	A	No	A
Hexachlorobenzene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	NA	NA	No	A	No	A
Hexachloroethane	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	NA	NA	No	F	No	A
Isophorone	No	C	NA	NA	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	NA	NA	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Naphthalene	No	C	NA	NA	No	F	No	A
Pentachlorophenol	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Phenanthrene	No	A	NA	NA	No	F	No	F
Phenol	No	A	NA	NA	No	A	No	A
Pyrene	No	A	NA	NA	No	F	No	A
Metals and Inorganics								
Aluminum	Uncertainty	G	NA	NA	No	F	No	F
Antimony	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Arsenic	Uncertainty	G	NA	NA	Yes	D	Yes	D
Barium	No	F	NA	NA	Yes	E	Yes	D
Beryllium	Uncertainty	G	NA	NA	Yes	E	No	F
Boron	No	A	NA	NA	No	F	No	A
Cadmium	Uncertainty	G	NA	NA	Yes	E	Yes	E
Calcium	No	H	NA	NA	No	H	No	H
Chromium	Uncertainty	G	NA	NA	Yes	E	Yes	D
Cobalt	Uncertainty	G	NA	NA	No	F	No	F
Copper	Uncertainty	G	NA	NA	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	NA	NA	No	F	No	F
Lead	Uncertainty	G	NA	NA	No	F	No	F
Magnesium	No	H	NA	NA	No	H	No	H
Manganese	Yes	E	NA	NA	No	F	No	F
Mercury	Yes	D	NA	NA	No	F	No	F
Nickel	No	F	NA	NA	Yes	E	Yes	D
Potassium	No	H	NA	NA	No	H	No	H
Selenium	No	F	NA	NA	Yes	D	Yes	D
Silver	Uncertainty	B	NA	NA	Uncertainty	B	No	A
Sodium	No	H	NA	NA	No	H	No	H
Thallium	No	C	NA	NA	No	F	No	F
Vanadium	Uncertainty	G	NA	NA	No	F	No	F
Zinc	Yes	E	NA	NA	No	F	No	F
Explosives								
1,3,5-Trinitrobenzene	No	C	NA	NA	No	A	No	A
1,3-Dinitrobenzene	No	C	NA	NA	No	A	No	A

TABLE 26-12, AUS-0066
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	C	NA	NA	No	A	No	A
2,4-Dinitrotoluene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2,6-Dinitrotoluene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	C	NA	NA	No	C	No	C
2-Nitrotoluene (ONT)	No	C	NA	NA	No	C	No	C
3-Nitrotoluene	No	C	NA	NA	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	NA	NA	No	C	No	C
4-Nitrotoluene (PNT)	No	C	NA	NA	No	A	No	A
HMX	No	C	NA	NA	No	A	No	A
Nitrobenzene	No	C	NA	NA	Uncertainty	B	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	NA	NA	No	A	No	A
Tetryl	No	C	NA	NA	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	Uncertainty	G	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 26-13, AUS-0066
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	A	NA	NA	No	A
1,1,2-Trichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethane	No	A	NA	NA	No	A
1,1-Dichloroethene	No	A	NA	NA	No	A
1,2-Dichloroethane (EDC)	No	A	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	A	NA	NA	No	A
2-Butanone (MEK)	No	A	NA	NA	No	A
2-Hexanone	No	A	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	No	A	NA	NA	No	A
Acetone	No	A	NA	NA	No	A
Benzene	No	A	NA	NA	No	A
Bromodichloromethane	No	A	NA	NA	No	A
Bromoform	No	A	NA	NA	No	A
Bromomethane	No	A	NA	NA	No	A
Carbon disulfide	Uncertainty	B	NA	NA	No	A
Carbon tetrachloride	No	A	NA	NA	No	A
Chlorobenzene	No	A	NA	NA	No	A
Chloroethane	No	A	NA	NA	No	C
Chloroform	No	A	NA	NA	No	A
Chloromethane	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	No	A	NA	NA	No	A
cis-1,3-Dichloropropene	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	A	NA	NA	No	A
Ethylbenzene	No	A	NA	NA	No	A
Methylene chloride	No	A	NA	NA	No	A
N-Hexane	No	C	NA	NA	No	C
Styrene	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	No	A	NA	NA	No	A
Toluene	No	A	NA	NA	No	A
total Xylenes	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	No	A	NA	NA	No	A
Trichloroethylene (TCE)	No	A	NA	NA	No	A
Vinyl chloride	No	A	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	No	A	No	A	No	A
1,2-Dichlorobenzene	No	A	Uncertainty	B	No	A
1,3-Dichlorobenzene	No	A	No	A	No	A
1,4-Dichlorobenzene	No	A	Uncertainty	B	No	A
2,4,5-Trichlorophenol	No	A	Uncertainty	B	No	A

TABLE 26-13, AUS-0066
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	Uncertainty	B	Uncertainty	B	No	A
2,4-Dichlorophenol	No	A	Uncertainty	B	No	A
2,4-Dimethylphenol	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B	Uncertainty	B	No	A
2-Chloronaphthalene	No	A	No	A	Uncertainty	B
2-Chlorophenol	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	No	A	Yes	E	Yes	E
2-Methylphenol	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	A	No	A	No	A
2-Nitrophenol	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	A	No	A	No	A
3-Nitroaniline	No	A	No	A	No	A
4,6-Dinitro-2-methylphenol	Uncertainty	B	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	Uncertainty	B	No	A	No	C
4-Chloro-3-methylphenol	Uncertainty	B	Uncertainty	B	No	A
4-Chloroaniline	No	A	No	A	No	A
4-Chlorophenyl phenyl ether	No	A	No	A	No	C
4-Methylphenol	No	A	No	A	No	A
4-Nitroaniline	No	A	No	A	No	A
4-Nitrophenol	No	A	Uncertainty	B	No	A
Acenaphthene	No	A	Uncertainty	B	No	A
Acenaphthylene	No	A	Uncertainty	B	No	A
Anthracene	Uncertainty	B	Uncertainty	B	No	A
Benzo(a)anthracene	Uncertainty	B	Yes	E	No	A
Benzo(a)pyrene	Uncertainty	B	Yes	E	No	A
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	No	A
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	No	A
Benzo(k)fluoranthene	Uncertainty	B	Yes	E	No	A
bis(2-Chloroethoxy)methane	No	A	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	No	A	No	A	No	A
bis(2-Chloroisopropyl) ether	No	C	No	C	No	C
bis(2-Ethylhexyl) phthalate	Uncertainty	B	Yes	E	Yes	E
Butyl benzyl phthalate	No	A	No	A	Uncertainty	B
Carbazole	No	A	No	A	No	C
Chrysene	No	A	Yes	E	No	A
Di-n-butyl phthalate	Uncertainty	B	No	A	No	A
Di-n-octyl phthalate	No	A	No	A	No	A
Dibenz(a,h)anthracene	Uncertainty	B	Uncertainty	B	No	A
Dibenzofuran	Uncertainty	B	Yes	E	No	C
Diethyl phthalate	No	A	Uncertainty	B	No	A
Dimethyl phthalate	No	A	No	A	No	A
Fluoranthene	Uncertainty	B	Yes	E	No	A

TABLE 26-13, AUS-0066
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobenzene	Uncertainty	B	Uncertainty	B	No	A
Hexachlorobutadiene	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	Uncertainty	B	Uncertainty	B	No	A
Hexachloroethane	Uncertainty	B	Uncertainty	B	No	A
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Yes	E	No	A
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	No	A
N-Nitrosodiphenylamine	No	A	No	A	No	A
Naphthalene	No	A	No	F	No	A
Pentachlorophenol	Uncertainty	B	Uncertainty	B	No	A
Phenanthrene	Uncertainty	B	Yes	E	Yes	E
Phenol	No	A	Uncertainty	B	No	A
Pyrene	No	A	Yes	E	No	A
Metals and Inorganics						
Aluminum	Yes	E	No	F	Uncertainty	I
Antimony	No	A	No	A	No	A
Arsenic	No	F	Yes	E	No	F
Barium	No	F	Uncertainty	G	No	F
Beryllium	Yes	E	Uncertainty	G	No	F
Boron	No	A	Uncertainty	G	Uncertainty	B
Cadmium	Yes	E	Yes	E	No	F
Calcium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	No	F	Yes	D
Cobalt	Yes	E	No	F	Yes	E
Copper	Yes	E	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	Yes	E
Lead	Yes	E	No	F	No	F
Magnesium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	Yes	E	No	F	Yes	D
Mercury	Yes	D	Yes	D	Yes	D
Nickel	No	F	Yes	E	No	F
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	Yes	E	Uncertainty	G	Yes	D
Silver	Uncertainty	B	Uncertainty	B	No	A
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Uncertainty	B	Uncertainty	G	No	F
Vanadium	Yes	E	Uncertainty	G	No	F
Zinc	Yes	E	Yes	E	No	F
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	No	A
1,3-Dinitrobenzene	No	A	Uncertainty	B	No	A

**TABLE 26-13, AUS-0066
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	No	A	Uncertainty	B	No	A
2,4-Dinitrotoluene	No	A	No	A	No	A
2,6-Dinitrotoluene	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	No	A	No	C	No	A
2-Nitrotoluene (ONT)	No	A	No	A	No	C
3-Nitrotoluene	No	A	No	A	No	C
4-Amino-2,6-Dinitrotoluene	No	A	No	C	No	C
4-Nitrotoluene (PNT)	No	A	No	A	No	C
HMX	No	A	Uncertainty	B	No	A
Nitrobenzene	No	A	No	A	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	Uncertainty	B	No	A
Tetryl	No	C	No	C	No	C

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 26-14
AUS-0066 - FORMER EMMA OU SITE COC-14
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum ¹	Soil	Sediment	Ground Water	Surface Water
SVOCs					
2-Methylnaphthalene		E	E	NA	
Benzo(a)anthracene			H,E	NA	
Benzo(a)pyrene			E	NA	
Benzo(b)fluoranthene			H,E	NA	
Benzo(g,h,i)perylene			E	NA	
Benzo(k)fluoranthene			E	NA	
bis(2-Ethylhexyl)phthalate (DEHP)		E	E	NA	
Chrysene			E	NA	
Dibenzofuran			E	NA	
Fluoranthene			E	NA	
Indeno(1,2,3-c,d)pyrene			E	NA	
Phenanthrene		E	E	NA	
Pyrene			E	NA	
Metals					
Aluminum				NA	E
Arsenic			E	NA	
Barium			H	NA	
Beryllium			H	NA	E
Cadmium		H	H,E	NA	E
Chromium			H	NA	
Cobalt		E		NA	E
Copper				NA	E
Iron		E		NA	H,E
Lead				NA	E
Manganese				NA	H,E
Nickel			H,E	NA	
Selenium				NA	E
Vanadium				NA	E
Zinc			E	NA	H,E

Key:

¹ Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-0066\FIG26-1.DWG Last edited: 09/24/01 @ 08:36 a.m. WC-ST.LOUIS, MO

AUS-0066-002						
	Units	Result:	Reference	Result:	Reference	Result:
		0 - 6 In	Code	2 ft	Code	4 ft
Volatile Organic Compounds						
All VOCs	UG/KG	NA		ND		NA
Semivolatile Organic Compounds						
All SVOCs	UG/KG			NA		NA
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	50	e5			
Explosives						
All Explosives	UG/KG	ND		ND		ND

AUS-0066-001						
	Units	Result:	Reference	Result:	Reference	Result:
		0 - 6 In	Code	2 ft	Code	4 ft
Volatile Organic Compounds						
All VOCs	UG/KG	NA		ND		NA
Semivolatile Organic Compounds						
All SVOCs	UG/KG	ND		NA		NA
Explosives						
All Explosives	UG/KG	ND		ND		ND

AUS-0066-003			
	Units	Result:	Reference
		0 - 6 In	Code
Sediment			
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	370	e2,e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	100	e5
Dibenzofuran	UG/KG	76	e5
Naphthalene	UG/KG	170	
Phenanthrene	UG/KG	160	e5
Pyrene	UG/KG	65	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0066-005				
	Units	Result:	Reference	Result:
		0 - 6 In	Code	2 ft
Volatile Organic Compounds				
All VOCs	UG/KG	NA		ND
Semivolatile Organic Compounds				
All SVOCs	UG/KG			NA
2-Methylnaphthalene	UG/KG	84	e5	
Phenanthrene	UG/KG	49	e5	
Explosives				
All Explosives	UG/KG	ND		NA

AUS-0066-006			
	Units	Result:	Reference
		0 - 6 In	Code
Sediment			
Semivolatile Organic Compounds			
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	61	e5
Explosives			
All Explosives	UG/KG	ND	

AUS-0066-007			
	Units	Result:	Reference
		0 - 6 In	Code
Sediment			
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0066-008					
	Units	Result:	Reference	Result:	Reference
		0 - 6 In	Code	2 ft	Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	49	e5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0066-004			
	Units	Result:	Reference
		0 - 6 In	Code
Sediment			
Semivolatile Organic Compounds			
2-Methylnaphthalene	UG/KG	210	e2,e5
Benzo(a)anthracene	UG/KG	160	e2,e5,e5
Benzo(a)pyrene	UG/KG	140	e5
Benzo(b)fluoranthene	UG/KG	220	e2,e5,e5
Benzo(k)fluoranthene	UG/KG	71	e2,e5
Benzo(a)fluoranthene	UG/KG	73	e2,e5
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	55	e5
Chrysene	UG/KG	180	e2,e5
Dibenzofuran	UG/KG	58	e5
Fluoranthene	UG/KG	150	e5
Indene(1,2,3-c)pyrene	UG/KG	76	e2,e5
Naphthalene	UG/KG	86	
Phenanthrene	UG/KG	110	e5
Pyrene	UG/KG	190	e5
Explosives			
All Explosives	UG/KG	ND	

LEGEND

- ⊕ HAND AUGER LOCATIONS
- 1998 USEPA SAMPLE LOCATIONS
- DITCHLINE
- ▨ DEPRESSION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
EPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulato)	e5
USEPA Region IX Industrial Soil PRG - carcinous	h1
USEPA Region IX Industrial Soil PRG - noncarcinous	h2
USEPA Region IX Tap Water PRG - carcinous	h3
USEPA Region IX Tap Water PRG - noncarcinous	h4
(USEPA Region IX Migration to Groundwater PRG (DAF=1))	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

3 STRAND BARB WIRE FENCE

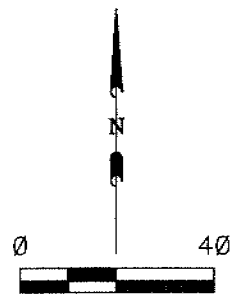
CONTAMINATED AREA SIGN

COC AREA ROAD (ABANDONED)

TO INTERSECTION →

NOTES:

1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.
4. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.



377250
766750

AUS-0066-FORMER EMMA OU SITE COC-14

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY:djd 12/16/00 DSGN. BY:mam CHKD. BY:mch/cmw	AUS-0066 Sample Locations and Detections of Organic Compounds in Soils/Sediments
FIG. NO. 26-1	

AUS-0066-001			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	7730	
Arsenic	MG/KG	4.2	h1,h5,h7
Barium	MG/KG	72.5	
Beryllium	MG/KG	0.57	
Calcium	MG/KG	246	
Chromium	MG/KG	11.4	e1,h5
Cobalt	MG/KG	11.4	
Copper	MG/KG	5.6	
Iron	MG/KG	11500	e1
Lead	MG/KG	13.4	
Magnesium	MG/KG	882	
Manganese	MG/KG	1160	e1
Mercury	MG/KG	0.028	e5
Nickel	MG/KG	10.6	h5
Potassium	MG/KG	599	
Sodium	MG/KG	30.9	
Thallium	MG/KG	0.57	b1
Vanadium	MG/KG	21.7	
Zinc	MG/KG	31.6	

AUS-0066-003			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	13500	b2
Arsenic	MG/KG	10.3	e2,h1,h5,h7
Barium	MG/KG	73.5	
Beryllium	MG/KG	2.8	b2,h7
Boron	MG/KG	1.8	
Cadmium	MG/KG	3.8	b2,e2,h5,h9
Calcium	MG/KG	12900	b2
Chromium	MG/KG	32.8	b2,h5,h9
Cobalt	MG/KG	39	b2
Copper	MG/KG	9.8	
Iron	MG/KG	86300	b2
Lead	MG/KG	20.8	
Magnesium	MG/KG	8270	b2
Manganese	MG/KG	505	
Mercury	MG/KG	0.037	e5
Nickel	MG/KG	65.6	b2,e2,h5
Potassium	MG/KG	523	
Sodium	MG/KG	86.8	
Vanadium	MG/KG	37.9	b2
Zinc	MG/KG	325	b2,e2

BERM WITH RED CLAY BRICKS

AUS-0066-005			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	7250	
Arsenic	MG/KG	5.9	h1,h5,h7
Barium	MG/KG	70.7	
Beryllium	MG/KG	0.42	
Cadmium	MG/KG	0.59	b2,h5
Calcium	MG/KG	705	
Chromium	MG/KG	10.6	e1,h5
Cobalt	MG/KG	7.4	
Copper	MG/KG	9.4	
Iron	MG/KG	12400	e1
Lead	MG/KG	17.9	
Magnesium	MG/KG	1220	
Manganese	MG/KG	1380	e1
Mercury	MG/KG	0.035	e5
Nickel	MG/KG	10	h5
Potassium	MG/KG	747	b1
Sodium	MG/KG	37	
Vanadium	MG/KG	20.9	
Zinc	MG/KG	44.7	

AUS-0066-007			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	14700	b2
Arsenic	MG/KG	2.5	h5
Barium	MG/KG	88.6	h5
Beryllium	MG/KG	0.88	
Boron	MG/KG	2.1	
Calcium	MG/KG	993	
Chromium	MG/KG	18.3	b2,h5
Cobalt	MG/KG	4.2	
Copper	MG/KG	19.4	b2
Iron	MG/KG	9690	
Lead	MG/KG	28.2	b2
Magnesium	MG/KG	2550	b2
Manganese	MG/KG	115	
Mercury	MG/KG	0.038	e5
Nickel	MG/KG	21.2	b2,h5
Potassium	MG/KG	1270	
Selenium	MG/KG	0.45	e5,h5
Sodium	MG/KG	107	
Thallium	MG/KG	0.77	b2
Vanadium	MG/KG	24.7	
Zinc	MG/KG	66.8	b2

LEGEND

- ⊕ HAND AUGER LOCATIONS
- 1998 USEPA SAMPLE LOCATIONS
- DITCHLINE
- ▨ DEPRESSION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grass Background Sediment UTL	b2
Little Grass Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
EPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IIEPA TACO Industrial/Commercial Soil Ingestion	h7
IIEPA TACO Construction Worker Soil Ingestion	h8
IIEPA TACO Class I Soil Component of Groundwater	h9
IIEPA General Use Surface Water Quality Human Health	h10

3 STRAND BARB WIRE FENCE

CONTAMINATED AREA SIGN

COC AREA ROAD (ABANDONED)

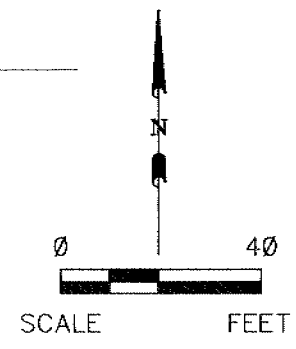
TO INTERSECTION →

AUS-0066-008			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	10100	
Arsenic	MG/KG	6.8	h1,h5,h7
Barium	MG/KG	75.1	
Beryllium	MG/KG	0.62	
Calcium	MG/KG	744	
Chromium	MG/KG	18.5	e1,h5
Cobalt	MG/KG	19.9	
Copper	MG/KG	8.6	
Iron	MG/KG	19700	b1,e1
Lead	MG/KG	26.1	b1
Magnesium	MG/KG	1180	
Manganese	MG/KG	1180	e1
Mercury	MG/KG	0.028	e5
Nickel	MG/KG	13.4	h5
Potassium	MG/KG	701	b1
Selenium	MG/KG	0.52	e5,h5
Sodium	MG/KG	35.9	
Vanadium	MG/KG	31.1	
Zinc	MG/KG	41.4	

AUS-0066-002			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	14400	
Arsenic	MG/KG	6.9	h1,h5,h7
Barium	MG/KG	132	h5
Beryllium	MG/KG	0.67	
Calcium	MG/KG	799	
Chromium	MG/KG	20.7	e1,h5
Cobalt	MG/KG	22.8	b1,e1
Copper	MG/KG	11.3	
Iron	MG/KG	21800	b1,e1
Lead	MG/KG	20.1	
Magnesium	MG/KG	1970	b1
Manganese	MG/KG	1700	e1
Mercury	MG/KG	0.038	e5
Nickel	MG/KG	17.3	h5
Potassium	MG/KG	818	b1
Selenium	MG/KG	0.39	e5,h5
Sodium	MG/KG	52.8	
Vanadium	MG/KG	33.2	
Zinc	MG/KG	56.7	b1

AUS-0066-004			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	20500	b2
Arsenic	MG/KG	8.7	h1,h5,h7
Barium	MG/KG	74.4	
Beryllium	MG/KG	2.1	b2,h7
Boron	MG/KG	1.9	
Cadmium	MG/KG	35.7	b2,e2,h5,h9
Calcium	MG/KG	940	
Chromium	MG/KG	17.9	b2,h5
Cobalt	MG/KG	9.5	b2
Copper	MG/KG	12.9	
Iron	MG/KG	29500	b2
Lead	MG/KG	22.7	
Magnesium	MG/KG	1380	
Manganese	MG/KG	195	
Mercury	MG/KG	0.025	e5
Nickel	MG/KG	27.9	b2,e2,h5
Potassium	MG/KG	505	
Selenium	MG/KG	0.64	e5,h5
Sodium	MG/KG	85.1	
Vanadium	MG/KG	41.1	b2
Zinc	MG/KG	44.7	b2,e2

AUS-0066-006			
Units	Result:	Reference	
0 - 6 in		Code	
Metals			
Aluminum	MG/KG	16900	b2
Arsenic	MG/KG	7	h1,h5,h7
Barium	MG/KG	241	b2,h5
Beryllium	MG/KG	0.57	
Boron	MG/KG	2.5	
Calcium	MG/KG	1100	
Chromium	MG/KG	21.3	b2,h5
Cobalt	MG/KG	6.2	
Copper	MG/KG	18.1	b2
Iron	MG/KG	20400	
Lead	MG/KG	28.7	b2
Magnesium	MG/KG	2840	b2
Manganese	MG/KG	199	
Mercury	MG/KG	0.048	e5
Nickel	MG/KG	17.9	b2,h5
Potassium	MG/KG	1640	b2
Sodium	MG/KG	77.5	
Vanadium	MG/KG	36.8	b2
Zinc	MG/KG	69	b2



NOTES:

1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
3. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. By: djd 12/16/00 DSGN. By: mam CHKD. By: mch/cmw	FIG. NO. 26-2

AUS-0066-FORMER EMMA OU SITE COC-14

File: E:\2320000026\PA-SI REPORT-AUS OU\AUS-0066FIG26-3.DWG Last edited: 09/24/01 @ 08:38 a.m. WC-ST. LOUIS, MO

AUS-0066-003-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	55500	b3, e3
Arsenic	UG/L	18.3	b3
Barium	UG/L	261	b3
Beryllium	UG/L	16.5	b3, e3
Cadmium	UG/L	33.9	b3, e3, e4
Calcium	UG/L	76700	b3
Chromium	UG/L	29.1	b3
Cobalt	UG/L	278	b3, e3
Copper	UG/L	40.1	b3, e3, e4
Iron	UG/L	346000	b3, e3, e4, h10
Lead	UG/L	48.4	b3, e3, e4
Magnesium	UG/L	53000	b3
Manganese	UG/L	6850	b3, e3, e4, h10
Mercury	UG/L	0.073	e5, h10
Nickel	UG/L	425	b3
Potassium	UG/L	3810	b3
Selenium	UG/L	7.6	b3, e3
Sodium	UG/L	17900	b3
Vanadium	UG/L	76.8	b3, e3
Zinc	UG/L	2240	b3, e3, e4, h10
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	23	
Nitrogen, Ammonia (as N)	MG/L	0.28	b3
Nitrogen, Nitrate-Nitrite	MG/L	0.2	b3

AUS-0066-007-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	6030	b3, e3
Arsenic	UG/L	5.5	
Barium	UG/L	110	b3
Calcium	UG/L	57800	b3
Chromium	UG/L	8.2	
Cobalt	UG/L	28.8	e3
Copper	UG/L	13.3	b3, e3, e4
Iron	UG/L	12000	b3, e3, e4, h10
Lead	UG/L	8.2	b3
Magnesium	UG/L	64300	b3
Manganese	UG/L	3890	b3, e3, e4, h10
Nickel	UG/L	193	b3
Potassium	UG/L	5070	b3
Sodium	UG/L	27500	b3
Vanadium	UG/L	15	
Zinc	UG/L	206	b3

AUS-0066-004-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	1450	b3, e3
Barium	UG/L	51.4	b3
Cadmium	UG/L	7.1	b3, e3, e4
Calcium	UG/L	64500	b3
Cobalt	UG/L	61.7	b3, e3
Copper	UG/L	1.4	
Iron	UG/L	4060	b3, e3, e4, h10
Magnesium	UG/L	46100	b3
Manganese	UG/L	4240	b3, e3, e4, h10
Nickel	UG/L	138	b3
Potassium	UG/L	1990	b3
Sodium	UG/L	17100	b3
Zinc	UG/L	325	b3
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	44.1	b3
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	ND	

AUS-0066-006-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	5580	b3, e3
Arsenic	UG/L	9.4	
Barium	UG/L	81.8	b3
Calcium	UG/L	19200	b3
Chromium	UG/L	6	
Cobalt	UG/L	19.6	e3
Copper	UG/L	13.2	b3, e3, e4
Iron	UG/L	12700	b3, e3, e4, h10
Lead	UG/L	7.8	b3
Magnesium	UG/L	16900	b3
Manganese	UG/L	2480	b3, e3, e4, h10
Mercury	UG/L	0.069	e5, h10
Nickel	UG/L	77.3	b3
Potassium	UG/L	4500	b3
Sodium	UG/L	8130	b3
Vanadium	UG/L	16.5	
Zinc	UG/L	112	b3

LEGEND

- ⊕ HAND AUGER LOCATIONS
- 1998 USEPA SAMPLE LOCATIONS
- DITCHLINE
- ▨ DEPRESSION

Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

CONTAMINATED AREA SIGN

3 STRAND BARBWIRE FENCE

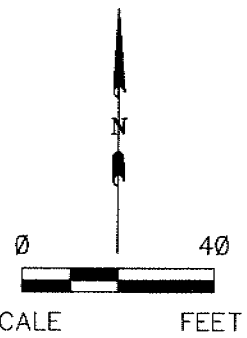
BERM WITH RED CLAY BRICKS

COC AREA ROAD (ABANDONED)

TO INTERSECTION →

NOTES:

1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 30, 1999.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.



377250
766750

AUS-0066-FORMER EMMA OU SITE COC-14

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY:djd 12/16/00 DSGN. BY:mam CHKD. BY:mch/cmw	AUS-0066 Sample Locations and Detections in Surface Water
FIG. NO. 26-3	

See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC Area. AUS-0067 is located on an unnamed roadway that parallels Wolf Creek Road, and lies exactly one mile to the west of Wolf Creek Road. AUS-0067 is on the east side of the unnamed road, about 0.3 miles north of the COC Area Road. (Figure 22-1).

AUS-0067 was included in the AUS OU primarily because of suspect fencing and signage.

AUS Original Site Designations

AUS-0067 is one of the original AUS OU sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS).

27.1 HISTORIC SEARCH INFORMATION

27.1.1 Site Description

AUS-0067 was originally described as “fence with contaminated area (sign) northwest of COC-6.”

27.1.2 Operational History and Waste Characteristics

There have been no known industrial lessees of this property.

The location in the COC Area, the signage, and the fencing suggest that this may have been a site used by the Army for detonation of ordnance during and/or after World War II (see introductory text in Section 22).

27.1.3 AUS-0067 Previous Sampling Results

There have been no previous investigations at this site.

27.1.4 Observations During Site Visit

The site slopes gently to the west and to the north and it is lightly wooded with some ground vegetation. A collapsed foundation, a cistern, some construction debris and some soil mounds were observed at the site (Figure 27-1).

27.1.5 Recommendations Based on Preliminary Assessment

AUS-0067 was included in the Site Investigation (SI) since this area was marked as a “Contaminated Area” and has not been previously investigated.

27.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0067 on May 8, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)¹ for the AUS OU Preliminary Assessment/Site Investigation (PA/SI). AUS OU SI sample locations are shown on Figure 27-1. Survey coordinates for all sample locations in AUS-0067 are listed in Table 27-1. Table 27-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples unless otherwise noted.

27.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. Two soil samples and a cistern water sample were collected. Sample 0067-001 was from a soil mound. Sample 0067-003 (soil) was taken in a depressed area containing pieces of foundation and brick. Sample 0067-002 (cistern water) was collected from an abandoned cistern. It is possible that materials may have been dumped into the cistern, since there appears to be other debris in this area.

27.2.2 Field Results**27.2.2.1 Site Conditions****27.2.2.1 *Geologic Conditions***

There were no test pits or monitoring wells installed at AUS-0067. Soil collected from the hand auger borings, which extended to 2 feet (ft), was described as silty clay fill.

27.2.2.2 *Hydrogeologic Conditions*

No hydrogeological information is available for this site.

27.2.2.3 *Hydrologic Conditions*

The general slope of the site is to the west. There were no ponded areas or ditches observed at this site during the site reconnaissance in 1999.

27.2.2.2 Chemical Results

The sample analytical results are summarized in the following tables:

- Table 27-3 – soil samples results, and
- Table 27-4 – cistern water results.

These tables list all the chemicals detected in AUS-0067 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report. All results are shown in Figure 27-1.

¹ U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

27.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 27-5 through 27-7 as follows:

- Table 27-5--human health risk screening for soils,
- Table 27-6--human health risk screening for cistern water, and
- Table 27-7--ecological risk screening for soils.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0067. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figure 27-1 the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 27-8 (human health risk) and 27-9 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 27-8) and COPECs (Table 27-9) are shaded in the tables.

27.3.1 Human Health Risk

27.3.1.1 Soil

Human health screening results for soil and sediment samples are presented in Tables 27-5. For carcinogens, a cancer risk was calculated using the United States Environmental Protection Agency (USEPA) Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

27.3.1.2 Cistern Water

Human health screening results for the cistern water sample are presented in Table 27-6. The maximum were screened against maximum contaminant levels (MCLs), Illinois Class I groundwater standards, and USEPA Region 9 tap water PRGs.

27.3.2 Ecological Risk

27.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 27-7. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)²
- Environment Canada (1995)³
- Talmage *et al.* (1999)⁴
- Efroymsen *et al.* (1997a, 1997b)⁵
- CCME (1999)⁶

² USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

³ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

⁴ Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

⁵ Efroymsen, 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, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efroymsen, 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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

⁶ Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

- MHSPE (1994)⁷
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)⁸ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

27.4 SCIENTIFIC MANAGEMENT DECISION POINT

A Remedial Investigation (RI) is recommended for Site AUS-0067, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not necessarily be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 27-8; and on the COPEC list, Table 27-9. COPCs in this category include antimony, chromium, and selenium in soil. COPECs coded with "D" on Table 27-9 include chromium, manganese, and selenium in soil. These chemicals may later be included in the RI for other reasons, but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be investigated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 27-10.

Note that 2,6-dinitrotoluene exceeded groundwater screening criteria in the cistern water sample taken at the site. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site and media and contaminants in addition to those addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

⁷ Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

⁸ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

**TABLE 27-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0067**

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0067-001	379255.1	769114.4	436.83	NA	
0067-002	379249.1	769160.5	438.42	NA	
0067-003	379200.8	769140.8	437.50	NA	

Sheet 1 of 1

NA = Not Applicable

**TABLE 27-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0067**

Soil	Cistern Water
AUS-0067-001	AUS-0067-002 ¹
AUS-0067-003	

Sheet 1 of 1

¹ This sample was originally designated as groundwater (“GW”), but is actually a cistern water sample.

TABLE 27-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	2/3	680 ug/kg to 950 ug/kg
Anthracene	2/3	43 ug/kg to 66 ug/kg
Benzo(a)Anthracene	2/3	110 ug/kg to 200 ug/kg
Benzo(a)Pyrene	2/3	73 ug/kg to 130 ug/kg
Benzo(b)Fluoranthene	2/3	76 ug/kg to 180 ug/kg
Bis(2-Ethylhexyl) Phthalate	2/3	59 ug/kg to 200 ug/kg
Carbazole	1/3	57 ug/kg
Chrysene	2/3	98 ug/kg to 210 ug/kg
Dibenzofuran	2/3	260 ug/kg to 360 ug/kg
Fluoranthene	2/3	110 ug/kg to 240 ug/kg
Naphthalene	2/3	220 ug/kg to 360 ug/kg
Phenanthrene	2/3	510 ug/kg to 770 ug/kg
Pyrene	2/3	160 ug/kg to 310 ug/kg
Explosives		
Tetryl	1/3	3,100 ug/kg
Metals		
Aluminum	3/3	12,900 mg/kg to 17,100 mg/kg
Antimony	3/3	0.54 mg/kg to 0.76 mg/kg
Arsenic	3/3	10 mg/kg to 14.2 mg/kg
Barium	3/3	109 mg/kg to 274 mg/kg
Beryllium	3/3	0.57 mg/kg to 1 mg/kg
Boron	3/3	2.1 mg/kg to 7.2 mg/kg
Cadmium	2/3	0.77 mg/kg to 1.5 mg/kg
Calcium	3/3	1,230 mg/kg to 2,290 mg/kg
Chromium, Total	3/3	20 mg/kg to 22.2 mg/kg
Cobalt	3/3	9.6 mg/kg to 14 mg/kg
Copper	3/3	16.8 mg/kg to 36.1 mg/kg
Iron	3/3	24,000 mg/kg to 35,100 mg/kg
Lead	3/3	26.8 mg/kg to 227 mg/kg
Magnesium	3/3	1,650 mg/kg to 2,930 mg/kg
Manganese	3/3	553 mg/kg to 1,880 mg/kg
Mercury	3/3	0.044 mg/kg to 0.12 mg/kg
Nickel	3/3	16.6 mg/kg to 22.9 mg/kg
Potassium	3/3	1,220 mg/kg to 1,630 mg/kg
Selenium	3/3	0.42 mg/kg to 0.89 mg/kg
Sodium	3/3	56.4 mg/kg to 76.2 mg/kg

Sheet 1 of 2

**TABLE 27-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY**

Constituent	Number of Detections	Range of Detections
Vanadium	3/3	37.5 mg/kg to 39.3 mg/kg
Zinc	3/3	75.3 mg/kg to 355 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram

ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

**TABLE 27-4
CISTERN WATER SAMPLE ANALYTICAL RESULTS SUMMARY**

Constituent	Number of Detections	Range of Detections
Explosives		
2,6-Dinitrotoluene	1/1	6.5 ug/L
Metals		
Aluminum	1/1	356 ug/L
Barium	1/1	35 ug/L
Boron	1/1	64.5 ug/L
Calcium	1/1	28,500 ug/L
Copper	1/1	3.4 ug/L
Iron	1/1	648 ug/L
Lead	1/1	2.2 ug/L
Magnesium	1/1	1,790 ug/L
Manganese	1/1	132 ug/L
Nickel	1/1	2.6 ug/L
Potassium	1/1	6,570 ug/L
Sodium	1/1	1,310 ug/L
Zinc	1/1	30.1 ug/L

Sheet 1 of 1

ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/23/01

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			1.80E-06	6.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG		6.68E-09	1.54E-06	3.00E+01
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG		3.16E-09	3.94E-05	6.67E+00
75-34-3	1,1-Dichloroethane	6	U	UG/KG			2.91E-06	6.00E-03
75-35-4	1,1-Dichloroethene	6	U	UG/KG		5.05E-08	8.91E-05	2.00E+00
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG		7.85E-09	1.70E-04	6.00E+00
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	6	U	UG/KG		7.81E-09	2.82E-04	6.00E+00
78-93-3	2-Butanone (MEK)	11	U	UG/KG			3.97E-07	
591-78-6	2-Hexanone	11	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	11	U	UG/KG			3.81E-06	
67-64-1	Acetone	19	U	UG/KG			3.05E-06	2.38E-02
71-43-2	Benzene	6	U	UG/KG		4.10E-09	2.48E-04	3.00E+00
75-27-4	Bromodichloromethane	6	U	UG/KG		2.55E-09	5.75E-06	2.00E-01
75-25-2	Bromoform	6	U	UG/KG		1.92E-11	3.41E-07	1.50E-01
74-83-9	Bromomethane	6	U	UG/KG			4.57E-04	6.00E-01
75-15-0	Carbon disulfide	6	U	UG/KG			4.96E-06	3.00E-03
56-23-5	Carbon tetrachloride	6	U	UG/KG		1.13E-08	8.58E-04	2.00E+00
108-90-7	Chlorobenzene	6	U	UG/KG			1.11E-05	8.57E-02
75-00-3	Chloroethane	6	U	UG/KG		9.22E-10	3.18E-07	
67-66-3	Chloroform	6	U	UG/KG		1.15E-08	4.66E-03	2.00E-01
74-87-3	Chloromethane	6	U	UG/KG		2.25E-09		
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG			4.07E-05	3.00E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
124-48-1	Dibromochloromethane	6	U	UG/KG		2.26E-09	3.77E-06	3.00E-01
100-41-4	Ethylbenzene	6	U	UG/KG			1.00E-06	8.57E-03
75-09-2	Methylene chloride	6	U	UG/KG		2.92E-10	6.14E-07	6.00E+00
110-54-3	N-Hexane	6	U	UG/KG			1.49E-05	
100-42-5	Styrene	6	U	UG/KG			2.94E-07	3.00E-02
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG		3.21E-10	3.52E-06	2.00E+00
108-88-3	Toluene	6	U	UG/KG			3.02E-06	1.00E-02
1330-20-7	total Xylenes	6	U	UG/KG			1.35E-06	6.00E-04
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG			2.80E-05	2.00E-01
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG		9.81E-10	7.59E-05	2.00E+00
75-01-4	Vinyl chloride	6	U	UG/KG		1.23E-07		8.57E+00
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	510	U	UG/KG			6.70E-05	1.70E+00
95-50-1	1,2-Dichlorobenzene	510	U	UG/KG			1.54E-04	5.67E-01
541-73-1	1,3-Dichlorobenzene	510	U	UG/KG			9.85E-03	
106-46-7	1,4-Dichlorobenzene	510	U	UG/KG		6.27E-08	2.65E-04	5.10E+00
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG			2.95E-05	2.60E-01
88-06-2	2,4,6-Trichlorophenol	510	U	UG/KG		2.27E-09		6.38E+01
120-83-2	2,4-Dichlorophenol	510	U	UG/KG			1.93E-04	1.02E+01
105-67-9	2,4-Dimethylphenol	510	U	UG/KG			2.89E-05	1.28E+00
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG			1.48E-03	2.60E+02
91-58-7	2-Chloronaphthalene	510	U	UG/KG			1.87E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES ON
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-57-8	2-Chlorophenol	510	U	UG/KG			2.11E-03	2.55E+00
91-57-6	2-Methylnaphthalene	950		UG/KG			1.75E-05	4.75E-03
95-48-7	2-Methylphenol	510	U	UG/KG			1.16E-05	6.38E-01
88-74-4	2-Nitroaniline	2600	U	UG/KG			5.17E-02	
88-75-5	2-Nitrophenol	510	U	UG/KG			7.24E-05	
91-94-1	3,3'-Dichlorobenzidine	510	U	UG/KG		9.30E-08		1.70E+03
99-09-2	3-Nitroaniline	2600	U	UG/KG			5.17E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	510	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	510	U	UG/KG			1.16E-05	
106-47-8	4-Chloroaniline	1000	U	UG/KG			2.84E-04	3.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	510	U	UG/KG				
106-44-5	4-Methylphenol	510	U	UG/KG			1.16E-04	
100-01-6	4-Nitroaniline	2600	U	UG/KG			5.17E-02	
100-02-7	4-Nitrophenol	2600	U	UG/KG			3.69E-04	
83-32-9	Acenaphthene	510	U	UG/KG			1.33E-05	1.70E-02
208-96-8	Acenaphthylene	510	U	UG/KG			9.41E-06	2.55E-03
120-12-7	Anthracene	66	J	UG/KG			1.69E-07	1.10E-04
56-55-3	Benzo(a)anthracene	200	J	UG/KG		6.93E-08		2.50E+00
50-32-8	Benzo(a)pyrene	130	J	UG/KG		4.50E-07		3.25E-01
205-99-2	Benzo(b)fluoranthene	180	J	UG/KG		6.24E-08		9.00E-01
191-24-2	Benzo(g,h,i)perylene	510	U	UG/KG			9.41E-06	2.55E-03
207-08-9	Benzo(k)fluoranthene	510	U	UG/KG		1.77E-08		2.55E-01
111-91-1	bis(2-Chloroethoxy)methane	510	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
111-44-4	bis(2-Chloroethyl) ether	510	U	UG/KG		8.23E-07		2.55E+04
108-60-1	bis(2-Chloroisopropyl) ether	510	U	UG/KG		6.31E-08	1.20E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	200	J	UG/KG		1.14E-09	1.14E-05	
85-68-7	Butyl benzyl phthalate	510	U	UG/KG			2.89E-06	6.38E-04
86-74-8	Carbazole	57	J	UG/KG		4.62E-10		1.90E+00
218-01-9	Chrysene	210	J	UG/KG		7.28E-10		2.63E-02
84-74-2	Di-n-butyl phthalate	510	U	UG/KG			5.79E-06	1.70E-03
117-84-0	Di-n-octyl phthalate	510	U	UG/KG			2.89E-05	5.10E-05
53-70-3	Dibenz(a,h)anthracene	510	U	UG/KG		1.77E-06		6.38E+00
132-64-9	Dibenzofuran	360	J	UG/KG			7.11E-05	
84-66-2	Diethyl phthalate	510	U	UG/KG			7.24E-07	
131-11-3	Dimethyl phthalate	510	U	UG/KG			5.79E-08	
206-44-0	Fluoranthene	240	J	UG/KG			7.97E-06	1.20E-03
86-73-7	Fluorene	510	U	UG/KG			1.54E-05	1.70E-02
118-74-1	Hexachlorobenzene	510	U	UG/KG		3.31E-07	7.24E-04	5.10E+00
87-68-3	Hexachlorobutadiene	510	U	UG/KG		1.61E-08	2.89E-03	5.10E+00
77-47-4	Hexachlorocyclopentadiene	510	U	UG/KG			8.65E-05	2.55E-02
67-72-1	Hexachloroethane	510	U	UG/KG		2.89E-09	5.79E-04	2.55E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	510	U	UG/KG		1.77E-07		7.29E-01
78-59-1	Isophorone	510	U	UG/KG		1.96E-10	2.89E-06	1.70E+01
621-64-7	N-Nitroso-di-n-propylamine	510	UJ	UG/KG		1.45E-06		2.55E+05
86-30-6	N-Nitrosodiphenylamine	510	U	UG/KG		1.01E-09		8.50E+00
91-20-3	Naphthalene	360	J	UG/KG			1.91E-03	9.00E-02
87-86-5	Pentachlorophenol	2600	U	UG/KG		2.34E-07	1.82E-04	2.60E+03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-01-8	Phenanthrene	770		UG/KG			1.42E-05	3.85E-03
108-95-2	Phenol	510	U	UG/KG			9.65E-07	1.02E-01
129-00-0	Pyrene	310	J	UG/KG			5.72E-06	1.55E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			1.44E-05	
99-65-0	1,3-Dinitrobenzene	380	U	UG/KG			4.31E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	770	U	UG/KG		9.37E-09	1.75E-03	
121-14-2	2,4-Dinitrotoluene	380	U	UG/KG			2.16E-04	9.50E+03
606-20-2	2,6-Dinitrotoluene	510	U	UG/KG			5.79E-04	1.70E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	770	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	770	U	UG/KG				
99-08-1	3-Nitrotoluene	770	U	UG/KG			3.79E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	770	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	770	U	UG/KG			3.79E-04	
2691-41-0	HMX	770	U	UG/KG			1.75E-05	
98-95-3	Nitrobenzene	380	U	UG/KG			3.32E-03	
121-82-4	RDX	770	U	UG/KG		3.43E-08	2.91E-04	
479-45-8	Tetryl	3100		UG/KG			3.52E-04	
Metals								
7429-90-5	Aluminum	17700		MG/KG	6.15E-01		1.06E-02	
7440-36-0	Antimony	0.76	J	MG/KG	9.16E-01		9.30E-04	2.53E+00
7440-38-2	Arsenic	14.2		MG/KG	1.05E+00	5.21E-06	3.23E-02	1.42E+01
7440-39-3	Barium	274		MG/KG	1.41E+00		2.20E-03	3.43E+00
7440-41-7	Beryllium	1		MG/KG	1.32E+00	4.46E-10	2.71E-04	3.33E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-42-8	Boron	7.2	J	MG/KG	1.36E+00		9.10E-05	
7440-43-9	Cadmium	1.5		MG/KG	7.89E+00	5.02E-10	1.85E-03	3.75E+00
7440-70-2	Calcium	2290		MG/KG	9.17E-01			
7440-47-3	Chromium	22.2		MG/KG	8.81E-01	4.95E-08		1.11E+01
7440-48-4	Cobalt	14		MG/KG	6.45E-01		1.14E-04	
7440-50-8	Copper	36.1		MG/KG	3.19E+00		4.76E-04	
7439-89-6	Iron	35100		MG/KG	1.82E+00		5.73E-02	
7439-92-1	Lead	227		MG/KG	9.70E+00			
7439-95-4	Magnesium	2940		MG/KG	1.89E+00			
7439-96-5	Manganese	1880		MG/KG	5.16E-01		5.83E-02	
7439-97-6	Mercury	0.12	J	MG/KG	2.00E+00			
7440-02-0	Nickel	22.9		MG/KG	1.21E+00		5.60E-04	3.27E+00
2023695	Potassium	1630		MG/KG	2.61E+00			
7782-49-2	Selenium	0.89		MG/KG	3.80E-01		8.71E-05	2.97E+00
7440-22-4	Silver	1.5	U	MG/KG	2.59E+00		1.47E-04	7.50E-01
7440-23-5	Sodium	76.2	J	MG/KG	4.48E-01			
7440-28-0	Thallium	0.49	J	MG/KG	1.20E+00		3.42E-06	
7440-62-2	Vanadium	41		MG/KG	8.69E-01		2.87E-03	1.37E-01
7440-66-6	Zinc	355		MG/KG	6.91E+00		5.80E-04	5.92E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			3.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG	7.32E-07	7.32E-07	3.00E-01
75-34-3	1,1-Dichloroethane	6	U	UG/KG	3.00E-08	3.00E-08	2.61E-04
75-35-4	1,1-Dichloroethene	6	U	UG/KG	3.33E-07	3.33E-06	1.00E-01
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG	9.52E-05	4.29E-06	3.00E-01
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	6	U	UG/KG	7.14E-05	3.33E-06	2.00E-01
78-93-3	2-Butanone (MEK)	11	U	UG/KG			
591-78-6	2-Hexanone	11	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	11	U	UG/KG			
67-64-1	Acetone	19	U	UG/KG	9.50E-08	9.50E-08	1.19E-03
71-43-2	Benzene	6	U	UG/KG	3.00E-05	1.40E-06	2.00E-01
75-27-4	Bromodichloromethane	6	U	UG/KG	6.52E-05	3.00E-06	1.00E-02
75-25-2	Bromoform	6	U	UG/KG	8.33E-06	3.75E-07	7.50E-03
74-83-9	Bromomethane	6	U	UG/KG	2.07E-06	6.00E-06	3.00E-02
75-15-0	Carbon disulfide	6	U	UG/KG	3.00E-08	3.00E-07	1.88E-04
56-23-5	Carbon tetrachloride	6	U	UG/KG	1.36E-04	1.46E-05	8.57E-02
108-90-7	Chlorobenzene	6	U	UG/KG	1.46E-07	1.46E-06	6.00E-03
75-00-3	Chloroethane	6	U	UG/KG			
67-66-3	Chloroform	6	U	UG/KG	6.38E-06	3.00E-06	1.00E-02
74-87-3	Chloromethane	6	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG			
124-48-1	Dibromochloromethane	6	U	UG/KG	1.46E-07	1.46E-07	1.50E-02
100-41-4	Ethylbenzene	6	U	UG/KG	3.00E-08	3.00E-07	4.62E-04
75-09-2	Methylene chloride	6	U	UG/KG	7.89E-06	5.00E-07	3.00E-01
110-54-3	N-Hexane	6	U	UG/KG			
100-42-5	Styrene	6	U	UG/KG	1.46E-08	1.46E-07	1.50E-03
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG	5.45E-05	2.50E-06	1.00E-01
108-88-3	Toluene	6	U	UG/KG	1.46E-08	1.46E-08	5.00E-04
1330-20-7	total Xylenes	6	U	UG/KG	6.00E-09	1.46E-08	4.00E-05
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG	1.46E-07	1.46E-07	8.57E-03
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG	1.15E-05	5.00E-06	1.00E-01
75-01-4	Vinyl chloride	6	U	UG/KG	2.00E-03	9.23E-05	6.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	510	U	UG/KG	2.55E-05	2.55E-04	1.02E-01
95-50-1	1,2-Dichlorobenzene	510	U	UG/KG	2.83E-06	2.83E-05	3.00E-02
541-73-1	1,3-Dichlorobenzene	510	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	510	U	UG/KG			2.55E-01
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG	1.30E-05	1.30E-05	9.63E-03
88-06-2	2,4,6-Trichlorophenol	510	U	UG/KG	9.81E-04	4.64E-05	2.55E+00
120-83-2	2,4-Dichlorophenol	510	U	UG/KG	8.36E-05	8.36E-04	5.10E-01
105-67-9	2,4-Dimethylphenol	510	U	UG/KG	1.24E-05	1.24E-05	5.67E-02
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG	6.34E-04	6.34E-03	1.30E+01
91-58-7	2-Chloronaphthalene	510	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-57-8	2-Chlorophenol	510	U	UG/KG	5.10E-05	5.10E-05	1.28E-01
91-57-6	2-Methylnaphthalene	950		UG/KG	1.56E-05	1.56E-05	2.26E-04
95-48-7	2-Methylphenol	510	U	UG/KG	5.10E-06	5.10E-06	3.40E-02
88-74-4	2-Nitroaniline	2600	U	UG/KG			
88-75-5	2-Nitrophenol	510	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	510	U	UG/KG	3.92E-02	1.82E-03	7.29E+01
99-09-2	3-Nitroaniline	2600	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	510	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	510	U	UG/KG			
106-47-8	4-Chloroaniline	1000	U	UG/KG	1.22E-04	1.22E-03	1.43E+00
7005-72-3	4-Chlorophenyl phenyl ether	510	U	UG/KG			
106-44-5	4-Methylphenol	510	U	UG/KG			
100-01-6	4-Nitroaniline	2600	U	UG/KG			
100-02-7	4-Nitrophenol	2600	U	UG/KG			
83-32-9	Acenaphthene	510	U	UG/KG	4.25E-06	4.25E-06	8.95E-04
208-96-8	Acenaphthylene	510	U	UG/KG	8.36E-06	8.36E-06	1.21E-04
120-12-7	Anthracene	66	J	UG/KG	1.08E-07	1.08E-07	5.50E-06
56-55-3	Benzo(a)anthracene	200	J	UG/KG	2.50E-02	1.18E-03	1.00E-01
50-32-8	Benzo(a)pyrene	130	J	UG/KG	1.63E-01	7.65E-03	1.63E-02
205-99-2	Benzo(b)fluoranthene	180	J	UG/KG	2.25E-02	1.06E-03	3.60E-02
191-24-2	Benzo(g,h,i)perylene	510	U	UG/KG	8.36E-06	8.36E-06	1.21E-04
207-08-9	Benzo(k)fluoranthene	510	U	UG/KG	6.54E-03	3.00E-04	1.04E-02
111-91-1	bis(2-Chloroethoxy)methane	510	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
111-44-4	bis(2-Chloroethyl) ether	510	U	UG/KG	1.02E-01	6.80E-03	1.28E+03
108-60-1	bis(2-Chloroisopropyl) ether	510	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	200	J	UG/KG	4.88E-04	4.88E-05	5.56E-05
85-68-7	Butyl benzyl phthalate	510	U	UG/KG	1.24E-06	1.24E-06	5.48E-04
86-74-8	Carbazole	57	J	UG/KG	1.97E-04	9.19E-06	9.50E-02
218-01-9	Chrysene	210	J	UG/KG	2.69E-04	1.24E-05	1.31E-03
84-74-2	Di-n-butyl phthalate	510	U	UG/KG	2.55E-06	2.55E-06	2.22E-04
117-84-0	Di-n-octyl phthalate	510	U	UG/KG	1.24E-05	1.24E-04	5.10E-05
53-70-3	Dibenz(a,h)anthracene	510	U	UG/KG	6.38E-01	3.00E-02	2.55E-01
132-64-9	Dibenzofuran	360	J	UG/KG			
84-66-2	Diethyl phthalate	510	U	UG/KG	5.10E-07	5.10E-07	1.09E-03
131-11-3	Dimethyl phthalate	510	U	UG/KG			
206-44-0	Fluoranthene	240	J	UG/KG	2.93E-06	2.93E-06	5.58E-05
86-73-7	Fluorene	510	U	UG/KG	6.22E-06	6.22E-06	9.11E-04
118-74-1	Hexachlorobenzene	510	U	UG/KG	1.28E-01	6.54E-03	2.55E-01
87-68-3	Hexachlorobutadiene	510	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	510	U	UG/KG	3.64E-05	3.64E-05	1.28E-03
67-72-1	Hexachloroethane	510	U	UG/KG	2.55E-04	2.55E-04	1.02E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	510	U	UG/KG	6.38E-02	3.00E-03	3.64E-02
78-59-1	Isophorone	510	U	UG/KG	1.24E-06	1.24E-06	6.38E-02
621-64-7	N-Nitroso-di-n-propylamine	510	UJ	UG/KG	6.38E-01	2.83E-02	1.02E+04
86-30-6	N-Nitrosodiphenylamine	510	U	UG/KG	4.25E-04	2.04E-05	5.10E-01
91-20-3	Naphthalene	360	J	UG/KG	4.39E-06	4.39E-05	4.29E-03
87-86-5	Pentachlorophenol	2600	U	UG/KG	1.08E-01	5.00E-03	8.67E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-01-8	Phenanthrene	770		UG/KG	1.26E-05	1.26E-05	1.83E-04
108-95-2	Phenol	510	U	UG/KG	5.10E-07	4.25E-06	5.10E-03
129-00-0	Pyrene	310	J	UG/KG	5.08E-06	5.08E-06	7.38E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	380	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	770	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	380	U	UG/KG	4.52E-02	2.11E-03	4.75E+02
606-20-2	2,6-Dinitrotoluene	510	U	UG/KG	6.07E-02	2.83E-03	7.29E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	770	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	770	U	UG/KG			
99-08-1	3-Nitrotoluene	770	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	770	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	770	U	UG/KG			
2691-41-0	HMX	770	U	UG/KG			
98-95-3	Nitrobenzene	380	U	UG/KG	3.80E-04	3.80E-04	3.80E+00
121-82-4	RDX	770	U	UG/KG			
479-45-8	Tetryl	3100		UG/KG			
Metals							
7429-90-5	Aluminum	17700		MG/KG			
7440-36-0	Antimony	0.76	J	MG/KG	9.27E-04	9.27E-03	1.52E-01
7440-38-2	Arsenic	14.2		MG/KG	4.73E+00	2.33E-01	5.07E-01
7440-39-3	Barium	274		MG/KG	1.96E-03	1.96E-02	2.28E-01
7440-41-7	Beryllium	1		MG/KG	1.00E+00	3.45E-02	1.52E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-5
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-42-8	Boron	7.2	J	MG/KG	4.00E-05	4.00E-04	
7440-43-9	Cadmium	1.5		MG/KG	7.50E-04	7.50E-03	4.05E-01
7440-70-2	Calcium	2290		MG/KG			
7440-47-3	Chromium	22.2		MG/KG	2.22E-03	5.41E-03	7.93E-01
7440-48-4	Cobalt	14		MG/KG	1.17E-04	1.17E-03	
7440-50-8	Copper	36.1		MG/KG	4.40E-04	4.40E-03	3.28E-03
7439-89-6	Iron	35100		MG/KG			
7439-92-1	Lead	227		MG/KG	5.68E-01	5.68E-01	
7439-95-4	Magnesium	2940		MG/KG			
7439-96-5	Manganese	1880		MG/KG	1.96E-02	1.96E-01	
7439-97-6	Mercury	0.12	J	MG/KG	1.97E-04	1.97E-03	8.00E-01
7440-02-0	Nickel	22.9		MG/KG	5.59E-04	5.59E-03	3.01E-01
2023695	Potassium	1630		MG/KG			
7782-49-2	Selenium	0.89		MG/KG	8.90E-05	8.90E-04	3.71E-01
7440-22-4	Silver	1.5	U	MG/KG	1.50E-04	1.50E-03	1.00E+00
7440-23-5	Sodium	76.2	J	MG/KG			
7440-28-0	Thallium	0.49	J	MG/KG	3.06E-03	3.06E-03	2.04E-01
7440-62-2	Vanadium	41		MG/KG	2.93E-03	2.93E-02	4.18E-02
7440-66-6	Zinc	355		MG/KG	5.82E-04	5.82E-03	9.86E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 27-6

HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		1.26E-03	5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L	1.81E-05	2.74E-03	
79-00-5	1,1,2-Trichloroethane	1	U	UG/L	5.01E-06	4.11E-02	2.00E-01
75-34-3	1,1-Dichloroethane	1	U	UG/L		1.23E-03	
75-35-4	1,1-Dichloroethene	1	U	UG/L	2.19E-05	1.83E-02	1.43E-01
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L	8.12E-06	9.88E-02	2.00E-01
78-87-5	1,2-Dichloropropane	1	U	UG/L	6.07E-06	1.45E-01	2.00E-01
78-93-3	2-Butanone (MEK)	5	U	UG/L		2.63E-03	
591-78-6	2-Hexanone	5	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	5	U	UG/L		3.17E-02	
67-64-1	Acetone	5	U	UG/L		8.22E-03	
71-43-2	Benzene	1	U	UG/L	2.44E-06	8.92E-02	2.00E-01
75-27-4	Bromodichloromethane	1	U	UG/L	5.53E-06	8.22E-03	
75-25-2	Bromoform	1	U	UG/L	1.18E-07	1.37E-03	
74-83-9	Bromomethane	1	U	UG/L		1.15E-01	
75-15-0	Carbon disulfide	1	U	UG/L		9.59E-04	
56-23-5	Carbon tetrachloride	1	U	UG/L	5.84E-06	2.35E-01	2.00E-01
108-90-7	Chlorobenzene	1	U	UG/L		9.43E-03	1.00E-02
75-00-3	Chloroethane	1	U	UG/L	2.16E-07	1.16E-04	
67-66-3	Chloroform	1	U	UG/L	6.08E-06	1.60E+00	
74-87-3	Chloromethane	1	U	UG/L	6.62E-07		
156-59-2	cis-1,2-Dichloroethene	1	U	UG/L		1.64E-02	1.43E-02
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
124-48-1	Dibromochloromethane	1	U	UG/L	7.50E-06	8.22E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-6
HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
100-41-4	Ethylbenzene	1	U	UG/L		7.46E-04	1.43E-03
75-09-2	Methylene chloride	1	U	UG/L	2.34E-07	6.16E-04	2.00E-01
110-54-3	N-Hexane	1	U	UG/L		2.85E-03	
100-42-5	Styrene	1	U	UG/L		6.09E-04	1.00E-02
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L	9.24E-07	3.94E-03	2.00E-01
108-88-3	Toluene	1	U	UG/L		1.38E-03	1.00E-03
1330-20-7	total Xylenes	1	U	UG/L		6.99E-04	1.00E-04
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		8.22E-03	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
79-01-6	Trichloroethylene (TCE)	1	U	UG/L	6.10E-07	2.74E-02	2.00E-01
75-01-4	Vinyl chloride	1	U	UG/L	5.06E-05		5.00E-01
Semivolatle Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		1.37E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	50	U	UG/L		6.85E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
91-57-6	2-Methylnaphthalene	10	U	UG/L		5.48E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 27-6

HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
88-74-4	2-Nitroaniline	50	U	UG/L		2.40E+01	
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L	1.34E-04		
99-09-2	3-Nitroaniline	50	U	UG/L		2.40E+01	
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	20	U	UG/L		1.37E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	50	U	UG/L		2.40E+01	
100-02-7	4-Nitrophenol	50	U	UG/L		1.71E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	10	U	UG/L		5.48E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	10	U	UG/L	1.09E-04		
50-32-8	Benzo(a)pyrene	10	U	UG/L	1.09E-03		5.00E+01
205-99-2	Benzo(b)fluoranthene	10	U	UG/L	1.09E-04		
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		5.48E-02	
207-08-9	Benzo(k)fluoranthene	10	U	UG/L	1.09E-05		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	U	UG/L	2.08E-06	1.37E-02	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-6
HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	10	U	UG/L	1.09E-06		
84-74-2	Di-n-butyl phthalate	10	U	UG/L		2.74E-03	
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	10	U	UG/L		3.42E-04	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	10	U	UG/L		6.85E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L	1.09E-04		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	U	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	10	U	UG/L		1.61E+00	
87-86-5	Pentachlorophenol	50	U	UG/L	8.92E-05	4.57E-02	5.00E+01
85-01-8	Phenanthrene	10	U	UG/L		5.48E-02	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	10	U	UG/L		5.48E-02	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	U	UG/L		2.28E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 27-6

HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
99-65-0	1,3-Dinitrobenzene	0.25	U	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	U	UG/L	2.23E-07	2.74E-02	
121-14-2	2,4-Dinitrotoluene	0.25	U	UG/L		3.42E-03	
606-20-2	2,6-Dinitrotoluene	6.5		UG/L		1.78E-01	
	Dinitrotoluene Mixture	6.5		UG/L	6.57E-05		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	U	UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		8.22E-03	
2691-41-0	HMX	0.5	U	UG/L		2.74E-04	
98-95-3	Nitrobenzene	0.25	UJ	UG/L		7.36E-02	
121-82-4	RDX	0.5	U	UG/L	8.18E-07	4.57E-03	
479-45-8	Tetryl	0.75	U	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	356		UG/L		9.75E-03	
7440-36-0	Antimony	6	U	UG/L		4.11E-01	1.00E+00
7440-38-2	Arsenic	10	U	UG/L	2.23E-04	9.13E-01	2.00E-01
7440-39-3	Barium	35	J	UG/L		1.37E-02	1.75E-02
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	64.5	J	UG/L		1.96E-02	3.23E-02
7440-43-9	Cadmium	5	U	UG/L		2.74E-01	1.00E+00
7440-70-2	Calcium	28500		UG/L			
7440-47-3	Chromium	10	U	UG/L			1.00E-01
7440-48-4	Cobalt	50	U	UG/L		2.28E-02	5.00E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-6
HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7440-50-8	Copper	3.4	J	UG/L		2.51E-03	5.23E-03
7439-89-6	Iron	648		UG/L		5.92E-02	1.30E-01
7439-92-1	Lead	2.2	J	UG/L			2.93E-01
7439-95-4	Magnesium	1790		UG/L			
7439-96-5	Manganese	132		UG/L		1.51E-01	8.80E-01
7439-97-6	Mercury	0.2	U	UG/L			1.00E-01
7440-02-0	Nickel	2.6	J	UG/L		3.56E-03	2.60E-02
2023695	Potassium	6570		UG/L			
7782-49-2	Selenium	5	U	UG/L		2.74E-02	1.00E-01
7440-22-4	Silver	10	U	UG/L		5.48E-02	2.00E-01
7440-23-5	Sodium	1310		UG/L			
7440-28-0	Thallium	10	U	UG/L		3.91E+00	5.00E+00
7440-62-2	Vanadium	50	U	UG/L		1.96E-01	
7440-66-6	Zinc	30.1		UG/L		2.75E-03	6.02E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-6
HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
99-65-0	1,3-Dinitrobenzene	0.25	U	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	U	UG/L	2.23E-07	2.74E-02	
121-14-2	2,4-Dinitrotoluene	0.25	U	UG/L		3.42E-03	
606-20-2	2,6-Dinitrotoluene	6.5		UG/L		1.78E-01	
	Dinitrotoluene Mixture	6.5		UG/L	6.57E-05		
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	U	UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L			
99-08-1	3-Nitrotoluene	0.5	UJ	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		8.22E-03	
2691-41-0	HMX	0.5	U	UG/L		2.74E-04	
98-95-3	Nitrobenzene	0.25	UJ	UG/L		7.36E-02	
121-82-4	RDX	0.5	U	UG/L	8.18E-07	4.57E-03	
479-45-8	Tetryl	0.75	U	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	356		UG/L		9.75E-03	
7440-36-0	Antimony	6	U	UG/L		4.11E-01	1.00E+00
7440-38-2	Arsenic	10	U	UG/L	2.23E-04	9.13E-01	2.00E-01
7440-39-3	Barium	35	J	UG/L		1.37E-02	1.75E-02
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	64.5	J	UG/L		1.96E-02	3.23E-02
7440-43-9	Cadmium	5	U	UG/L		2.74E-01	1.00E+00
7440-70-2	Calcium	28500		UG/L			
7440-47-3	Chromium	10	U	UG/L			1.00E-01
7440-48-4	Cobalt	50	U	UG/L		2.28E-02	5.00E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-6
HUMAN HEALTH SCREENING OF CISTERN WATER RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7440-50-8	Copper	3.4	J	UG/L		2.51E-03	5.23E-03
7439-89-6	Iron	648		UG/L		5.92E-02	1.30E-01
7439-92-1	Lead	2.2	J	UG/L			2.93E-01
7439-95-4	Magnesium	1790		UG/L			
7439-96-5	Manganese	132		UG/L		1.51E-01	8.80E-01
7439-97-6	Mercury	0.2	U	UG/L			1.00E-01
7440-02-0	Nickel	2.6	J	UG/L		3.56E-03	2.60E-02
2023695	Potassium	6570		UG/L			
7782-49-2	Selenium	5	U	UG/L		2.74E-02	1.00E-01
7440-22-4	Silver	10	U	UG/L		5.48E-02	2.00E-01
7440-23-5	Sodium	1310		UG/L			
7440-28-0	Thallium	10	U	UG/L		3.91E+00	5.00E+00
7440-62-2	Vanadium	50	U	UG/L		1.96E-01	
7440-66-6	Zinc	30.1		UG/L		2.75E-03	6.02E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		6	U	UG/KG	2.01E-04	
79-34-5	1,1,2,2-Tetrachloroethane		6	U	UG/KG	4.72E-02	
79-00-5	1,1,2-Trichloroethane		6	U	UG/KG	2.10E-04	
75-34-3	1,1-Dichloroethane		6	U	UG/KG	2.99E-04	
75-35-4	1,1-Dichloroethene		6	U	UG/KG	7.25E-04	
107-06-2	1,2-Dichloroethane (EDC)		6	U	UG/KG	2.83E-04	
540-59-0	1,2-Dichloroethene (total)		6	U	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		6	U	UG/KG	8.57E-06	
78-93-3	2-Butanone (MEK)		11	U	UG/KG	1.23E-04	
591-78-6	2-Hexanone		11	U	UG/KG	8.73E-04	
108-10-1	4-Methyl-2-pentanone (MIBK)		11	U	UG/KG	2.48E-05	
67-64-1	Acetone		19	U	UG/KG	7.60E-03	
71-43-2	Benzene		6	U	UG/KG	3.75E-04	
75-27-4	Bromodichloromethane		6	U	UG/KG	1.11E-02	
75-25-2	Bromoform		6	U	UG/KG	3.77E-04	
74-83-9	Bromomethane		6	U	UG/KG	2.55E-02	
75-15-0	Carbon disulfide		6	U	UG/KG	6.37E-02	
56-23-5	Carbon tetrachloride		6	U	UG/KG	6.00E-06	
108-90-7	Chlorobenzene		6	U	UG/KG	1.50E-04	
75-00-3	Chloroethane		6	U	UG/KG		
67-66-3	Chloroform		6	U	UG/KG	5.04E-03	
74-87-3	Chloromethane		6	U	UG/KG	5.77E-04	
156-59-2	cis-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-01-5	cis-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
124-48-1	Dibromochloromethane		6	U	UG/KG	2.93E-03	
100-41-4	Ethylbenzene		6	U	UG/KG	1.20E-03	
75-09-2	Methylene chloride		6	U	UG/KG	1.48E-03	
110-54-3	N-Hexane		6	U	UG/KG		
100-42-5	Styrene		6	U	UG/KG	2.00E-05	
127-18-4	Tetrachloroethylene (PCE)		6	U	UG/KG	4.62E-04	
108-88-3	Toluene		6	U	UG/KG	2.00E-03	
1330-20-7	total Xylenes		6	U	UG/KG	1.00E-02	
156-60-5	trans-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-02-6	trans-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
79-01-6	Trichloroethylene (TCE)		6	U	UG/KG	6.67E-04	
75-01-4	Vinyl chloride		6	U	UG/KG	9.29E-03	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		510	U	UG/KG	2.55E-02	
95-50-1	1,2-Dichlorobenzene		510	U	UG/KG	1.72E-01	
541-73-1	1,3-Dichlorobenzene		510	U	UG/KG	1.35E-02	
106-46-7	1,4-Dichlorobenzene		510	U	UG/KG	2.55E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2600	U	UG/KG	6.50E-01	
88-06-2	2,4,6-Trichlorophenol		510	U	UG/KG	5.10E-02	
120-83-2	2,4-Dichlorophenol		510	U	UG/KG	5.83E-03	
105-67-9	2,4-Dimethylphenol		510	U	UG/KG	5.10E+01	
51-28-5	2,4-Dinitrophenol		2600	U	UG/KG	1.30E-01	
91-58-7	2-Chloronaphthalene		510	U	UG/KG	4.19E+01	
95-57-8	2-Chlorophenol		510	U	UG/KG	2.10E+00	
91-57-6	2-Methylnaphthalene		950		UG/KG	2.93E-01	YES
95-48-7	2-Methylphenol		510	U	UG/KG	1.26E-02	
88-74-4	2-Nitroaniline		2600	U	UG/KG	3.51E-02	
88-75-5	2-Nitrophenol		510	U	UG/KG	3.19E-01	
91-94-1	3,3'-Dichlorobenzidine		510	U	UG/KG	7.89E-01	
99-09-2	3-Nitroaniline		2600	U	UG/KG	8.23E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2600	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		510	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		510	U	UG/KG	6.42E-02	
106-47-8	4-Chloroaniline		1000	U	UG/KG	9.09E-01	
7005-72-3	4-Chlorophenyl phenyl ether		510	U	UG/KG		
106-44-5	4-Methylphenol		510	U	UG/KG	3.13E-03	
100-01-6	4-Nitroaniline		2600	U	UG/KG	1.19E-01	
100-02-7	4-Nitrophenol		2600	U	UG/KG	3.71E-01	
83-32-9	Acenaphthene		510	U	UG/KG	7.47E-04	
208-96-8	Acenaphthylene		510	U	UG/KG	7.47E-04	
120-12-7	Anthracene		66	J	UG/KG	4.46E-05	YES
56-55-3	Benzo(a)anthracene		200	J	UG/KG	3.84E-02	YES
50-32-8	Benzo(a)pyrene		130	J	UG/KG	2.95E-05	YES
205-99-2	Benzo(b)fluoranthene		180	J	UG/KG	3.01E-03	YES
191-24-2	Benzo(g,h,i)perylene		510	U	UG/KG	4.29E-03	
207-08-9	Benzo(k)fluoranthene		510	U	UG/KG	8.53E-03	
111-91-1	bis(2-Chloroethoxy)methane		510	U	UG/KG	1.68E+00	
111-44-4	bis(2-Chloroethyl) ether		510	U	UG/KG	2.15E-02	
108-60-1	bis(2-Chloroisopropyl) ether		510	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		200	J	UG/KG	2.16E-01	YES
85-68-7	Butyl benzyl phthalate		510	U	UG/KG	2.13E+00	
86-74-8	Carbazole		57	J	UG/KG		YES
218-01-9	Chrysene		210	J	UG/KG	4.44E-02	YES
84-74-2	Di-n-butyl phthalate		510	U	UG/KG	2.55E-03	
117-84-0	Di-n-octyl phthalate		510	U	UG/KG	7.19E-04	
53-70-3	Dibenz(a,h)anthracene		510	U	UG/KG	2.77E-02	
132-64-9	Dibenzofuran		360	J	UG/KG		YES
84-66-2	Diethyl phthalate		510	U	UG/KG	5.10E-03	
131-11-3	Dimethyl phthalate		510	U	UG/KG	2.55E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		240	J	UG/KG	1.97E-03	YES
86-73-7	Fluorene		510	U	UG/KG	1.70E-02	
118-74-1	Hexachlorobenzene		510	U	UG/KG	5.10E-04	
87-68-3	Hexachlorobutadiene		510	U	UG/KG	1.28E+01	
77-47-4	Hexachlorocyclopentadiene		510	U	UG/KG	5.10E-02	
67-72-1	Hexachloroethane		510	U	UG/KG	8.55E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		510	U	UG/KG	4.68E-03	
78-59-1	Isophorone		510	U	UG/KG	3.67E-03	
621-64-7	N-Nitroso-di-n-propylamine		510	UJ	UG/KG	9.38E-01	
86-30-6	N-Nitrosodiphenylamine		510	U	UG/KG	2.55E-02	
91-20-3	Naphthalene		360	J	UG/KG	1.45E-03	
87-86-5	Pentachlorophenol		2600	U	UG/KG	4.33E-01	
85-01-8	Phenanthrene		770		UG/KG	1.68E-02	YES
108-95-2	Phenol		510	U	UG/KG	1.28E-02	
129-00-0	Pyrene		310	J	UG/KG	3.95E-03	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		380	U	UG/KG	1.01E+00	
99-65-0	1,3-Dinitrobenzene		380	U	UG/KG	5.80E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		770	U	UG/KG	2.57E-02	
121-14-2	2,4-Dinitrotoluene		380	U	UG/KG	2.97E-01	
606-20-2	2,6-Dinitrotoluene		510	U	UG/KG	1.55E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		770	U	UG/KG	9.63E-03	
88-72-2	2-Nitrotoluene (ONT)		770	U	UG/KG		
99-08-1	3-Nitrotoluene		770	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		770	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		770	U	UG/KG		
2691-41-0	HMX		770	U	UG/KG	3.08E-02	
98-95-3	Nitrobenzene		380	U	UG/KG	9.50E-03	
121-82-4	RDX		770	U	UG/KG	7.70E-03	
479-45-8	Tetryl		3100		UG/KG		
Metals							
7429-90-5	Aluminum	28800	17700		MG/KG		
7440-36-0	Antimony	0.83	0.76	J	MG/KG	1.52E-01	
7440-38-2	Arsenic	13.5	14.2		MG/KG	1.58E+00	
7440-39-3	Barium	195	274		MG/KG	5.48E-01	
7440-41-7	Beryllium	0.76	1		MG/KG	1.00E-01	
7440-42-8	Boron	5.3	7.2	J	MG/KG	1.44E+01	
7440-43-9	Cadmium	0.19	1.5		MG/KG	5.17E-02	
7440-70-2	Calcium	2497	2290		MG/KG		
7440-47-3	Chromium	25.2	22.2		MG/KG	4.44E+00	
7440-48-4	Cobalt	21.7	14		MG/KG	7.00E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 27-7
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0067**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7440-50-8	Copper	11.3	36.1		MG/KG	1.6E+00	
7439-89-6	Iron	19306	35100		MG/KG	1.76E+02	
7439-92-1	Lead	23.4	227		MG/KG	5.24E-01	
7439-95-4	Magnesium	1552	2940		MG/KG		
7439-96-5	Manganese	3640	1880		MG/KG	1.88E+01	
7439-97-6	Mercury	0.06	0.12	J	MG/KG	1.71E-02	YES
7440-02-0	Nickel	18.9	22.9		MG/KG	7.63E-01	
2023695	Potassium	625	1630		MG/KG		
7782-49-2	Selenium	2.34	0.89		MG/KG	8.90E-01	YES
7440-22-4	Silver	0.58	1.5	U	MG/KG	7.50E-01	
7440-23-5	Sodium	170	76.2	J	MG/KG		
7440-28-0	Thallium	0.41	0.49	J	MG/KG	4.90E-01	
7440-62-2	Vanadium	47.2	41		MG/KG	8.91E-01	
7440-66-6	Zinc	51.4	355		MG/KG	2.96E+00	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 27-8, AUS-0067
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Cistern Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	NA	NA	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,1-Dichloroethane	NA	NA	No	A	NA	NA	No	A
1,1-Dichloroethene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
2-Butanone (MEK)	NA	NA	No	A	NA	NA	No	A
2-Hexanone	NA	NA	No	C	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	NA	NA	No	A	NA	NA	No	A
Acetone	NA	NA	No	A	NA	NA	No	A
Benzene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Bromodichloromethane	NA	NA	Uncertainty	B	NA	NA	No	A
Bromoform	NA	NA	No	A	NA	NA	No	A
Bromomethane	NA	NA	No	A	NA	NA	No	A
Carbon disulfide	NA	NA	No	A	NA	NA	No	A
Carbon tetrachloride	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Chlorobenzene	NA	NA	No	A	NA	NA	No	A
Chloroethane	NA	NA	No	A	NA	NA	No	A
Chloroform	NA	NA	Uncertainty	B	NA	NA	No	A
Chloromethane	NA	NA	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	NA	NA	No	A	NA	NA	No	A
cis-1,3-Dichloropropene	NA	NA	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	NA	NA	Uncertainty	B	NA	NA	No	A
Ethylbenzene	NA	NA	No	A	NA	NA	No	A
Methylene chloride	NA	NA	No	A	NA	NA	Uncertainty	B
N-Hexane	NA	NA	No	A	NA	NA	No	A
Styrene	NA	NA	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	NA	NA	No	A	NA	NA	Uncertainty	B
Toluene	NA	NA	No	A	NA	NA	No	A
total Xylenes	NA	NA	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	NA	NA	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	NA	NA	Uncertainty	B	NA	NA	No	A
Trichloroethylene (TCE)	NA	NA	No	A	NA	NA	Uncertainty	B
Vinyl chloride	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	No	A	NA	NA	Uncertainty	B
1,2-Dichlorobenzene	NA	NA	No	A	NA	NA	No	A
1,3-Dichlorobenzene	NA	NA	Uncertainty	B	NA	NA	No	A
1,4-Dichlorobenzene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
2,4,5-Trichlorophenol	NA	NA	No	A	NA	NA	No	A

TABLE 27-8, AUS-0067
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Cistern Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
2,4-Dichlorophenol	NA	NA	No	A	NA	NA	Uncertainty	B
2,4-Dimethylphenol	NA	NA	No	A	NA	NA	Uncertainty	B
2,4-Dinitrophenol	NA	NA	No	A	NA	NA	Uncertainty	B
2-Chloronaphthalene	NA	NA	No	A	NA	NA	No	A
2-Chlorophenol	NA	NA	No	A	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	No	A	NA	NA	No	F
2-Methylphenol	NA	NA	No	A	NA	NA	No	A
2-Nitroaniline	NA	NA	Uncertainty	B	NA	NA	No	A
2-Nitrophenol	NA	NA	No	A	NA	NA	No	A
3,3'-Dichlorobenzidine	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
3-Nitroaniline	NA	NA	Uncertainty	B	NA	NA	No	A
4,6-Dinitro-2-methylphenol	NA	NA	No	C	NA	NA	No	C
4-Bromophenyl phenyl ether	NA	NA	No	C	NA	NA	No	C
4-Chloro-3-methylphenol	NA	NA	No	A	NA	NA	No	A
4-Chloroaniline	NA	NA	No	A	NA	NA	Uncertainty	B
4-Chlorophenyl phenyl ether	NA	NA	No	C	NA	NA	No	C
4-Methylphenol	NA	NA	No	A	NA	NA	No	A
4-Nitroaniline	NA	NA	Uncertainty	B	NA	NA	No	A
4-Nitrophenol	NA	NA	No	A	NA	NA	No	A
Acenaphthene	NA	NA	No	A	NA	NA	No	A
Acenaphthylene	NA	NA	No	A	NA	NA	No	A
Anthracene	NA	NA	No	A	NA	NA	No	F
Benzo(a)anthracene	NA	NA	Uncertainty	B	NA	NA	Yes	E
Benzo(a)pyrene	NA	NA	Uncertainty	B	NA	NA	No	F
Benzo(b)fluoranthene	NA	NA	Uncertainty	B	NA	NA	No	F
Benzo(g,h,i)perylene	NA	NA	No	A	NA	NA	No	A
Benzo(k)fluoranthene	NA	NA	Uncertainty	B	NA	NA	No	A
bis(2-Chloroethoxy)methane	NA	NA	No	C	NA	NA	No	C
bis(2-Chloroethyl) ether	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
bis(2-Chloroisopropyl) ether	NA	NA	Uncertainty	B	NA	NA	No	A
bis(2-Ethylhexyl) phthalate	NA	NA	Uncertainty	B	NA	NA	No	F
Butyl benzyl phthalate	NA	NA	No	A	NA	NA	No	A
Carbazole	NA	NA	Uncertainty	B	NA	NA	Yes	E
Chrysene	NA	NA	Uncertainty	B	NA	NA	No	F
Di-n-butyl phthalate	NA	NA	No	A	NA	NA	No	A
Di-n-octyl phthalate	NA	NA	No	A	NA	NA	No	A
Dibenz(a,h)anthracene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Dibenzofuran	NA	NA	No	A	NA	NA	No	F
Diethyl phthalate	NA	NA	No	A	NA	NA	No	A
Dimethyl phthalate	NA	NA	No	A	NA	NA	No	A
Fluoranthene	NA	NA	No	A	NA	NA	No	F

**TABLE 27-8, AUS-0067
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Cistern Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	NA	NA	No	A	NA	NA	No	A
Hexachlorobenzene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Hexachlorobutadiene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	No	A	NA	NA	No	A
Hexachloroethane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	NA	NA	Uncertainty	B	NA	NA	No	A
Isophorone	NA	NA	No	A	NA	NA	Uncertainty	B
N-Nitroso-di-n-propylamine	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
N-Nitrosodiphenylamine	NA	NA	No	A	NA	NA	Uncertainty	B
Naphthalene	NA	NA	Uncertainty	B	NA	NA	No	F
Pentachlorophenol	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Phenanthrene	NA	NA	No	A	NA	NA	No	F
Phenol	NA	NA	No	A	NA	NA	No	A
Pyrene	NA	NA	No	A	NA	NA	No	F
Metals and Inorganics								
Aluminum	NA	NA	No	F	NA	NA	No	F
Antimony	NA	NA	Uncertainty	B	NA	NA	Yes	D
Arsenic	NA	NA	Uncertainty	B	NA	NA	Yes	E
Barium	NA	NA	No	F	NA	NA	Yes	E
Beryllium	NA	NA	Uncertainty	B	NA	NA	Yes	E
Boron	NA	NA	No	F	NA	NA	No	F
Cadmium	NA	NA	Uncertainty	B	NA	NA	Yes	E
Calcium	NA	NA	No	H	NA	NA	No	H
Chromium	NA	NA	No	A	NA	NA	Yes	D
Cobalt	NA	NA	No	A	NA	NA	No	F
Copper	NA	NA	No	F	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	No	F	NA	NA	No	F
Lead	NA	NA	No	F	NA	NA	No	F
Magnesium	NA	NA	No	H	NA	NA	No	H
Manganese	NA	NA	No	F	NA	NA	No	F
Mercury	NA	NA	No	A	NA	NA	No	F
Nickel	NA	NA	No	F	NA	NA	Yes	E
Potassium	NA	NA	No	H	NA	NA	No	H
Selenium	NA	NA	No	A	NA	NA	Yes	D
Silver	NA	NA	No	A	NA	NA	Uncertainty	B
Sodium	NA	NA	No	H	NA	NA	No	H
Thallium	NA	NA	Uncertainty	B	NA	NA	No	F
Vanadium	NA	NA	No	A	NA	NA	No	F
Zinc	NA	NA	No	F	NA	NA	No	F
Explosives								
1,3,5-Trinitrobenzene	NA	NA	No	A	NA	NA	No	A
1,3-Dinitrobenzene	NA	NA	No	A	NA	NA	No	A

**TABLE 27-8, AUS-0067
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Cistern Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	No	A	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	No	A	NA	NA	Uncertainty	B
2,6-Dinitrotoluene	NA	NA	No	F	NA	NA	Uncertainty	B
Dinitrotoluene Mixture	NA	NA	Yes	E	NA	NA	NA	NA
2-Amino-4,6-Dinitrotoluene	NA	NA	No	C	NA	NA	No	C
2-Nitrotoluene (ONT)	NA	NA	No	C	NA	NA	No	C
3-Nitrotoluene	NA	NA	No	A	NA	NA	No	A
4-Amino-2,6-Dinitrotoluene	NA	NA	No	C	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	No	A	NA	NA	No	A
HMX	NA	NA	No	A	NA	NA	No	A
Nitrobenzene	NA	NA	No	A	NA	NA	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	No	A	NA	NA	No	A
Tetryl	NA	NA	No	A	NA	NA	No	F
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 27-9, AUS-0067
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	No	A
1,1,2-Trichloroethane	NA	NA	NA	NA	No	A
1,1-Dichloroethane	NA	NA	NA	NA	No	A
1,1-Dichloroethene	NA	NA	NA	NA	No	A
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	NA	NA	NA	NA	No	A
2-Butanone (MEK)	NA	NA	NA	NA	No	A
2-Hexanone	NA	NA	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	No	A
Acetone	NA	NA	NA	NA	No	A
Benzene	NA	NA	NA	NA	No	A
Bromodichloromethane	NA	NA	NA	NA	No	A
Bromoform	NA	NA	NA	NA	No	A
Bromomethane	NA	NA	NA	NA	No	A
Carbon disulfide	NA	NA	NA	NA	No	A
Carbon tetrachloride	NA	NA	NA	NA	No	A
Chlorobenzene	NA	NA	NA	NA	No	A
Chloroethane	NA	NA	NA	NA	No	C
Chloroform	NA	NA	NA	NA	No	A
Chloromethane	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	NA	NA	NA	NA	No	A
Dibromochloromethane	NA	NA	NA	NA	No	A
Ethylbenzene	NA	NA	NA	NA	No	A
Methylene chloride	NA	NA	NA	NA	No	A
N-Hexane	NA	NA	NA	NA	No	C
Styrene	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	NA	NA	NA	NA	No	A
Toluene	NA	NA	NA	NA	No	A
total Xylenes	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	NA	NA	NA	NA	No	A
Vinyl chloride	NA	NA	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	NA	NA	NA	NA	No	A
1,2-Dichlorobenzene	NA	NA	NA	NA	No	A
1,3-Dichlorobenzene	NA	NA	NA	NA	No	A
1,4-Dichlorobenzene	NA	NA	NA	NA	No	A
2,4,5-Trichlorophenol	NA	NA	NA	NA	No	A

**TABLE 27-9, AUS-0067
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	No	A
2,4-Dichlorophenol	NA	NA	NA	NA	No	A
2,4-Dimethylphenol	NA	NA	NA	NA	Uncertainty	B
2,4-Dinitrophenol	NA	NA	NA	NA	No	A
2-Chloronaphthalene	NA	NA	NA	NA	Uncertainty	B
2-Chlorophenol	NA	NA	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	Yes	E
2-Methylphenol	NA	NA	NA	NA	No	A
2-Nitroaniline	NA	NA	NA	NA	No	A
2-Nitrophenol	NA	NA	NA	NA	No	A
3,3'-Dichlorobenzidine	NA	NA	NA	NA	No	A
3-Nitroaniline	NA	NA	NA	NA	No	A
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	No	C
4-Bromophenyl phenyl ether	NA	NA	NA	NA	No	C
4-Chloro-3-methylphenol	NA	NA	NA	NA	No	A
4-Chloroaniline	NA	NA	NA	NA	No	A
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	No	C
4-Methylphenol	NA	NA	NA	NA	No	A
4-Nitroaniline	NA	NA	NA	NA	No	A
4-Nitrophenol	NA	NA	NA	NA	No	A
Acenaphthene	NA	NA	NA	NA	No	A
Acenaphthylene	NA	NA	NA	NA	No	A
Anthracene	NA	NA	NA	NA	Yes	E
Benzo(a)anthracene	NA	NA	NA	NA	Yes	E
Benzo(a)pyrene	NA	NA	NA	NA	Yes	E
Benzo(b)fluoranthene	NA	NA	NA	NA	Yes	E
Benzo(g,h,i)perylene	NA	NA	NA	NA	No	A
Benzo(k)fluoranthene	NA	NA	NA	NA	No	A
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	Uncertainty	B
bis(2-Chloroethyl) ether	NA	NA	NA	NA	No	A
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	No	C
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	Yes	E
Butyl benzyl phthalate	NA	NA	NA	NA	Uncertainty	B
Carbazole	NA	NA	NA	NA	Yes	E
Chrysene	NA	NA	NA	NA	Yes	E
Di-n-butyl phthalate	NA	NA	NA	NA	No	A
Di-n-octyl phthalate	NA	NA	NA	NA	No	A
Dibenz(a,h)anthracene	NA	NA	NA	NA	No	A
Dibenzofuran	NA	NA	NA	NA	Yes	E
Diethyl phthalate	NA	NA	NA	NA	No	A
Dimethyl phthalate	NA	NA	NA	NA	No	A
Fluoranthene	NA	NA	NA	NA	Yes	E

TABLE 27-9, AUS-0067
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	No	A
Hexachlorobenzene	NA	NA	NA	NA	No	A
Hexachlorobutadiene	NA	NA	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	NA	NA	No	A
Hexachloroethane	NA	NA	NA	NA	No	A
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	No	A
Isophorone	NA	NA	NA	NA	No	A
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	No	A
N-Nitrosodiphenylamine	NA	NA	NA	NA	No	A
Naphthalene	NA	NA	NA	NA	No	F
Pentachlorophenol	NA	NA	NA	NA	No	A
Phenanthrene	NA	NA	NA	NA	Yes	E
Phenol	NA	NA	NA	NA	No	A
Pyrene	NA	NA	NA	NA	Yes	E
Metals and Inorganics						
Aluminum	NA	NA	NA	NA	Uncertainty	I
Antimony	NA	NA	NA	NA	No	F
Arsenic	NA	NA	NA	NA	Yes	E
Barium	NA	NA	NA	NA	No	F
Beryllium	NA	NA	NA	NA	No	F
Boron	NA	NA	NA	NA	Yes	E
Cadmium	NA	NA	NA	NA	No	F
Calcium	NA	NA	NA	NA	Uncertainty	G,H
Chromium	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	Yes	E
Lead	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	Uncertainty	G,H
Manganese	NA	NA	NA	NA	Yes	D
Mercury	NA	NA	NA	NA	Yes	E
Nickel	NA	NA	NA	NA	No	F
Potassium	NA	NA	NA	NA	Uncertainty	G,H
Selenium	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	No	A
Sodium	NA	NA	NA	NA	Uncertainty	G,H
Thallium	NA	NA	NA	NA	No	F
Vanadium	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	Yes	E
Explosives						
1,3,5-Trinitrobenzene	NA	NA	NA	NA	Uncertainty	B
1,3-Dinitrobenzene	NA	NA	NA	NA	No	A

**TABLE 27-9, AUS-0067
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	No	A
2,6-Dinitrotoluene	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	No	A
2-Nitrotoluene (ONT)	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	No	C
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	No	C
HMX	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	Uncertainty	G

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 27-10
AUS-0067 - FENCE WITH "CONTAMINATED AREA" SIGN, NORTHWEST OF COC-6
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum ¹	Soil	Sediment	Cistern Water	Surface Water
SVOCs					
2-Methylnaphthalene		E	NA		NA
Anthracene		E	NA		NA
Benzo(a)anthracene		H,E	NA		NA
Benzo(a)pyrene		E	NA		NA
Benzo(b)fluoranthene		E	NA		NA
bis(2-Ethylhexyl)phthalate		E	NA		NA
Carbazole		H,E	NA		NA
Chrysene		E	NA		NA
Dibenzofuran		E	NA		NA
Fluoranthene		E	NA		NA
Phenanthrene		E	NA		NA
Pyrene		E	NA		NA
Metals					
Arsenic		H,E	NA		NA
Barium		H	NA		NA
Beryllium		H	NA		NA
Boron		E	NA		NA
Cadmium		H	NA		NA
Copper		E	NA		NA
Iron		E	NA		NA
Mercury		E	NA		NA
Nickel		H	NA		NA
Zinc		E	NA		NA
Explosives					
Dinitrotoluene Mixture		NA	NA	H	NA

Key:

¹ Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-0067.DWG Last edited: 09/24/01 @ 08:43 a.m. WC-ST. LOUIS, MO

AUS-0067-001		Units	Result:	Reference	Result:	Reference
			0 - 6 in	Code	2 ft	Code
Volatile Organic Compounds						
All VOCs	UG/KG	NA			ND	
Semivolatile Organic Compounds						
2-Methylnaphthalene	UG/KG	950	e5	680	e5	
Anthracene	UG/KG	66	e5	43	e5	
Benz(a)anthracene	UG/KG	200	e5,h5	110	e5,h5	
Benz(a)pyrene	UG/KG	130	e5	73	e5	
Benz(b)fluoranthene	UG/KG	180	e5	76	e5	
bis(2-Ethylhexyl) phthalate (DEHP)	UG/KG	59	e5	200	e5	
Carbazole	UG/KG	57	e5,h5	ND		
Chrysene	UG/KG	210	e5	98	e5	
Dibenzofuran	UG/KG	380	e5	260	e5	
Fluoranthene	UG/KG	240	e5	110	e5	
Naphthalene	UG/KG	360		220		
Phenanthrene	UG/KG	770	e5	510	e5	
Pyrene	UG/KG	310	e5	160	e5	
Explosives						
All Explosives	UG/KG				ND	
Tetryl	UG/KG	3100				
Metals						
Aluminum	MG/KG	12900		14900		
Antimony	MG/KG	0.76	h5	0.54	h5	
Arsenic	MG/KG	14.2	b1, e1, h1, h5, h7	11.9	e1, h1, h5, h7	
Barium	MG/KG	274	h5	152	h5	
Beryllium	MG/KG	1	b1	0.85	b1	
Boron	MG/KG	7.2	b1, e1	3.4	e1	
Cadmium	MG/KG	1.5	e1, h5	0.77	e1, h5	
Calcium	MG/KG	2290		1520		
Chromium	MG/KG	22.2	e1, h5	21.3	e1, h5	
Cobalt	MG/KG	14		10.9		
Copper	MG/KG	36.1	b1, e1	21.8	b1	
Iron	MG/KG	30700	b1, e1	35100	b1, e1	
Lead	MG/KG	227	b1	86.3	b1	
Magnesium	MG/KG	1650	b1	1910	b1	
Manganese	MG/KG	1880	e1	796	e1	
Mercury	MG/KG	0.12	b1, e5	0.054	e5	
Nickel	MG/KG	22.9	b1, h5	17.6	h5	
Potassium	MG/KG	1630	b1	1220	b1	
Selenium	MG/KG	0.89	e5, h5	0.74	e5, h5	
Sodium	MG/KG	76.2		61.4		
Vanadium	MG/KG	39.2		37.5		
Zinc	MG/KG	352	b1, e1	171	b1, e1	

AUS-0067-003		Units	Result:	Reference	Result:	Reference
			0 - 6 in	Code	2 ft	Code
Volatile Organic Compounds						
All VOCs	UG/KG	NA			ND	
Semivolatile Organic Compounds						
All SVOCs	UG/KG	ND			NA	
Explosives						
All Explosives	UG/KG	ND			NA	
Metals						
All Metals	MG/KG				NA	
Aluminum	MG/KG	17100				
Antimony	MG/KG	0.55	h5			
Arsenic	MG/KG	10	e1, h1, h5, h7			
Barium	MG/KG	109	h5			
Beryllium	MG/KG	0.57				
Boron	MG/KG	2.1	e1			
Calcium	MG/KG	1230				
Chromium	MG/KG	20	e1, h5			
Cobalt	MG/KG	9.6				
Copper	MG/KG	16.8	b1			
Iron	MG/KG	24000	b1, e1			
Lead	MG/KG	26.8	b1			
Magnesium	MG/KG	2930	b1			
Manganese	MG/KG	553	e1			
Mercury	MG/KG	0.044	e5			
Nickel	MG/KG	16.6	h5			
Potassium	MG/KG	1350	b1			
Selenium	MG/KG	0.42	e5, h5			
Sodium	MG/KG	56.4				
Vanadium	MG/KG	39.3				
Zinc	MG/KG	75.3	b1			

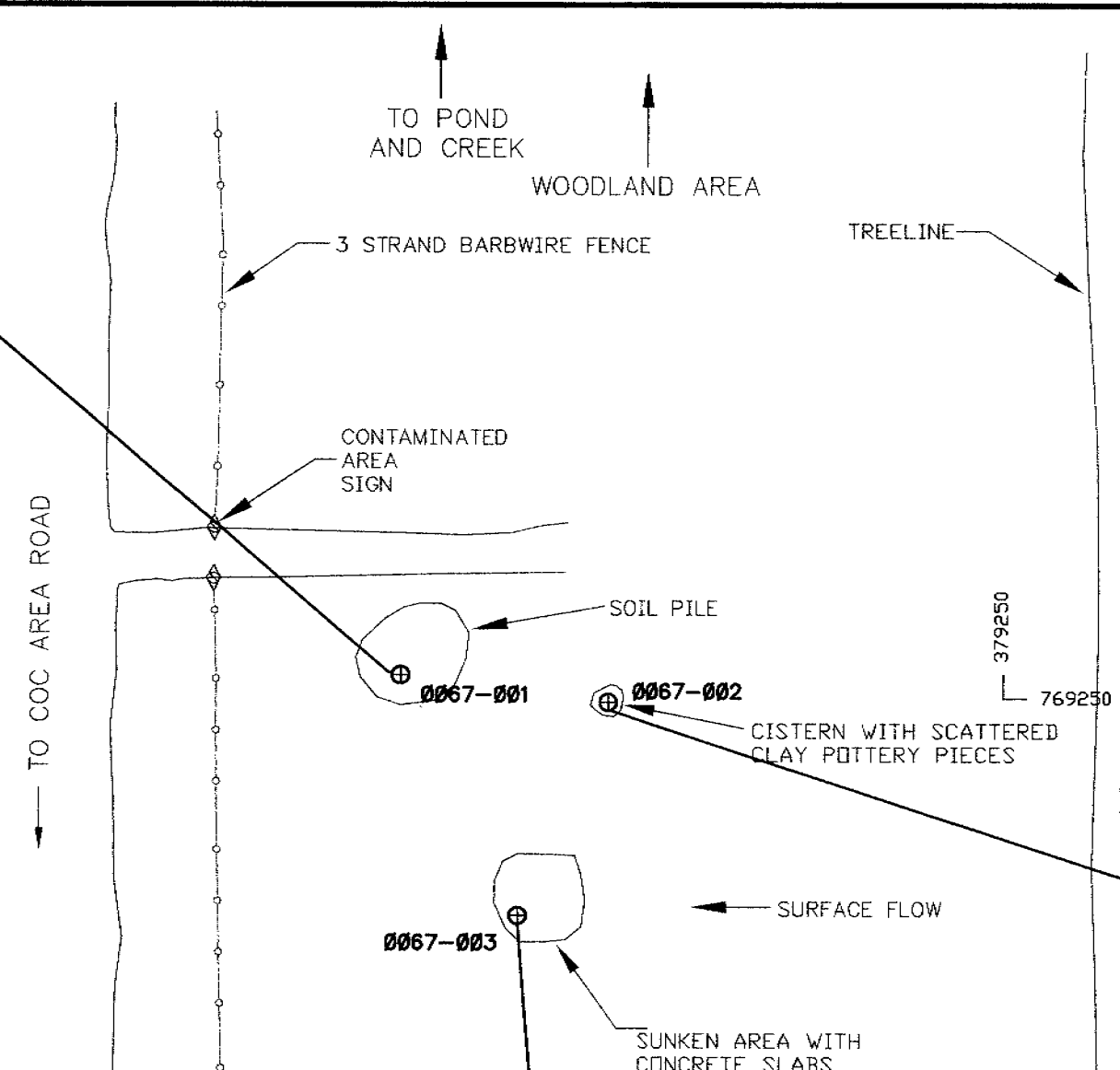
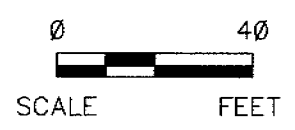
Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Grassy Background Sediment UTL	b2
Little Grassy Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
IEPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Kow values (potential bioaccumulator)	e5
USEPA Region IX Industrial Soil PRG - carcinous	h1
USEPA Region IX Industrial Soil PRG - noncarcinous	h2
USEPA Region IX Tap Water PRG - carcinous	h3
USEPA Region IX Tap Water PRG - noncarcinous	h4
USEPA Region IX Migration to Groundwater PRG (DAF=1)	h5
USEPA MCL Drinking Water Standards	h6
IEPA TACO Industrial/Commercial Soil Ingestion	h7
IEPA TACO Construction Worker Soil Ingestion	h8
IEPA TACO Class I Soil Component of Groundwater	h9
IEPA General Use Surface Water Quality Human Health	h10

AUS-0067-002-GW-00 (Cistern Water)			
Units	Result	Screening	Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
2,4-Dinitrotoluene	UG/L	6.5	h3
Metals			
Aluminum	UG/L	358	
Barium	UG/L	35	
Boron	UG/L	64.5	
Calcium	UG/L	28500	
Copper	UG/L	3.4	
Iron	UG/L	648	
Lead	UG/L	2.2	
Magnesium	UG/L	1790	
Manganese	UG/L	132	
Nickel	UG/L	2.6	
Potassium	UG/L	6570	
Sodium	UG/L	1310	
Zinc	UG/L	30.1	

- NOTES:
1. BASED MAP FROM SITE RECONNAISSANCE SKETCH, MARCH 31, 1999.
 2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
 3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

PA/SI REPORT-AU SOU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY:djd 10/24/00 DSGN. BY:mjh CHKD. BY:mch/cmww	AUS-0067 Sample Locations and Detections in Soils and Cistern Water
FIG. NO. 27-1	

AUS-0067-FENCE WITH "CONTAMINATED AREA" SIGN, TO NW OF FORMER COC-6



See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC Area. AUS-0069 is located approximately 700 feet (ft) east and 800 ft north of the intersection of Wolf Creek Road and the COC Area Road. The northern side of the site borders Crab Orchard Lake (Figure 22-1).

AUS-0069 partially coincides with Explosives and Munitions Manufacturing Area Operable Unit (EMMA OU) Site COC-15 (Figure 22-2), one of the COC sites for which no chemical analyses were done as part of the EMMA OU. AUS-0069 is also a dump site.

AUS Original Site Designations

AUS-0069 is one of the original AUS OU sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS).

28.1 HISTORIC SEARCH INFORMATION

28.1.1 Site Description

AUS-0069 was originally described as “dump near south shore of Crab Orchard Lake” and it was “close to where landmines were located in 1996 (COC-15)”. According to a report done by Parsons Engineering¹, AUS-0069 is a part of COC-15. COC-15 measures approximately 600 ft by 1,000 ft.² Figure 28-1 is a site map.

28.1.2 Operational History and Waste Characteristics

AUS-0069 was identified in aerial photographs as a potential dump. The 1943 aerial photographs show deposits of probable debris and large numbers of crated materials in this area along with a looping access road.³ By 1951, there was still some ground scarring and mounded debris present on site, however it appears that activity in this area had been terminated.⁴ This would indicate that this site was used by the IOP.

There have been no known industrial lessees of this property.

¹ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Figure 2.1.

² Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-31.

³ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-23 and Volume II (Maps) Page L. The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

⁴ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-23 and Volume II (Maps) Page L.

28.1.3 AUS-0069 Previous Sampling Results**Parsons Engineering, 1997**

Under contract with the Department of Army, Parsons Engineering conducted an Ordnance and Explosive Waste (OEW) investigation at this site (COC-15) in 1997. Six 100-ft by 200-ft grids were investigated at this site and a total of 2,702 magnetic anomalies were identified.⁵ Of these, 501 were investigated and 465 were non-ordnance scrap, 29 were ordnance scrap and seven were unexploded ordnance (UXO).⁶ The recovered ordnance scrap consisted of munitions fragments and mine spider wheels.⁷ The UXO recovered were all M-1 mine fuses which were later disposed of by demolition.⁸ The ordnance removal work was completed by the U.S. Army Corps of Engineers in 2000.

28.1.4 Observations During Site Visit

The site appeared to have been a dump. The following types of material were observed: construction debris (culverts, corrugated asbestos sheeting, concrete rubble, clay blocks, bricks, steel scrap), rusted drums, piping and soil mounds. Most of the debris is located in a stand of trees along the lakeshore and some of the debris is in Crab Orchard Lake.

28.1.5 Recommendations Based on Preliminary Assessment

AUS-0069 was included in the SI since there were numerous abandoned drums (empty) observed on site and some ordnance was also found on site during previous investigations.

28.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0069 on May 2, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)⁹ for the AUS OU PA/SI. AUS OU SI sample locations are shown on Figures 28-1, 28-2, and 28-3. Survey coordinates for all sample locations in AUS-0069 are listed in Table 28-1. Table 28-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples unless otherwise noted.

28.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted.

⁵ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-31.

⁶ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-31.

⁷ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-31.

⁸ Parsons Engineering Science, Inc., October 1997, Engineering Evaluation and Cost Analysis, Final Report, Former Illinois Ordnance Plant, Marion, Illinois, Page 2-31.

⁹ U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

Abandoned Drums/Disposal Areas

Two test pits (0069-001 and 0069-013) and two hand auger samples (0069-006 and 0069-009) were located in the vicinity of abandoned drums (Figure 28-1). Test pit 0069-001 was located in an area with other dumped material in addition to the drums. Test pit 0069-013 was located on the northwest portion of the site, next to Crab Orchard Lake. A sample of water from the test pit (trench water) was also taken at location 0069-013.

Three hand augers (0069-004, 0069-007 and 0069-008) and one test pit (0069-012) were located in soil mounds at the site. A sample of water from the test pit (trench water) was also taken at location 0069-012.

Sample location 0069-005 is near the shore of Crab Orchard Lake, near some construction debris.

Sample locations 0069-014 through 0069-017 were planned for possible disposal areas that were identified in historical aerial photographs. These four samples were collected as planned, except that location 0069-014 was mistakenly labeled 0069-018.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0069-001-GW-00 This sample was not collected because groundwater was not encountered during excavation activities.
- AUS-0069-014-SS-0X Due to a mistake in sample labeling during the field investigation, this sample was labeled AUS-0069-018-SS-0X in the field.
- AUS-0069-014-SS-02 Due to a mistake in sample labeling during the field investigation, this sample was labeled AUS-0069-018-SS-02 in the field.

Drainageways

Sample locations 0069-010 and 0069-011 (sediment) were in a drainageway that runs along the east side of the site and drains into Crab Orchard Lake.

Sample locations 0069-002 and 0069-003 were in a drainage swale that also flows into Crab Orchard Lake, near abandoned drums.

All samples were collected in accordance with the tables in the Field Sampling Plan with the following exceptions:

- AUS-0069-010-SW-00 This sample was not collected because there was no surface water present.
- AUS-0069-011-SW-00 This sample was not collected because there was no surface water present.

28.2.2 Field Results**28.2.2.1 Site Conditions**

The northern boundary of the site is the south shore of Crab Orchard Lake, and the western, southern, and eastern sides of the site are bounded by woodlands.

28.2.2.1.1 *Geologic Conditions*

No monitoring wells were installed at AUS-0069. The test pits indicate that a 0.5 to 4.5 ft thick layer of fill material (topsoil, etc.) overlays the site at the test pit locations. In Test Pits 0069-012 and 0069-001 the fill contained burnt debris including metal, glass, and brick. The material encountered from below the fill to approximately 12 ft below ground surface (bgs), which was the bottom of pit depth for the deepest pits 0069-001 and 0069-013, was described as loess (low plastic silty clay, and silt). Hand auger samples collected at the site also described the first 5 ft of soil at the site as silty clay fill. The fill at sample locations 0069-001, 0069-006, and 0069-008 included debris.

28.2.2.1.2 *Hydrogeologic Conditions*

Groundwater was encountered in two of the three test pits during excavation, at depths of 4 ft bgs and 11 ft bgs (elevations of 404 and 396 ft mean sea level (msl)).

28.2.2.1.3 *Hydrologic Conditions*

The site drains north into Crab Orchard Lake. There is a drainageway at the east side of the site.

28.2.2.2 Chemical Results

The sample analytical results are summarized in the following tables:

- Table 28-3 – soil samples results,
- Table 28-4 – sediment samples results, and
- Table 28-5 – trench water samples results.

These tables list all the chemicals detected in AUS-0069 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report.

Sample results are presented on the following figures:

- Figure 28-1 – organic results for soil and sediment samples,
- Figure 28-2 – inorganic results for soil and sediment samples, and
- Figure 28-3 – all results for trench water samples at this site.

28.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 28-6 through 28-10 as follows:

- Table 28-6--human health risk screening for soils,

- Table 28-7--human health risk screening for sediment,
- Table 28-8--human health risk screening for trench water,
- Table 28-9--ecological risk screening for soils, and
- Table 28-10--ecological risk screening for sediment.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0069. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified with a "U" qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figures 28-1 through 28-3 the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with "J") are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 28-11 (human health risk) and 28-12 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 28-11) and COPECs (Table 28-12) are shaded in the tables.

28.3.1 Human Health Risk

28.3.1.1 Soil/Sediment

Human health screening results for soil and sediment samples are presented in Tables 28-6 and 28-7, respectively. Soil screening values were conservatively used to screen the sediment samples.

For carcinogens, a cancer risk was calculated using the United States Environmental Protection Agency (USEPA) Region 9 Industrial Soil (preliminary remediation goals) PRGs as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA

Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

28.3.1.2 Trench Water

Human health screening results for trench water are presented in Table 28-8. The maximum trench water concentrations from AUS-0069 were conservatively screened against maximum contaminant levels (MCLs) and Illinois Class I groundwater standards.

28.3.2 Ecological Risk

There were no complete exposure pathways to surface water for ecological receptors. Discussion of soil and sediment are presented below.

28.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 28-9. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)¹⁰
- Environment Canada (1995)¹¹
- Talmage *et al.* (1999)¹²
- Efrogmson *et al.* (1997a, 1997b)¹³
- CCME (1999)¹⁴
- MHSPE (1994)¹⁵
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

¹⁰ USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

¹¹ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

¹² Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

¹³ Efrogmson, 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, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efrogmson, 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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

¹⁴ Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

¹⁵ Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)¹⁶ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

28.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 28-10. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)¹⁷
- USEPA (1996 – summarized by Ingersoll et al. 1996)¹⁸
- Ontario Ministry of the Environment and Energy (1995)¹⁹
- NOAA (1999)²⁰
- Ecotox (USEPA 1996)²¹
- Long et al. (1995)²²
- Equilibrium partitioning
- USEPA Region V Environmental Data Quality Levels (EDQLs)
- Other sources

With respect to effects levels, there are a number of potential sources and endpoints. There are also multiple endpoints from some sources. For example, threshold effects levels (TELs) as reported by Ingersoll et al. (1996) are the geometric mean of the 15th percentile in the effects data set and the 50th percentile in the no-effects data set. The effects-range low (ERL) and effects-range medium (ERM) are the 15th percentile and 50th percentile values in the effects datasets, respectively. The Probable Effects Level (PEL) is the geometric mean of the 50th

¹⁶ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

¹⁷ MacDonald, D.D., Ingersoll, C.G., Berger, T.A. 1999. *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems*. MacDonald Environmental Services Ltd., British Columbia, Canada.

¹⁸ Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfield, F.J. Dwyer, C. E. Henke, N.E. Kemble, D.R. Mount, and R.G. Fox. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyaella azteca* and the midge *Chironomus riparius*. *J. Great Lakes Res.* 22(3):602-623.

¹⁹ Ontario Ministry of Environment and Energy. 1995. *Ontario's Approach to Sediment Assessment and Remediation*. Second SETAC World Congress (16th Annual Meeting). Vancouver, British Columbia, Canada.

²⁰ NOAA. 1999. *Screening quick Reference Tables*. National Oceanic and Atmospheric Administration HAZMAT Report 99-1, Seattle Washington.

²¹ USEPA. 1996. *ECO Update: Ecotox Thresholds*. EPA-540/F-95/038. U.S. Environmental Protection Agency. Office of Solid Waste and Emergency Response. Washington, D.C. 12pp.

²² Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. *Environ. Management.* 19(1): 81-97.

percentile in the effects data set and the 85th percentile in the no-effects data set, and the effects range medium is the 50th percentile value of the effects dataset. A TEL or ERL is assumed to represent a concentration below which toxic effects are rarely observed. The range between the TEL and PEL is assumed to represent the range in which effects are occasionally observed. MacDonald et al. (2000) developed "consensus-based" freshwater sediment screening concentrations. Threshold effect concentrations (TECs) were developed as concentrations below which adverse effects are not expected to occur. Probable effect concentrations (PECs) were levels above which effects are frequently expected to occur. Among other potential screening values, no effect concentrations (NECs – Ingersoll et al. 1996) and upper effect thresholds (JETs – NOAA 1999) are also levels above which effects are frequently or always observed.

In deriving an ecological screening value (ESV), preference was given to the TEC, TEL and ERL values since these are the most conservative (i.e., levels below which effects are rarely observed). Preference was also given to freshwater-derived values (MacDonald et al. [1999], Ingersoll et al. [1996], Ontario [1995] and NOAA [1999]) as opposed to estuarine or saltwater (Long et al. 1995). If screening values were unavailable from the sources noted above, the "equilibrium-partitioning" (EqP) approach was used. This used the surface water ecological screening value and the expected partitioning between sediment and sediment pore water as described in USEPA (1993). A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 28.3.2.1.

28.4 SCIENTIFIC MANAGEMENT DECISION POINT

A Remedial Investigation (RI) is recommended for Site AUS-0069, based on exceedances of the SI screening criteria.

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not necessarily be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 28-11; and on the COPEC list, Table 28-12. COPCs in this category include arsenic and silver in sediment. COPECs coded with "D" on Table 28-12 include silver in sediment and manganese in soil. These chemicals may later be included in the RI for other reasons, but the detections at the locations noted are not considered to be of concern since they are below Refuge background levels. All other COPCs/COPECs listed on these tables should be investigated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 28-13.

Note that a number of the human health COPCs exceed migration to groundwater screening criteria. Groundwater has not been investigated at this site, and based on these data, should be considered in the RI. Other areas of the site and media and contaminants in addition to those

addressed in this study may warrant investigation in the RI. These issues will be addressed in the work plan for the RI.

**TABLE 28-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0069**

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0069-001	378014.2	775382.6	426.53	NA	
0069-002	378025.9	775396.3	422.28	NA	
0069-003	378084.2	775441.1	416.15	NA	
0069-004	378051.0	775631.7	407.10	NA	
0069-005	378086.5	775641.9	406.11	NA	
0069-006	377988.8	775639.4	408.79	NA	
0069-007	378042.1	775656.4	408.67	NA	
0069-008	378009.8	775664.7	409.44	NA	
0069-009	377981.9	775710.7	407.59	NA	
0069-010	377990.1	775747.0	404.03	NA	
0069-011	377890.0	775697.8	407.00	NA	
0069-012	377990.7	775668.0	408.46	NA	
0069-013	378162.8	775514.9	406.99	NA	
0069-014				NA	This sample was not collected. Sample 0069-018 was collected instead.
0069-015	377622.7	775028.7	424.60	NA	
0069-016	377780.1	775053.2	415.36	NA	
0069-017	377862.7	775369.8	428.25	NA	
0069-018	377770.7	775609.8	410.32	NA	

Sheet 1 of 1

**TABLE 28-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0069**

Sediment	Soil	Trench Water
AUS-0069-010	AUS-0069-001	AUS-0069-012
AUS-0069-011	AUS-0069-002	AUS-0069-013
	AUS-0069-003	
	AUS-0069-004	
	AUS-0069-005	
	AUS-0069-006	
	AUS-0069-007	
	AUS-0069-008	
	AUS-0069-009	
	AUS-0069-012	
	AUS-0069-013	
	AUS-0069-015	
	AUS-0069-016	
	AUS-0069-017	
	AUS-0069-018	

Sheet 1 of 1

TABLE 28-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Volatile Organic Compounds		
Tetrachloroethylene(PCE)	1/18	5 ug/kg
Semivolatile Organic Compounds		
2-Methylnaphthalene	1/15	72 ug/kg
Anthracene	1/15	130 ug/kg
Benzo(a)Anthracene	3/15	53 ug/kg to 1,700 ug/kg
Benzo(a)Pyrene	3/15	88 ug/kg to 2,200 ug/kg
Benzo(b)Fluoranthene	4/15	66 ug/kg to 2,600 ug/kg
Benzo(g,h,i)Perylene	4/15	79 ug/kg to 2,000 ug/kg
Benzo(k)Fluoranthene	2/15	110 ug/kg to 1,700 ug/kg
Bis(2-ethylhexyl) Phthalate	3/15	49 ug/kg to 120 ug/kg
Carbazole	1/15	77 ug/kg
Chrysene	4/15	48 ug/kg to 1,800 ug/kg
Dibenz(a,h)Anthracene	1/15	630 ug/kg
Dibenzofuran	1/15	65 ug/kg
Di-n-Butyl Phthalate	2/15	130 ug/kg to 720 ug/kg
Fluoranthene	4/15	45 ug/kg to 2,400 ug/kg
Indeno(1,2,3-c,d)Pyrene	3/15	100 ug/kg to 1,700 ug/kg
Naphthalene	2/15	50 ug/kg to 160 ug/kg
Phenanthrene	4/15	47 ug/kg to 440 ug/kg
Pyrene	5/15	46 ug/kg to 2,200 ug/kg
Explosives		
2,4,6-Trinitrotoluene	1/15	680 ug/kg
2-Amino-4,6-Dinitrotoluene	1/15	370 ug/kg
4-Amino-2,6-Dinitrotoluene	1/15	250 ug/kg
Metals		
Aluminum	14/14	5,320 mg/kg to 14,800 mg/kg
Antimony	12/14	0.39 mg/kg to 173 mg/kg
Arsenic	14/14	5.9 mg/kg to 48.1 mg/kg
Barium	14/14	95.5 mg/kg to 4,940 mg/kg
Beryllium	11/14	0.44 mg/kg to 1.6 mg/kg
Boron	12/14	0.77 mg/kg to 84.2 mg/kg
Cadmium	8/14	0.72 mg/kg to 28 mg/kg
Calcium	14/14	1,220 mg/kg to 51,300 mg/kg
Chromium, Total	14/14	8.7mg/kg to 266 mg/kg
Cobalt	14/14	6.3 mg/kg to 28.6 mg/kg
Copper	14/14	6.8 mg/kg to 7,060 mg/kg
Iron	14/14	12,200 mg/kg to 308,000 mg/kg
Lead	14/14	9.4 mg/kg to 51,000 mg/kg
Magnesium	14/14	1,050 mg/kg to 13,900 mg/kg
Manganese	14/14	614 mg/kg to 1,450 mg/kg
Mercury	14/14	0.029 mg/kg to 0.52 mg/kg
Nickel	14/14	9.3 mg/kg to 130 mg/kg
Potassium	14/14	493 mg/kg to 1,580 mg/kg

Sheet 1 of 2

**TABLE 28-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY**

Constituent	Number of Detections	Range of Detections
Selenium	9/14	0.26 mg/kg to 4.1 mg/kg
Silver	7/14	0.36 mg/kg to 15.3 mg/kg
Sodium	12/14	31.9 mg/kg to 1,080 mg/kg
Vanadium	14/14	13.6 mg/kg to 89.5 mg/kg
Zinc	14/14	38.4 mg/kg to 16,400 mg/kg

Sheet 2 of 2

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/20/01

TABLE 28-4
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Benzo(a)Anthracene	1/2	67 ug/kg
Benzo(a)Pyrene	1/2	54 ug/kg
Benzo(b)Fluoranthene	1/2	120 ug/kg
Chrysene	1/2	82 ug/kg
Dibenzofuran	1/2	59 ug/kg
Di-n-Butyl Phthalate	1/2	260 ug/kg
Fluoranthene	1/2	150 ug/kg
Phenanthrene	1/2	220 ug/kg
Pyrene	1/2	130 ug/kg
Other Inorganics		
Total Organic Carbon	1/1	142,000 mg/kg
Metals		
Aluminum	2/2	10,600 mg/kg to 10,700 mg/kg
Antimony	2/2	2.1 mg/kg to 8.8 mg/kg
Arsenic	2/2	7.1 mg/kg to 8.4 mg/kg
Barium	2/2	170 mg/kg to 472 mg/kg
Beryllium	2/2	0.67 mg/kg to 0.68 mg/kg
Boron	2/2	11.6 mg/kg to 19.4 mg/kg
Cadmium	2/2	7.1 mg/kg to 9.4 mg/kg
Calcium	2/2	4,960 mg/kg to 6,940 mg/kg
Chromium, Total	2/2	24.6 mg/kg to 44.9 mg/kg
Cobalt	2/2	8.3 mg/kg to 9.1 mg/kg
Copper	2/2	83.9 mg/kg to 157 mg/kg
Iron	2/2	17,200 mg/kg to 21,500 mg/kg
Lead	2/2	196 mg/kg to 610 mg/kg
Magnesium	2/2	2,040 mg/kg to 3,130 mg/kg
Manganese	2/2	1,180 mg/kg to 1,190 mg/kg
Mercury	2/2	0.6 mg/kg to 0.81 mg/kg
Nickel	2/2	24 mg/kg to 31.8 mg/kg
Potassium	2/2	811 mg/kg to 1,000 mg/kg
Silver	2/2	0.63 mg/kg to 2.9 mg/kg
Sodium	2/2	149 mg/kg to 170 mg/kg
Vanadium	2/2	26.6 mg/kg to 29.3 mg/kg
Zinc	2/2	368 mg/kg to 1,110 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram
ug/kg = micrograms per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/20/01

TABLE 28-5
TRENCH WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Volatile Organic Compounds		
cis-1,2-Dichloroethene	1/2	1 ug/L
Semivolatile Organic Compounds		
bis(2-Ethylhexyl) Phthalate	1/2	3.9 ug/L
Explosives		
HMX	1/2	0.71 ug/L
Metals		
Aluminum	2/2	5,260 ug/L 1,430,000 ug/L
Antimony	2/2	3.9 ug/L to 6 ug/L
Arsenic	2/2	3.6 ug/L to 327 ug/L
Barium	2/2	345 ug/L to 11,200 ug/L
Beryllium	1/2	47.3 ug/L
Boron	2/2	3 ug/L to 250 ug/L
Cadmium	1/2	1 ug/L
Calcium	2/2	1,680 ug/L to 179,000 ug/L
Chromium, Total	2/2	15.2 ug/L to 1,380 ug/L
Cobalt	2/2	4.5 ug/L to 518 ug/L
Copper	2/2	62 ug/L to 1,290 ug/L
Iron	2/2	12,700 ug/L to 1,870,000 ug/L
Lead	2/2	138 ug/L to 875 ug/L
Magnesium	2/2	1,200 ug/L to 286,000 ug/L
Manganese	2/2	320 ug/L to 49,900 ug/L
Mercury	2/2	3.6 ug/L to 6.8 ug/L
Nickel	2/2	8.2 ug/L to 1,350 ug/L
Potassium	2/2	347 ug/L to 61,200 ug/L
Silver	1/2	11.7 ug/L
Sodium	1/2	74,100 ug/L
Thallium	1/2	10.6 ug/L
Vanadium	2/2	15.4 ug/L to 1,910 ug/L
Zinc	2/2	490 ug/L to 4,160 ug/L

Sheet 1 of 1

ug/L = micrograms per Liter

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/20/01

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			2.10E-06	7.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG		7.79E-09	1.79E-06	3.50E+01
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG		3.68E-09	4.60E-05	7.78E+00
75-34-3	1,1-Dichloroethane	7	U	UG/KG			3.40E-06	7.00E-03
75-35-4	1,1-Dichloroethene	7	U	UG/KG		5.90E-08	1.04E-04	2.33E+00
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG		9.15E-09	1.99E-04	7.00E+00
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG			4.75E-05	3.50E-01
78-87-5	1,2-Dichloropropane	7	U	UG/KG		9.12E-09	3.29E-04	7.00E+00
78-93-3	2-Butanone (MEK)	14	U	UG/KG			5.05E-07	
591-78-6	2-Hexanone	14	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	14	U	UG/KG			4.85E-06	
67-64-1	Acetone	21	U	UG/KG			3.38E-06	2.63E-02
71-43-2	Benzene	7	U	UG/KG		4.78E-09	2.89E-04	3.50E+00
75-27-4	Bromodichloromethane	7	U	UG/KG		2.97E-09	6.71E-06	2.33E-01
75-25-2	Bromoform	7	U	UG/KG		2.24E-11	3.97E-07	1.75E-01
74-83-9	Bromomethane	7	U	UG/KG			5.33E-04	7.00E-01
75-15-0	Carbon disulfide	7	U	UG/KG			5.79E-06	3.50E-03
56-23-5	Carbon tetrachloride	7	U	UG/KG		1.32E-08	1.00E-03	2.33E+00
108-90-7	Chlorobenzene	7	U	UG/KG			1.29E-05	1.00E-01
75-00-3	Chloroethane	7	U	UG/KG		1.08E-09	3.71E-07	
67-66-3	Chloroform	7	U	UG/KG		1.34E-08	5.43E-03	2.33E-01
74-87-3	Chloromethane	7	U	UG/KG		2.63E-09		
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG			4.75E-05	3.50E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	
124-48-1	Dibromochloromethane	7	U	UG/KG		2.64E-09	4.40E-06	3.50E-01
100-41-4	Ethylbenzene	7	U	UG/KG			1.17E-06	1.00E-02
75-09-2	Methylene chloride	8	U	UG/KG		3.90E-10	8.18E-07	8.00E+00
110-54-3	N-Hexane	7	U	UG/KG			1.73E-05	
100-42-5	Styrene	7	U	UG/KG			3.42E-07	3.50E-02
127-18-4	Tetrachloroethylene (PCE)	5	J	UG/KG		2.68E-10	2.94E-06	1.67E+00
108-88-3	Toluene	7	U	UG/KG			3.52E-06	1.17E-02
1330-20-7	total Xylenes	7	U	UG/KG			1.57E-06	7.00E-04
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG			3.27E-05	2.33E-01
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG		3.94E-08	1.59E-04	
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG		1.14E-09	8.85E-05	2.33E+00
75-01-4	Vinyl chloride	7	U	UG/KG		1.44E-07		1.00E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	510	U	UG/KG			6.70E-05	1.70E+00
95-50-1	1,2-Dichlorobenzene	510	U	UG/KG			1.54E-04	5.67E-01
541-73-1	1,3-Dichlorobenzene	510	U	UG/KG			9.85E-03	
106-46-7	1,4-Dichlorobenzene	510	U	UG/KG		6.27E-08	2.65E-04	5.10E+00
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG			2.95E-05	2.60E-01
88-06-2	2,4,6-Trichlorophenol	510	U	UG/KG		2.27E-09		6.38E+01
120-83-2	2,4-Dichlorophenol	510	U	UG/KG			1.93E-04	1.02E+01
105-67-9	2,4-Dimethylphenol	510	U	UG/KG			2.89E-05	1.28E+00
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG			1.48E-03	2.60E+02
91-58-7	2-Chloronaphthalene	510	U	UG/KG			1.87E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-57-8	2-Chlorophenol	510	U	UG/KG			2.11E-03	2.55E+00
91-57-6	2-Methylnaphthalene	72	J	UG/KG			1.33E-06	3.60E-04
95-48-7	2-Methylphenol	510	U	UG/KG			1.16E-05	6.38E-01
88-74-4	2-Nitroaniline	2600	U	UG/KG			5.17E-02	
88-75-5	2-Nitrophenol	510	U	UG/KG			7.24E-05	
91-94-1	3,3'-Dichlorobenzidine	510	U	UG/KG		9.30E-08		1.70E+03
99-09-2	3-Nitroaniline	2600	U	UG/KG			5.17E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	510	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	510	U	UG/KG			1.16E-05	
106-47-8	4-Chloroaniline	1000	U	UG/KG			2.84E-04	3.33E+01
7005-72-3	4-Chlorophenyl phenyl ether	510	U	UG/KG				
106-44-5	4-Methylphenol	510	U	UG/KG			1.16E-04	
100-01-6	4-Nitroaniline	2600	U	UG/KG			5.17E-02	
100-02-7	4-Nitrophenol	2600	U	UG/KG			3.69E-04	
83-32-9	Acenaphthene	510	U	UG/KG			1.33E-05	1.70E-02
208-96-8	Acenaphthylene	510	U	UG/KG			9.41E-06	2.55E-03
120-12-7	Anthracene	130	J	UG/KG			3.34E-07	2.17E-04
56-55-3	Benzo(a)anthracene	1700		UG/KG		5.89E-07		2.13E+01
50-32-8	Benzo(a)pyrene	2200		UG/KG		7.62E-06		5.50E+00
205-99-2	Benzo(b)fluoranthene	2600		UG/KG		9.01E-07		1.30E+01
191-24-2	Benzo(g,h,i)perylene	2000		UG/KG			3.69E-05	1.00E-02
207-08-9	Benzo(k)fluoranthene	1700		UG/KG		5.89E-08		8.50E-01
111-91-1	bis(2-Chloroethoxy)methane	510	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
111-44-4	bis(2-Chloroethyl) ether	510	U	UG/KG		8.23E-07		2.55E+04
108-60-1	bis(2-Chloroisopropyl) ether	510	U	UG/KG		6.31E-08	1.20E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	120	J	UG/KG		6.81E-10	6.81E-06	
85-68-7	Butyl benzyl phthalate	510	U	UG/KG			2.89E-06	6.38E-04
86-74-8	Carbazole	77	J	UG/KG		6.24E-10		2.57E+00
218-01-9	Chrysene	1800		UG/KG		6.24E-09		2.25E-01
84-74-2	Di-n-butyl phthalate	720		UG/KG			8.17E-06	2.40E-03
117-84-0	Di-n-octyl phthalate	510	U	UG/KG			2.89E-05	5.10E-05
53-70-3	Dibenz(a,h)anthracene	630		UG/KG		2.18E-06		7.88E+00
132-64-9	Dibenzofuran	65	J	UG/KG			1.28E-05	
84-66-2	Diethyl phthalate	510	U	UG/KG			7.24E-07	
131-11-3	Dimethyl phthalate	510	U	UG/KG			5.79E-08	
206-44-0	Fluoranthene	2400		UG/KG			7.97E-05	1.20E-02
86-73-7	Fluorene	510	U	UG/KG			1.54E-05	1.70E-02
118-74-1	Hexachlorobenzene	510	U	UG/KG		3.31E-07	7.24E-04	5.10E+00
87-68-3	Hexachlorobutadiene	510	U	UG/KG		1.61E-08	2.89E-03	5.10E+00
77-47-4	Hexachlorocyclopentadiene	510	U	UG/KG			8.65E-05	2.55E-02
67-72-1	Hexachloroethane	510	U	UG/KG		2.89E-09	5.79E-04	2.55E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	1700		UG/KG		5.89E-07		2.43E+00
78-59-1	Isophorone	510	U	UG/KG		1.96E-10	2.89E-06	1.70E+01
621-64-7	N-Nitroso-di-n-propylamine	510	U	UG/KG		1.45E-06		2.55E+05
86-30-6	N-Nitrosodiphenylamine	510	U	UG/KG		1.01E-09		8.50E+00
91-20-3	Naphthalene	160	J	UG/KG			8.49E-04	4.00E-02
87-86-5	Pentachlorophenol	2600	U	UG/KG		2.34E-07	1.82E-04	2.60E+03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-01-8	Phenanthrene	440	J	UG/KG			8.11E-06	2.20E-03
108-95-2	Phenol	510	U	UG/KG			9.65E-07	1.02E-01
129-00-0	Pyrene	2200		UG/KG			4.06E-05	1.10E-02
Explosives								
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			1.44E-05	
99-65-0	1,3-Dinitrobenzene	380	U	UG/KG			4.31E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	680	J	UG/KG		8.27E-09	1.54E-03	
121-14-2	2,4-Dinitrotoluene	380	U	UG/KG			2.16E-04	9.50E+03
606-20-2	2,6-Dinitrotoluene	510	U	UG/KG			5.79E-04	1.70E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	370	J	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	770	U	UG/KG				
99-08-1	3-Nitrotoluene	770	U	UG/KG			3.79E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	250	J	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	770	U	UG/KG			3.79E-04	
2691-41-0	HMX	770	U	UG/KG			1.75E-05	
98-95-3	Nitrobenzene	380	U	UG/KG			3.32E-03	
121-82-4	RDX	770	U	UG/KG		3.43E-08	2.91E-04	
479-45-8	Tetryl	1200	U	UG/KG			1.36E-04	
Metals								
7429-90-5	Aluminum	14800		MG/KG	5.14E-01		8.83E-03	
7440-36-0	Antimony	173		MG/KG	2.08E+02		2.12E-01	5.77E+02
7440-38-2	Arsenic	48.1		MG/KG	3.56E+00	1.76E-05	1.10E-01	4.81E+01
7440-39-3	Barium	4940		MG/KG	2.53E+01		3.97E-02	6.18E+01
7440-41-7	Beryllium	1.6		MG/KG	2.11E+00	7.14E-10	4.33E-04	5.33E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-42-8	Boron	84.2		MG/KG	1.59E+01		1.06E-03	
7440-43-9	Cadmium	28		MG/KG	1.47E+02	9.37E-09	3.46E-02	7.00E+01
7440-70-2	Calcium	51300		MG/KG	2.05E+01			
7440-47-3	Chromium	266		MG/KG	1.06E+01	5.93E-07		1.33E+02
7440-48-4	Cobalt	28.6		MG/KG	1.32E+00		2.33E-04	
7440-50-8	Copper	7060		MG/KG	6.25E+02		9.30E-02	
7439-89-6	Iron	308000		MG/KG	1.60E+01		5.03E-01	
7439-92-1	Lead	51000		MG/KG	2.18E+03			
7439-95-4	Magnesium	13900		MG/KG	8.96E+00			
7439-96-5	Manganese	1620		MG/KG	4.45E-01		5.02E-02	
7439-97-6	Mercury	0.52		MG/KG	8.67E+00			
7440-02-0	Nickel	130		MG/KG	6.88E+00		3.18E-03	1.86E+01
2023695	Potassium	1580		MG/KG	2.53E+00			
7782-49-2	Selenium	4.1	J	MG/KG	1.75E+00		4.01E-04	1.37E+01
7440-22-4	Silver	15.3		MG/KG	2.64E+01		1.50E-03	7.65E+00
7440-23-5	Sodium	1080		MG/KG	6.35E+00			
7440-28-0	Thallium	14	U	MG/KG	3.41E+01		9.78E-05	
7440-62-2	Vanadium	89.5	J	MG/KG	1.90E+00		6.26E-03	2.98E-01
7440-66-6	Zinc	16400		MG/KG	3.19E+02		2.68E-02	2.73E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	7	U	UG/KG			3.50E-03
79-34-5	1,1,2,2-Tetrachloroethane	7	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	7	U	UG/KG	8.54E-07	8.54E-07	3.50E-01
75-34-3	1,1-Dichloroethane	7	U	UG/KG	3.50E-08	3.50E-08	3.04E-04
75-35-4	1,1-Dichloroethene	7	U	UG/KG	3.89E-07	3.89E-06	1.17E-01
107-06-2	1,2-Dichloroethane (EDC)	7	U	UG/KG	1.11E-04	5.00E-06	3.50E-01
540-59-0	1,2-Dichloroethene (total)	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02
78-87-5	1,2-Dichloropropane	7	U	UG/KG	8.33E-05	3.89E-06	2.33E-01
78-93-3	2-Butanone (MEK)	14	U	UG/KG			
591-78-6	2-Hexanone	14	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	14	U	UG/KG			
67-64-1	Acetone	21	U	UG/KG	1.05E-07	1.05E-07	1.31E-03
71-43-2	Benzene	7	U	UG/KG	3.50E-05	1.63E-06	2.33E-01
75-27-4	Bromodichloromethane	7	U	UG/KG	7.61E-05	3.50E-06	1.17E-02
75-25-2	Bromoform	7	U	UG/KG	9.72E-06	4.38E-07	8.75E-03
74-83-9	Bromomethane	7	U	UG/KG	2.41E-06	7.00E-06	3.50E-02
75-15-0	Carbon disulfide	7	U	UG/KG	3.50E-08	3.50E-07	2.19E-04
56-23-5	Carbon tetrachloride	7	U	UG/KG	1.59E-04	1.71E-05	1.00E-01
108-90-7	Chlorobenzene	7	U	UG/KG	1.71E-07	1.71E-06	7.00E-03
75-00-3	Chloroethane	7	U	UG/KG			
67-66-3	Chloroform	7	U	UG/KG	7.45E-06	3.50E-06	1.17E-02
74-87-3	Chloromethane	7	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	7	U	UG/KG	3.50E-07	3.50E-07	1.75E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
10061-01-5	cis-1,3-Dichloropropene	7	U	UG/KG			
124-48-1	Dibromochloromethane	7	U	UG/KG	1.71E-07	1.71E-07	1.75E-02
100-41-4	Ethylbenzene	7	U	UG/KG	3.50E-08	3.50E-07	5.38E-04
75-09-2	Methylene chloride	8	U	UG/KG	1.05E-05	6.67E-07	4.00E-01
110-54-3	N-Hexane	7	U	UG/KG			
100-42-5	Styrene	7	U	UG/KG	1.71E-08	1.71E-07	1.75E-03
127-18-4	Tetrachloroethylene (PCE)	5	J	UG/KG	4.55E-05	2.08E-06	8.33E-02
108-88-3	Toluene	7	U	UG/KG	1.71E-08	1.71E-08	5.83E-04
1330-20-7	total Xylenes	7	U	UG/KG	7.00E-09	1.71E-08	4.67E-05
156-60-5	trans-1,2-Dichloroethene	7	U	UG/KG	1.71E-07	1.71E-07	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	7	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	7	U	UG/KG	1.35E-05	5.83E-06	1.17E-01
75-01-4	Vinyl chloride	7	U	UG/KG	2.33E-03	1.08E-04	7.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	510	U	UG/KG	2.55E-05	2.55E-04	1.02E-01
95-50-1	1,2-Dichlorobenzene	510	U	UG/KG	2.83E-06	2.83E-05	3.00E-02
541-73-1	1,3-Dichlorobenzene	510	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	510	U	UG/KG			2.55E-01
95-95-4	2,4,5-Trichlorophenol	2600	U	UG/KG	1.30E-05	1.30E-05	9.63E-03
88-06-2	2,4,6-Trichlorophenol	510	U	UG/KG	9.81E-04	4.64E-05	2.55E+00
120-83-2	2,4-Dichlorophenol	510	U	UG/KG	8.36E-05	8.36E-04	5.10E-01
105-67-9	2,4-Dimethylphenol	510	U	UG/KG	1.24E-05	1.24E-05	5.67E-02
51-28-5	2,4-Dinitrophenol	2600	U	UG/KG	6.34E-04	6.34E-03	1.30E+01
91-58-7	2-Chloronaphthalene	510	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OF
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-57-8	2-Chlorophenol	510	U	UG/KG	5.10E-05	5.10E-05	1.28E-01
91-57-6	2-Methylnaphthalene	72	J	UG/KG	1.18E-06	1.18E-06	1.71E-05
95-48-7	2-Methylphenol	510	U	UG/KG	5.10E-06	5.10E-06	3.40E-02
88-74-4	2-Nitroaniline	2600	U	UG/KG			
88-75-5	2-Nitrophenol	510	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	510	U	UG/KG	3.92E-02	1.82E-03	7.29E+01
99-09-2	3-Nitroaniline	2600	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2600	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	510	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	510	U	UG/KG			
106-47-8	4-Chloroaniline	1000	U	UG/KG	1.22E-04	1.22E-03	1.43E+00
7005-72-3	4-Chlorophenyl phenyl ether	510	U	UG/KG			
106-44-5	4-Methylphenol	510	U	UG/KG			
100-01-6	4-Nitroaniline	2600	U	UG/KG			
100-02-7	4-Nitrophenol	2600	U	UG/KG			
83-32-9	Acenaphthene	510	U	UG/KG	4.25E-06	4.25E-06	8.95E-04
208-96-8	Acenaphthylene	510	U	UG/KG	8.36E-06	8.36E-06	1.21E-04
120-12-7	Anthracene	130	J	UG/KG	2.13E-07	2.13E-07	1.08E-05
56-55-3	Benzo(a)anthracene	1700		UG/KG	2.13E-01	1.00E-02	8.50E-01
50-32-8	Benzo(a)pyrene	2200		UG/KG	2.75E+00	1.29E-01	2.75E-01
205-99-2	Benzo(b)fluoranthene	2600		UG/KG	3.25E-01	1.53E-02	5.20E-01
191-24-2	Benzo(g,h,i)perylene	2000		UG/KG	3.28E-05	3.28E-05	4.76E-04
207-08-9	Benzo(k)fluoranthene	1700		UG/KG	2.18E-02	1.00E-03	3.47E-02
111-91-1	bis(2-Chloroethoxy)methane	510	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
111-44-4	bis(2-Chloroethyl) ether	510	U	UG/KG	1.02E-01	6.80E-03	1.28E+03
108-60-1	bis(2-Chloroisopropyl) ether	510	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	120	J	UG/KG	2.93E-04	2.93E-05	3.33E-05
85-68-7	Butyl benzyl phthalate	510	U	UG/KG	1.24E-06	1.24E-06	5.48E-04
86-74-8	Carbazole	77	J	UG/KG	2.66E-04	1.24E-05	1.28E-01
218-01-9	Chrysene	1800		UG/KG	2.31E-03	1.06E-04	1.13E-02
84-74-2	Di-n-butyl phthalate	720		UG/KG	3.60E-06	3.60E-06	3.13E-04
117-84-0	Di-n-octyl phthalate	510	U	UG/KG	1.24E-05	1.24E-04	5.10E-05
53-70-3	Dibenz(a,h)anthracene	630		UG/KG	7.88E-01	3.71E-02	3.15E-01
132-64-9	Dibenzofuran	65	J	UG/KG			
84-66-2	Diethyl phthalate	510	U	UG/KG	5.10E-07	5.10E-07	1.09E-03
131-11-3	Dimethyl phthalate	510	U	UG/KG			
206-44-0	Fluoranthene	2400		UG/KG	2.93E-05	2.93E-05	5.58E-04
86-73-7	Fluorene	510	U	UG/KG	6.22E-06	6.22E-06	9.11E-04
118-74-1	Hexachlorobenzene	510	U	UG/KG	1.28E-01	6.54E-03	2.55E-01
87-68-3	Hexachlorobutadiene	510	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	510	U	UG/KG	3.64E-05	3.64E-05	1.28E-03
67-72-1	Hexachloroethane	510	U	UG/KG	2.55E-04	2.55E-04	1.02E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	1700		UG/KG	2.13E-01	1.00E-02	1.21E-01
78-59-1	Isophorone	510	U	UG/KG	1.24E-06	1.24E-06	6.38E-02
621-64-7	N-Nitroso-di-n-propylamine	510	U	UG/KG	6.38E-01	2.83E-02	1.02E+04
86-30-6	N-Nitrosodiphenylamine	510	U	UG/KG	4.25E-04	2.04E-05	5.10E-01
91-20-3	Naphthalene	160	J	UG/KG	1.95E-06	1.95E-05	1.90E-03
87-86-5	Pentachlorophenol	2600	U	UG/KG	1.08E-01	5.00E-03	8.67E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-01-8	Phenanthrene	440	J	UG/KG	7.21E-06	7.21E-06	1.05E-04
108-95-2	Phenol	510	U	UG/KG	5.10E-07	4.25E-06	5.10E-03
129-00-0	Pyrene	2200		UG/KG	3.61E-05	3.61E-05	5.24E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	380	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	380	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	680	J	UG/KG			
121-14-2	2,4-Dinitrotoluene	380	U	UG/KG	4.52E-02	2.11E-03	4.75E+02
606-20-2	2,6-Dinitrotoluene	510	U	UG/KG	6.07E-02	2.83E-03	7.29E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	370	J	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	770	U	UG/KG			
99-08-1	3-Nitrotoluene	770	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	250	J	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	770	U	UG/KG			
2691-41-0	HMX	770	U	UG/KG			
98-95-3	Nitrobenzene	380	U	UG/KG	3.80E-04	3.80E-04	3.80E+00
121-82-4	RDX	770	U	UG/KG			
479-45-8	Tetryl	1200	U	UG/KG			
Metals							
7429-90-5	Aluminum	14800		MG/KG			
7440-36-0	Antimony	173		MG/KG	2.11E-01	2.11E+00	3.46E+01
7440-38-2	Arsenic	48.1		MG/KG	1.60E+01	7.89E-01	1.72E+00
7440-39-3	Barium	4940		MG/KG	3.53E-02	3.53E-01	4.12E+00
7440-41-7	Beryllium	1.6		MG/KG	1.60E+00	5.52E-02	2.42E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-6
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-42-8	Boron	84.2		MG/KG	4.68E-04	4.68E-03	
7440-43-9	Cadmium	28		MG/KG	1.40E-02	1.40E-01	7.57E+00
7440-70-2	Calcium	51300		MG/KG			
7440-47-3	Chromium	266		MG/KG	2.66E-02	6.49E-02	9.50E+00
7440-48-4	Cobalt	28.6		MG/KG	2.38E-04	2.38E-03	
7440-50-8	Copper	7060		MG/KG	8.61E-02	8.61E-01	6.42E-01
7439-89-6	Iron	308000		MG/KG			
7439-92-1	Lead	51000		MG/KG	1.28E+02	1.28E+02	
7439-95-4	Magnesium	13900		MG/KG			
7439-96-5	Manganese	1620		MG/KG	1.69E-02	1.69E-01	
7439-97-6	Mercury	0.52		MG/KG	8.52E-04	8.52E-03	3.47E+00
7440-02-0	Nickel	130		MG/KG	3.17E-03	3.17E-02	1.71E+00
2023695	Potassium	1580		MG/KG			
7782-49-2	Selenium	4.1	J	MG/KG	4.10E-04	4.10E-03	1.71E+00
7440-22-4	Silver	15.3		MG/KG	1.53E-03	1.53E-02	1.02E+01
7440-23-5	Sodium	1080		MG/KG			
7440-28-0	Thallium	14	U	MG/KG	8.75E-02	8.75E-02	5.83E+00
7440-62-2	Vanadium	89.5	J	MG/KG	6.39E-03	6.39E-02	9.13E-02
7440-66-6	Zinc	16400		MG/KG	2.69E-02	2.69E-01	4.56E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	580	U	UG/KG			7.61E-05	1.93E+00
95-50-1	1,2-Dichlorobenzene	580	U	UG/KG			1.75E-04	6.44E-01
541-73-1	1,3-Dichlorobenzene	580	U	UG/KG			1.12E-02	
106-46-7	1,4-Dichlorobenzene	580	U	UG/KG		7.14E-08	3.02E-04	5.80E+00
95-95-4	2,4,5-Trichlorophenol	2900	U	UG/KG			3.29E-05	2.90E-01
88-06-2	2,4,6-Trichlorophenol	580	U	UG/KG		2.59E-09		7.25E+01
120-83-2	2,4-Dichlorophenol	580	U	UG/KG			2.19E-04	1.16E+01
105-67-9	2,4-Dimethylphenol	580	U	UG/KG			3.29E-05	1.45E+00
51-28-5	2,4-Dinitrophenol	2900	U	UG/KG			1.65E-03	2.90E+02
91-58-7	2-Chloronaphthalene	580	U	UG/KG			2.13E-05	
95-57-8	2-Chlorophenol	580	U	UG/KG			2.40E-03	2.90E+00
91-57-6	2-Methylnaphthalene	580	U	UG/KG			1.07E-05	2.90E-03
95-48-7	2-Methylphenol	580	U	UG/KG			1.32E-05	7.25E-01
88-74-4	2-Nitroaniline	2900	U	UG/KG			5.76E-02	
88-75-5	2-Nitrophenol	580	U	UG/KG			8.23E-05	
91-94-1	3,3'-Dichlorobenzidine	580	U	UG/KG		1.06E-07		1.93E+03
99-09-2	3-Nitroaniline	2900	U	UG/KG			5.76E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2900	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	580	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	580	U	UG/KG			1.32E-05	
106-47-8	4-Chloroaniline	1200	U	UG/KG			3.41E-04	4.00E+01
7005-72-3	4-Chlorophenyl phenyl ether	580	U	UG/KG				
106-44-5	4-Methylphenol	580	U	UG/KG			1.32E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
 J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
100-01-6	4-Nitroaniline	2900	U	UG/KG			5.76E-02	
100-02-7	4-Nitrophenol	2900	U	UG/KG			4.12E-04	
83-32-9	Acenaphthene	580	U	UG/KG			1.51E-05	1.93E-02
208-96-8	Acenaphthylene	580	U	UG/KG			1.07E-05	2.90E-03
120-12-7	Anthracene	580	U	UG/KG			1.49E-06	9.67E-04
56-55-3	Benzo(a)anthracene	67	J	UG/KG		2.32E-08		8.38E-01
50-32-8	Benzo(a)pyrene	54	J	UG/KG		1.87E-07		1.35E-01
205-99-2	Benzo(b)fluoranthene	120	J	UG/KG		4.16E-08		6.00E-01
191-24-2	Benzo(g,h,i)perylene	580	U	UG/KG			1.07E-05	2.90E-03
207-08-9	Benzo(k)fluoranthene	580	U	UG/KG		2.01E-08		2.90E-01
111-91-1	bis(2-Chloroethoxy)methane	580	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	580	U	UG/KG		9.36E-07		2.90E+04
108-60-1	bis(2-Chloroisopropyl) ether	580	U	UG/KG		7.18E-08	1.37E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	580	U	UG/KG		3.29E-09	3.29E-05	
85-68-7	Butyl benzyl phthalate	580	U	UG/KG			3.29E-06	7.25E-04
86-74-8	Carbazole	580	U	UG/KG		4.70E-09		1.93E+01
218-01-9	Chrysene	82	J	UG/KG		2.84E-10		1.03E-02
84-74-2	Di-n-butyl phthalate	260	J	UG/KG			2.95E-06	8.67E-04
117-84-0	Di-n-octyl phthalate	580	U	UG/KG			3.29E-05	5.80E-05
53-70-3	Dibenz(a,h)anthracene	580	U	UG/KG		2.01E-06		7.25E+00
132-64-9	Dibenzofuran	59	J	UG/KG			1.17E-05	
84-66-2	Diethyl phthalate	580	U	UG/KG			8.23E-07	
131-11-3	Dimethyl phthalate	580	U	UG/KG			6.58E-08	
206-44-0	Fluoranthene	150	J	UG/KG			4.98E-06	7.50E-04

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
86-73-7	Fluorene	580	U	UG/KG			1.75E-05	1.93E-02
118-74-1	Hexachlorobenzene	580	U	UG/KG		3.76E-07	8.23E-04	5.80E+00
87-68-3	Hexachlorobutadiene	580	U	UG/KG		1.83E-08	3.29E-03	5.80E+00
77-47-4	Hexachlorocyclopentadiene	580	U	UG/KG			9.84E-05	2.90E-02
67-72-1	Hexachloroethane	580	U	UG/KG		3.29E-09	6.58E-04	2.90E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	580	U	UG/KG		2.01E-07		8.29E-01
78-59-1	Isophorone	580	U	UG/KG		2.23E-10	3.29E-06	1.93E+01
621-64-7	N-Nitroso-di-n-propylamine	580	U	UG/KG		1.65E-06		2.90E+05
86-30-6	N-Nitrosodiphenylamine	580	U	UG/KG		1.15E-09		9.67E+00
91-20-3	Naphthalene	580	U	UG/KG			3.08E-03	1.45E-01
87-86-5	Pentachlorophenol	2900	U	UG/KG		2.61E-07	2.03E-04	2.90E+03
85-01-8	Phenanthrene	220	J	UG/KG			4.06E-06	1.10E-03
108-95-2	Phenol	580	U	UG/KG			1.10E-06	1.16E-01
129-00-0	Pyrene	130	J	UG/KG			2.40E-06	6.50E-04
Explosives								
99-35-4	1,3,5-Trinitrobenzene	440	UJ	UG/KG			1.66E-05	
99-65-0	1,3-Dinitrobenzene	440	UJ	UG/KG			4.99E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	880	UJ	UG/KG		1.07E-08	2.00E-03	
121-14-2	2,4-Dinitrotoluene	440	UJ	UG/KG			2.50E-04	1.10E+04
606-20-2	2,6-Dinitrotoluene	580	U	UG/KG			6.58E-04	1.93E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	880	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	880	UJ	UG/KG				
99-08-1	3-Nitrotoluene	880	UJ	UG/KG			4.33E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	880	UJ	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
99-99-0	4-Nitrotoluene (PNT)	880	UJ	UG/KG			4.33E-04	
2691-41-0	HMX	880	UJ	UG/KG			2.00E-05	
98-95-3	Nitrobenzene	440	UJ	UG/KG			3.84E-03	
121-82-4	RDX	880	UJ	UG/KG		3.92E-08	3.33E-04	
479-45-8	Tetryl	1300	UJ	UG/KG			1.48E-04	
Metals								
7429-90-5	Aluminum	10700		MG/KG	9.52E-01		6.38E-03	
7440-36-0	Antimony	8.8		MG/KG	4.63E+00		1.08E-02	2.93E+01
7440-38-2	Arsenic	8.4		MG/KG	8.16E-01	3.08E-06	1.91E-02	8.40E+00
7440-39-3	Barium	472		MG/KG	2.41E+00		3.79E-03	5.90E+00
7440-41-7	Beryllium	0.68	J	MG/KG	4.25E-01	3.03E-10	1.84E-04	2.27E-01
7440-42-8	Boron	19.4		MG/KG			2.45E-04	
7440-43-9	Cadmium	9.4		MG/KG	5.88E+00	3.15E-09	1.16E-02	2.35E+01
7440-70-2	Calcium	6940		MG/KG	4.79E+00			
7440-47-3	Chromium	44.9		MG/KG	2.61E+00	1.00E-07		2.25E+01
7440-48-4	Cobalt	9.1		MG/KG	1.00E+00		7.42E-05	
7440-50-8	Copper	157		MG/KG	9.35E+00		2.07E-03	
7439-89-6	Iron	21500		MG/KG	1.04E+00		3.51E-02	
7439-92-1	Lead	610		MG/KG	2.54E+01			
7439-95-4	Magnesium	3130		MG/KG	1.64E+00			
7439-96-5	Manganese	1190		MG/KG	1.14E+00		3.69E-02	
7439-97-6	Mercury	0.81		MG/KG	5.40E+00			
7440-02-0	Nickel	31.8		MG/KG	1.88E+00		7.78E-04	4.54E+00
2023695	Potassium	1000		MG/KG	7.04E-01			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 28-7

HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SEDIMENT)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7782-49-2	Selenium	1.8	U	MG/KG	2.81E+00		1.76E-04	6.00E+00
7440-22-4	Silver	2.9		MG/KG	9.67E-01		2.84E-04	1.45E+00
7440-23-5	Sodium	170		MG/KG	1.17E-01			
7440-28-0	Thallium	3.5	U	MG/KG	1.13E+01		2.45E-05	
7440-62-2	Vanadium	29.3		MG/KG	1.05E+00		2.05E-03	9.77E-02
7440-66-6	Zinc	1110		MG/KG	1.94E+01		1.81E-03	1.85E+00
Other Parameters								
TOC	TOC	142000	E	MG/KG	2.26E+00			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	580	U	UG/KG	2.90E-05	2.90E-04	1.16E-01
95-50-1	1,2-Dichlorobenzene	580	U	UG/KG	3.22E-06	3.22E-05	3.41E-02
541-73-1	1,3-Dichlorobenzene	580	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	580	U	UG/KG			2.90E-01
95-95-4	2,4,5-Trichlorophenol	2900	U	UG/KG	1.45E-05	1.45E-05	1.07E-02
88-06-2	2,4,6-Trichlorophenol	580	U	UG/KG	1.12E-03	5.27E-05	2.90E+00
120-83-2	2,4-Dichlorophenol	580	U	UG/KG	9.51E-05	9.51E-04	5.80E-01
105-67-9	2,4-Dimethylphenol	580	U	UG/KG	1.41E-05	1.41E-05	6.44E-02
51-28-5	2,4-Dinitrophenol	2900	U	UG/KG	7.07E-04	7.07E-03	1.45E+01
91-58-7	2-Chloronaphthalene	580	U	UG/KG			
95-57-8	2-Chlorophenol	580	U	UG/KG	5.80E-05	5.80E-05	1.45E-01
91-57-6	2-Methylnaphthalene	580	U	UG/KG	9.51E-06	9.51E-06	1.38E-04
95-48-7	2-Methylphenol	580	U	UG/KG	5.80E-06	5.80E-06	3.87E-02
88-74-4	2-Nitroaniline	2900	U	UG/KG			
88-75-5	2-Nitrophenol	580	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	580	U	UG/KG	4.46E-02	2.07E-03	8.29E+01
99-09-2	3-Nitroaniline	2900	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2900	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	580	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	580	U	UG/KG			
106-47-8	4-Chloroaniline	1200	U	UG/KG	1.46E-04	1.46E-03	1.71E+00
7005-72-3	4-Chlorophenyl phenyl ether	580	U	UG/KG			
106-44-5	4-Methylphenol	580	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
100-01-6	4-Nitroaniline	2900	U	UG/KG			
100-02-7	4-Nitrophenol	2900	U	UG/KG			
83-32-9	Acenaphthene	580	U	UG/KG	4.83E-06	4.83E-06	1.02E-03
208-96-8	Acenaphthylene	580	U	UG/KG	9.51E-06	9.51E-06	1.38E-04
120-12-7	Anthracene	580	U	UG/KG	9.51E-07	9.51E-07	4.83E-05
56-55-3	Benzo(a)anthracene	67	J	UG/KG	8.38E-03	3.94E-04	3.35E-02
50-32-8	Benzo(a)pyrene	54	J	UG/KG	6.75E-02	3.18E-03	6.75E-03
205-99-2	Benzo(b)fluoranthene	120	J	UG/KG	1.50E-02	7.06E-04	2.40E-02
191-24-2	Benzo(g,h,i)perylene	580	U	UG/KG	9.51E-06	9.51E-06	1.38E-04
207-08-9	Benzo(k)fluoranthene	580	U	UG/KG	7.44E-03	3.41E-04	1.18E-02
111-91-1	bis(2-Chloroethoxy)methane	580	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	580	U	UG/KG	1.16E-01	7.73E-03	1.45E+03
108-60-1	bis(2-Chloroisopropyl) ether	580	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	580	U	UG/KG	1.41E-03	1.41E-04	1.61E-04
85-68-7	Butyl benzyl phthalate	580	U	UG/KG	1.41E-06	1.41E-06	6.24E-04
86-74-8	Carbazole	580	U	UG/KG	2.00E-03	9.35E-05	9.67E-01
218-01-9	Chrysene	82	J	UG/KG	1.05E-04	4.82E-06	5.13E-04
84-74-2	Di-n-butyl phthalate	260	J	UG/KG	1.30E-06	1.30E-06	1.13E-04
117-84-0	Di-n-octyl phthalate	580	U	UG/KG	1.41E-05	1.41E-04	5.80E-05
53-70-3	Dibenz(a,h)anthracene	580	U	UG/KG	7.25E-01	3.41E-02	2.90E-01
132-64-9	Dibenzofuran	59	J	UG/KG			
84-66-2	Diethyl phthalate	580	U	UG/KG	5.80E-07	5.80E-07	1.23E-03
131-11-3	Dimethyl phthalate	580	U	UG/KG			
206-44-0	Fluoranthene	150	J	UG/KG	1.83E-06	1.83E-06	3.49E-05

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
86-73-7	Fluorene	580	U	UG/KG	7.07E-06	7.07E-06	1.04E-03
118-74-1	Hexachlorobenzene	580	U	UG/KG	1.45E-01	7.44E-03	2.90E-01
87-68-3	Hexachlorobutadiene	580	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	580	U	UG/KG	4.14E-05	4.14E-05	1.45E-03
67-72-1	Hexachloroethane	580	U	UG/KG	2.90E-04	2.90E-04	1.16E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	580	U	UG/KG	7.25E-02	3.41E-03	4.14E-02
78-59-1	Isophorone	580	U	UG/KG	1.41E-06	1.41E-06	7.25E-02
621-64-7	N-Nitroso-di-n-propylamine	580	U	UG/KG	7.25E-01	3.22E-02	1.16E+04
86-30-6	N-Nitrosodiphenylamine	580	U	UG/KG	4.83E-04	2.32E-05	5.80E-01
91-20-3	Naphthalene	580	U	UG/KG	7.07E-06	7.07E-05	6.90E-03
87-86-5	Pentachlorophenol	2900	U	UG/KG	1.21E-01	5.58E-03	9.67E+01
85-01-8	Phenanthrene	220	J	UG/KG	3.61E-06	3.61E-06	5.24E-05
108-95-2	Phenol	580	U	UG/KG	5.80E-07	4.83E-06	5.80E-03
129-00-0	Pyrene	130	J	UG/KG	2.13E-06	2.13E-06	3.10E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	440	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	440	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	880	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	440	UJ	UG/KG	5.24E-02	2.44E-03	5.50E+02
606-20-2	2,6-Dinitrotoluene	580	U	UG/KG	6.90E-02	3.22E-03	8.29E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	880	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	880	UJ	UG/KG			
99-08-1	3-Nitrotoluene	880	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	880	UJ	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
99-99-0	4-Nitrotoluene (PNT)	880	UJ	UG/KG			
2691-41-0	HMX	880	UJ	UG/KG			
98-95-3	Nitrobenzene	440	UJ	UG/KG	4.40E-04	4.40E-04	4.40E+00
121-82-4	RDX	880	UJ	UG/KG			
479-45-8	Tetryl	1300	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	10700		MG/KG			
7440-36-0	Antimony	8.8		MG/KG	1.07E-02	1.07E-01	1.76E+00
7440-38-2	Arsenic	8.4		MG/KG	2.80E+00	1.38E-01	3.00E-01
7440-39-3	Barium	472		MG/KG	3.37E-03	3.37E-02	3.93E-01
7440-41-7	Beryllium	0.68	J	MG/KG	6.80E-01	2.34E-02	1.03E-01
7440-42-8	Boron	19.4		MG/KG	1.08E-04	1.08E-03	
7440-43-9	Cadmium	9.4		MG/KG	4.70E-03	4.70E-02	2.54E+00
7440-70-2	Calcium	6940		MG/KG			
7440-47-3	Chromium	44.9		MG/KG	4.49E-03	1.10E-02	1.60E+00
7440-48-4	Cobalt	9.1		MG/KG	7.58E-05	7.58E-04	
7440-50-8	Copper	157		MG/KG	1.91E-03	1.91E-02	1.43E-02
7439-89-6	Iron	21500		MG/KG			
7439-92-1	Lead	610		MG/KG	1.53E+00	1.53E+00	
7439-95-4	Magnesium	3130		MG/KG			
7439-96-5	Manganese	1190		MG/KG	1.24E-02	1.24E-01	
7439-97-6	Mercury	0.81		MG/KG	1.33E-03	1.33E-02	5.40E+00
7440-02-0	Nickel	31.8		MG/KG	7.76E-04	7.76E-03	4.18E-01
2023695	Potassium	1000		MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-7
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7782-49-2	Selenium	1.8	U	MG/KG	1.80E-04	1.80E-03	7.50E-01
7440-22-4	Silver	2.9		MG/KG	2.90E-04	2.90E-03	1.93E+00
7440-23-5	Sodium	170		MG/KG			
7440-28-0	Thallium	3.5	U	MG/KG	2.19E-02	2.19E-02	1.46E+00
7440-62-2	Vanadium	29.3		MG/KG	2.09E-03	2.09E-02	2.99E-02
7440-66-6	Zinc	1110		MG/KG	1.82E-03	1.82E-02	3.08E-01
Other Parameters							
TOC	TOC	142000	E	MG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-8
HUMAN HEALTH SCREENING OF TRENCH WATER RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	1	U	UG/L		1.26E-03	5.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	1	U	UG/L	1.81E-05	2.74E-03	
79-00-5	1,1,2-Trichloroethane	1	U	UG/L	5.01E-06	4.11E-02	2.00E-01
75-34-3	1,1-Dichloroethane	1	U	UG/L		1.23E-03	
75-35-4	1,1-Dichloroethene	1	U	UG/L	2.19E-05	1.83E-02	1.43E-01
107-06-2	1,2-Dichloroethane (EDC)	1	U	UG/L	8.12E-06	9.88E-02	2.00E-01
78-87-5	1,2-Dichloropropane	1	U	UG/L	6.07E-06	1.45E-01	2.00E-01
78-93-3	2-Butanone (MEK)	2	U	UG/L		1.05E-03	
591-78-6	2-Hexanone	2	U	UG/L			
108-10-1	4-Methyl-2-pentanone (MIBK)	2	U	UG/L		1.27E-02	
67-64-1	Acetone	3	U	UG/L		4.93E-03	
71-43-2	Benzene	1	U	UG/L	2.44E-06	8.92E-02	2.00E-01
75-27-4	Bromodichloromethane	1	U	UG/L	5.53E-06	8.22E-03	
75-25-2	Bromoform	1	U	UG/L	1.18E-07	1.37E-03	
74-83-9	Bromomethane	1	U	UG/L		1.15E-01	
75-15-0	Carbon disulfide	1	U	UG/L		9.59E-04	
56-23-5	Carbon tetrachloride	1	U	UG/L	5.84E-06	2.35E-01	2.00E-01
108-90-7	Chlorobenzene	1	U	UG/L		9.43E-03	1.00E-02
75-00-3	Chloroethane	1	U	UG/L	2.16E-07	1.16E-04	
67-66-3	Chloroform	1	U	UG/L	6.08E-06	1.60E+00	
74-87-3	Chloromethane	1	U	UG/L	6.62E-07		
156-59-2	cis-1,2-Dichloroethene	1		UG/L		1.64E-02	1.43E-02
10061-01-5	cis-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
124-48-1	Dibromochloromethane	1	U	UG/L	7.50E-06	8.22E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-8
HUMAN HEALTH SCREENING OF TRENCH WATER RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
100-41-4	Ethylbenzene	1	U	UG/L		7.46E-04	1.43E-03
75-09-2	Methylene chloride	1	U	UG/L	2.34E-07	6.16E-04	2.00E-01
110-54-3	N-Hexane	1	U	UG/L		2.85E-03	
100-42-5	Styrene	1	U	UG/L		6.09E-04	1.00E-02
127-18-4	Tetrachloroethylene (PCE)	1	U	UG/L	9.24E-07	3.94E-03	2.00E-01
108-88-3	Toluene	1	U	UG/L		1.38E-03	1.00E-03
1330-20-7	total Xylenes	1	U	UG/L		6.99E-04	1.00E-04
156-60-5	trans-1,2-Dichloroethene	1	U	UG/L		8.22E-03	1.00E-02
10061-02-6	trans-1,3-Dichloropropene	1	U	UG/L	1.23E-05	1.15E-01	
79-01-6	Trichloroethylene (TCE)	1	U	UG/L	6.10E-07	2.74E-02	2.00E-01
75-01-4	Vinyl chloride	1	U	UG/L	5.06E-05		5.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		5.14E-02	1.43E-01
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		2.70E-02	1.67E-02
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		1.83E+00	
106-46-7	1,4-Dichlorobenzene	10	U	UG/L	1.99E-05	5.48E-02	1.33E-01
95-95-4	2,4,5-Trichlorophenol	50	U	UG/L		1.37E-02	
88-06-2	2,4,6-Trichlorophenol	10	U	UG/L	1.64E-06		
120-83-2	2,4-Dichlorophenol	10	U	UG/L		9.13E-02	
105-67-9	2,4-Dimethylphenol	10	U	UG/L		1.37E-02	
51-28-5	2,4-Dinitrophenol	50	U	UG/L		6.85E-01	
91-58-7	2-Chloronaphthalene	10	U	UG/L		2.05E-02	
95-57-8	2-Chlorophenol	10	U	UG/L		3.29E-01	
91-57-6	2-Methylnaphthalene	10	U	UG/L		5.48E-02	
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-8
HUMAN HEALTH SCREENING OF TRENCH WATER RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
88-74-4	2-Nitroaniline	50	U	UG/L		2.40E+01	
88-75-5	2-Nitrophenol	10	U	UG/L		3.42E-02	
91-94-1	3,3'-Dichlorobenzidine	20	U	UG/L	1.34E-04		
99-09-2	3-Nitroaniline	50	U	UG/L		2.40E+01	
534-52-1	4,6-Dinitro-2-methylphenol	50	U	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	U	UG/L			
59-50-7	4-Chloro-3-methylphenol	10	U	UG/L		5.48E-03	
106-47-8	4-Chloroaniline	20	U	UG/L		1.37E-01	
7005-72-3	4-Chlorophenyl phenyl ether	10	U	UG/L			
106-44-5	4-Methylphenol	10	U	UG/L		5.48E-02	
100-01-6	4-Nitroaniline	50	U	UG/L		2.40E+01	
100-02-7	4-Nitrophenol	50	U	UG/L		1.71E-01	
83-32-9	Acenaphthene	10	U	UG/L		2.74E-02	
208-96-8	Acenaphthylene	10	U	UG/L		5.48E-02	
120-12-7	Anthracene	10	U	UG/L		5.48E-03	
56-55-3	Benzo(a)anthracene	10	U	UG/L	1.09E-04		
50-32-8	Benzo(a)pyrene	10	U	UG/L	1.09E-03		5.00E+01
205-99-2	Benzo(b)fluoranthene	10	U	UG/L	1.09E-04		
191-24-2	Benzo(g,h,i)perylene	10	U	UG/L		5.48E-02	
207-08-9	Benzo(k)fluoranthene	10	U	UG/L	1.09E-05		
111-91-1	bis(2-Chloroethoxy)methane	10	U	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	U	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	3.9	J	UG/L	8.12E-07	5.34E-03	
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-8
HUMAN HEALTH SCREENING OF TRENCH WATER RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
86-74-8	Carbazole	10	U	UG/L	2.97E-06		
218-01-9	Chrysene	10	U	UG/L	1.09E-06		
84-74-2	Di-n-butyl phthalate	10	U	UG/L		2.74E-03	
117-84-0	Di-n-octyl phthalate	10	U	UG/L		1.37E-02	
53-70-3	Dibenz(a,h)anthracene	10	U	UG/L	1.09E-03		
132-64-9	Dibenzofuran	10	U	UG/L		4.11E-01	
84-66-2	Diethyl phthalate	10	U	UG/L		3.42E-04	
131-11-3	Dimethyl phthalate	10	U	UG/L		2.74E-05	
206-44-0	Fluoranthene	10	U	UG/L		6.85E-03	
86-73-7	Fluorene	10	U	UG/L		4.11E-02	
118-74-1	Hexachlorobenzene	10	U	UG/L	2.38E-04	3.42E-01	1.00E+01
87-68-3	Hexachlorobutadiene	10	U	UG/L	1.16E-05	1.37E+00	
77-47-4	Hexachlorocyclopentadiene	10	U	UG/L		3.91E-02	2.00E-01
67-72-1	Hexachloroethane	10	U	UG/L	2.08E-06	2.74E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene	10	U	UG/L	1.09E-04		
78-59-1	Isophorone	10	U	UG/L	1.41E-07	1.37E-03	
621-64-7	N-Nitroso-di-n-propylamine	10	UJ	UG/L	1.04E-03		
86-30-6	N-Nitrosodiphenylamine	10	U	UG/L	7.29E-07		
91-20-3	Naphthalene	10	U	UG/L		1.61E+00	
87-86-5	Pentachlorophenol	50	U	UG/L	8.92E-05	4.57E-02	5.00E+01
85-01-8	Phenanthrene	10	U	UG/L		5.48E-02	
108-95-2	Phenol	10	U	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	10	U	UG/L		5.48E-02	
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	U	UG/L		2.28E-04	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-8
HUMAN HEALTH SCREENING OF TRENCH WATER RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
99-65-0	1,3-Dinitrobenzene	0.25	U	UG/L		6.85E-02	
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.5	U	UG/L	2.23E-07	2.74E-02	
121-14-2	2,4-Dinitrotoluene	0.25	U	UG/L		3.42E-03	
606-20-2	2,6-Dinitrotoluene	0.5	U	UG/L		1.37E-02	
35572-78-2	2-Amino-4,6-Dinitrotoluene	0.5	U	UG/L			
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L			
99-08-1	3-Nitrotoluene	0.5	U	UG/L		8.22E-03	
19406-51-0	4-Amino-2,6-Dinitrotoluene	0.5	U	UG/L			
99-99-0	4-Nitrotoluene (PNT)	0.5	U	UG/L		8.22E-03	
2691-41-0	HMX	0.71		UG/L		3.89E-04	
98-95-3	Nitrobenzene	0.25	U	UG/L		7.36E-02	
121-82-4	RDX	0.5	U	UG/L	8.18E-07	4.57E-03	
479-45-8	Tetryl	0.75	U	UG/L		2.05E-03	
Metals							
7429-90-5	Aluminum	1430000		UG/L		3.92E+01	
7440-36-0	Antimony	6	J	UG/L		4.11E-01	1.00E+00
7440-38-2	Arsenic	327	J	UG/L	7.30E-03	2.99E+01	6.54E+00
7440-39-3	Barium	11200		UG/L		4.38E+00	5.60E+00
7440-41-7	Beryllium	47.3		UG/L		6.48E-01	1.18E+01
7440-42-8	Boron	250	J	UG/L		7.61E-02	1.25E-01
7440-43-9	Cadmium	1	J	UG/L		5.48E-02	2.00E-01
7440-70-2	Calcium	179000		UG/L			
7440-47-3	Chromium	1380		UG/L			1.38E+01
7440-48-4	Cobalt	518		UG/L		2.37E-01	5.18E-01
7440-50-8	Copper	1290		UG/L		9.52E-01	1.98E+00

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-8
HUMAN HEALTH SCREENING OF TRENCH WATER RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Cancer Risk Based on USEPA Region 9 PRG for Carcinogens (Tap Water)	Hazard Quotient (HQ) Based on USEPA Region 9 PRG for Toxins (Tap Water)	Ratio of Max Concentration (or Max RL) to USEPA MCL and/or IEPA Class I Groundwater Standard
7439-89-6	Iron	1870000		UG/L		1.71E+02	3.74E+02
7439-92-1	Lead	875		UG/L			1.17E+02
7439-95-4	Magnesium	286000		UG/L			
7439-96-5	Manganese	49900		UG/L		5.70E+01	3.33E+02
7439-97-6	Mercury	6.8		UG/L			3.40E+00
7440-02-0	Nickel	1350		UG/L		1.85E+00	1.35E+01
2023695	Potassium	61200		UG/L			
7782-49-2	Selenium	5	U	UG/L		2.74E-02	1.00E-01
7440-22-4	Silver	11.7	J	UG/L		6.41E-02	2.34E-01
7440-23-5	Sodium	74100		UG/L			
7440-28-0	Thallium	10.6	J	UG/L		4.15E+00	5.30E+00
7440-62-2	Vanadium	1910	J	UG/L		7.48E+00	
7440-66-6	Zinc	4160		UG/L		3.80E-01	8.32E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		7	U	UG/KG	2.35E-04	
79-34-5	1,1,2,2-Tetrachloroethane		7	U	UG/KG	5.50E-02	
79-00-5	1,1,2-Trichloroethane		7	U	UG/KG	2.45E-04	
75-34-3	1,1-Dichloroethane		7	U	UG/KG	3.48E-04	
75-35-4	1,1-Dichloroethene		7	U	UG/KG	8.45E-04	
107-06-2	1,2-Dichloroethane (EDC)		7	U	UG/KG	3.30E-04	
540-59-0	1,2-Dichloroethene (total)		7	U	UG/KG	8.89E-03	
78-87-5	1,2-Dichloropropane		7	U	UG/KG	1.00E-05	
78-93-3	2-Butanone (MEK)		14	U	UG/KG	1.56E-04	
591-78-6	2-Hexanone		14	U	UG/KG	1.11E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		14	U	UG/KG	3.16E-05	
67-64-1	Acetone		21	U	UG/KG	8.40E-03	
71-43-2	Benzene		7	U	UG/KG	4.38E-04	
75-27-4	Bromodichloromethane		7	U	UG/KG	1.30E-02	
75-25-2	Bromoform		7	U	UG/KG	4.40E-04	
74-83-9	Bromomethane		7	U	UG/KG	2.98E-02	
75-15-0	Carbon disulfide		7	U	UG/KG	7.44E-02	
56-23-5	Carbon tetrachloride		7	U	UG/KG	7.00E-06	
108-90-7	Chlorobenzene		7	U	UG/KG	1.75E-04	
75-00-3	Chloroethane		7	U	UG/KG		
67-66-3	Chloroform		7	U	UG/KG	5.88E-03	
74-87-3	Chloromethane		7	U	UG/KG	6.73E-04	
156-59-2	cis-1,2-Dichloroethene		7	U	UG/KG	8.89E-03	
10061-01-5	cis-1,3-Dichloropropene		7	U	UG/KG	1.76E-02	
124-48-1	Dibromochloromethane		7	U	UG/KG	3.41E-03	
100-41-4	Ethylbenzene		7	U	UG/KG	1.40E-03	
75-09-2	Methylene chloride		8	U	UG/KG	1.98E-03	
110-54-3	N-Hexane		7	U	UG/KG		
100-42-5	Styrene		7	U	UG/KG	2.33E-05	
127-18-4	Tetrachloroethylene (PCE)		5	J	UG/KG	3.85E-04	
108-88-3	Toluene		7	U	UG/KG	2.33E-03	
1330-20-7	total Xylenes		7	U	UG/KG	1.17E-02	
156-60-5	trans-1,2-Dichloroethene		7	U	UG/KG	8.89E-03	
10061-02-6	trans-1,3-Dichloropropene		7	U	UG/KG	1.76E-02	
79-01-6	Trichloroethylene (TCE)		7	U	UG/KG	7.78E-04	
75-01-4	Vinyl chloride		7	U	UG/KG	1.08E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		510	U	UG/KG	2.55E-02	
95-50-1	1,2-Dichlorobenzene		510	U	UG/KG	1.72E-01	
541-73-1	1,3-Dichlorobenzene		510	U	UG/KG	1.35E-02	
106-46-7	1,4-Dichlorobenzene		510	U	UG/KG	2.55E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 28-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0069

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2600	U	UG/KG	6.50E-01	
88-06-2	2,4,6-Trichlorophenol		510	U	UG/KG	5.10E-02	
120-83-2	2,4-Dichlorophenol		510	U	UG/KG	5.83E-03	
105-67-9	2,4-Dimethylphenol		510	U	UG/KG	5.10E+01	
51-28-5	2,4-Dinitrophenol		2600	U	UG/KG	1.30E-01	
91-58-7	2-Chloronaphthalene		510	U	UG/KG	4.19E+01	
95-57-8	2-Chlorophenol		510	U	UG/KG	2.10E+00	
91-57-6	2-Methylnaphthalene		72	J	UG/KG	2.22E-02	YES
95-48-7	2-Methylphenol		510	U	UG/KG	1.26E-02	
88-74-4	2-Nitroaniline		2600	U	UG/KG	3.51E-02	
88-75-5	2-Nitrophenol		510	U	UG/KG	3.19E-01	
91-94-1	3,3'-Dichlorobenzidine		510	U	UG/KG	7.89E-01	
99-09-2	3-Nitroaniline		2600	U	UG/KG	8.23E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2600	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		510	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		510	U	UG/KG	6.42E-02	
106-47-8	4-Chloroaniline		1000	U	UG/KG	9.09E-01	
7005-72-3	4-Chlorophenyl phenyl ether		510	U	UG/KG		
106-44-5	4-Methylphenol		510	U	UG/KG	3.13E-03	
100-01-6	4-Nitroaniline		2600	U	UG/KG	1.19E-01	
100-02-7	4-Nitrophenol		2600	U	UG/KG	3.71E-01	
83-32-9	Acenaphthene		510	U	UG/KG	7.47E-04	
208-96-8	Acenaphthylene		510	U	UG/KG	7.47E-04	
120-12-7	Anthracene		130	J	UG/KG	8.78E-05	YES
56-55-3	Benzo(a)anthracene		1700		UG/KG	3.26E-01	YES
50-32-8	Benzo(a)pyrene		2200		UG/KG	5.00E-04	YES
205-99-2	Benzo(b)fluoranthene		2600		UG/KG	4.35E-02	YES
191-24-2	Benzo(g,h,i)perylene		2000		UG/KG	1.68E-02	YES
207-08-9	Benzo(k)fluoranthene		1700		UG/KG	2.84E-02	YES
111-91-1	bis(2-Chloroethoxy)methane		510	U	UG/KG	1.68E+00	
111-44-4	bis(2-Chloroethyl) ether		510	U	UG/KG	2.15E-02	
108-60-1	bis(2-Chloroisopropyl) ether		510	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		120	J	UG/KG	1.30E-01	YES
85-68-7	Butyl benzyl phthalate		510	U	UG/KG	2.13E+00	
86-74-8	Carbazole		77	J	UG/KG		YES
218-01-9	Chrysene		1800		UG/KG	3.81E-01	YES
84-74-2	Di-n-butyl phthalate		720		UG/KG	3.60E-03	YES
117-84-0	Di-n-octyl phthalate		510	U	UG/KG	7.19E-04	
53-70-3	Dibenz(a,h)anthracene		630		UG/KG	3.42E-02	YES
132-64-9	Dibenzofuran		65	J	UG/KG		YES
84-66-2	Diethyl phthalate		510	U	UG/KG	5.10E-03	
131-11-3	Dimethyl phthalate		510	U	UG/KG	2.55E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		2400		UG/KG	1.97E-02	YES
86-73-7	Fluorene		510	U	UG/KG	1.70E-02	
118-74-1	Hexachlorobenzene		510	U	UG/KG	5.10E-04	
87-68-3	Hexachlorobutadiene		510	U	UG/KG	1.28E+01	
77-47-4	Hexachlorocyclopentadiene		510	U	UG/KG	5.10E-02	
67-72-1	Hexachloroethane		510	U	UG/KG	8.55E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		1700		UG/KG	1.56E-02	YES
78-59-1	Isophorone		510	U	UG/KG	3.67E-03	
621-64-7	N-Nitroso-di-n-propylamine		510	U	UG/KG	9.38E-01	
86-30-6	N-Nitrosodiphenylamine		510	U	UG/KG	2.55E-02	
91-20-3	Naphthalene		160	J	UG/KG	6.43E-04	
87-86-5	Pentachlorophenol		2600	U	UG/KG	4.33E-01	
85-01-8	Phenanthrene		440	J	UG/KG	9.63E-03	YES
108-95-2	Phenol		510	U	UG/KG	1.28E-02	
129-00-0	Pyrene		2200		UG/KG	2.80E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		380	U	UG/KG	1.01E+00	
99-65-0	1,3-Dinitrobenzene		380	U	UG/KG	5.80E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		680	J	UG/KG	2.27E-02	
121-14-2	2,4-Dinitrotoluene		380	U	UG/KG	2.97E-01	
606-20-2	2,6-Dinitrotoluene		510	U	UG/KG	1.55E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		370	J	UG/KG	4.63E-03	
88-72-2	2-Nitrotoluene (ONT)		770	U	UG/KG		
99-08-1	3-Nitrotoluene		770	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		250	J	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		770	U	UG/KG		
2691-41-0	HMX		770	U	UG/KG	3.08E-02	
98-95-3	Nitrobenzene		380	U	UG/KG	9.50E-03	
121-82-4	RDX		770	U	UG/KG	7.70E-03	
479-45-8	Tetryl		1200	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	14800		MG/KG		
7440-36-0	Antimony	0.83	173		MG/KG	3.46E+01	
7440-38-2	Arsenic	13.5	48.1		MG/KG	5.34E+00	
7440-39-3	Barium	195	4940		MG/KG	9.88E+00	
7440-41-7	Beryllium	0.76	1.6		MG/KG	1.60E-01	
7440-42-8	Boron	5.3	84.2		MG/KG	1.68E+02	
7440-43-9	Cadmium	0.19	28		MG/KG	9.66E-01	
7440-70-2	Calcium	2497	51300		MG/KG		
7440-47-3	Chromium	25.2	266		MG/KG	5.32E+01	
7440-48-4	Cobalt	21.7	28.6		MG/KG	1.43E+00	
7440-50-8	Copper	11.3	7060		MG/KG	2.28E+02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-9
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7439-89-6	Iron	19306	308000		MG/KG	1.54E+03	
7439-92-1	Lead	23.4	51000		MG/KG	3.11E+02	
7439-95-4	Magnesium	1552	13900		MG/KG		
7439-96-5	Manganese	3640	1620		MG/KG	1.62E+01	
7439-97-6	Mercury	0.06	0.52		MG/KG	7.43E-02	YES
7440-02-0	Nickel	18.9	130		MG/KG	4.33E+00	
2023695	Potassium	625	1580		MG/KG		
7782-49-2	Selenium	2.34	4.1	J	MG/KG	4.10E+00	YES
7440-22-4	Silver	0.58	15.3		MG/KG	7.65E+00	
7440-23-5	Sodium	170	1080		MG/KG		
7440-28-0	Thallium	0.41	14	U	MG/KG	1.40E+01	
7440-62-2	Vanadium	47.2	89.5	J	MG/KG	1.95E+00	
7440-66-6	Zinc	51.4	16400		MG/KG	1.37E+02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 28-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0069

ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		580	U	UG/KG	6.30E-02	
95-50-1	1,2-Dichlorobenzene		580	U	UG/KG	1.71E+00	
541-73-1	1,3-Dichlorobenzene		580	U	UG/KG	3.41E-01	
106-46-7	1,4-Dichlorobenzene		580	U	UG/KG	1.66E+00	
95-95-4	2,4,5-Trichlorophenol		2900	U	UG/KG	2.00E+00	
88-06-2	2,4,6-Trichlorophenol		580	U	UG/KG	3.16E+01	
120-83-2	2,4-Dichlorophenol		580	U	UG/KG	1.59E+00	
105-67-9	2,4-Dimethylphenol		580	U	UG/KG	1.29E+01	
51-28-5	2,4-Dinitrophenol		2900	U	UG/KG	2.34E+02	
91-58-7	2-Chloronaphthalene		580	U	UG/KG	1.66E-01	
95-57-8	2-Chlorophenol		580	U	UG/KG	2.62E+00	
91-57-6	2-Methylnaphthalene		580	U	UG/KG	8.29E+00	
95-48-7	2-Methylphenol		580	U	UG/KG	1.27E+02	
88-74-4	2-Nitroaniline		2900	U	UG/KG	6.00E-02	
88-75-5	2-Nitrophenol		580	U	UG/KG	1.82E-01	
91-94-1	3,3'-Dichlorobenzidine		580	U	UG/KG	2.90E-01	
99-09-2	3-Nitroaniline		2900	U	UG/KG	4.87E-02	
534-52-1	4,6-Dinitro-2-methylphenol		2900	U	UG/KG	3.46E+02	
101-55-3	4-Bromophenyl phenyl ether		580	U	UG/KG	4.46E-01	
59-50-7	4-Chloro-3-methylphenol		580	U	UG/KG	3.87E+03	
106-47-8	4-Chloroaniline		1200	U	UG/KG	7.32E-02	
7005-72-3	4-Chlorophenyl phenyl ether		580	U	UG/KG	4.22E-01	
106-44-5	4-Methylphenol		580	U	UG/KG	1.45E-01	
100-01-6	4-Nitroaniline		2900	U	UG/KG	8.01E-02	
100-02-7	4-Nitrophenol		2900	U	UG/KG	6.99E+01	
83-32-9	Acenaphthene		580	U	UG/KG	3.63E+01	
208-96-8	Acenaphthylene		580	U	UG/KG	1.32E+01	
120-12-7	Anthracene		580	U	UG/KG	1.02E+01	
56-55-3	Benzo(a)anthracene		67	J	UG/KG	6.20E-01	YES
50-32-8	Benzo(a)pyrene		54	J	UG/KG	3.60E-01	YES
205-99-2	Benzo(b)fluoranthene		120	J	UG/KG	4.44E+00	YES
191-24-2	Benzo(g,h,i)perylene		580	U	UG/KG	3.63E+01	
207-08-9	Benzo(k)fluoranthene		580	U	UG/KG	2.15E+01	
111-91-1	bis(2-Chloroethoxy)methane		580	U	UG/KG	4.46E-01	
111-44-4	bis(2-Chloroethyl) ether		580	U	UG/KG	2.03E-01	
108-60-1	bis(2-Chloroisopropyl) ether		580	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		580	U	UG/KG	7.73E-01	
85-68-7	Butyl benzyl phthalate		580	U	UG/KG	5.27E-02	
86-74-8	Carbazole		580	U	UG/KG	1.76E-01	
218-01-9	Chrysene		82	J	UG/KG	4.94E-01	YES
84-74-2	Di-n-butyl phthalate		260	J	UG/KG	2.36E-02	YES

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
117-84-0	Di-n-octyl phthalate		580	U	UG/KG	8.19E-04	
53-70-3	Dibenz(a,h)anthracene		580	U	UG/KG	1.76E+01	
132-64-9	Dibenzofuran		59	J	UG/KG	2.95E-02	YES
84-66-2	Diethyl phthalate		580	U	UG/KG	9.21E-01	
131-11-3	Dimethyl phthalate		580	U	UG/KG	1.11E-03	
206-44-0	Fluoranthene		150	J	UG/KG	3.55E-01	YES
86-73-7	Fluorene		580	U	UG/KG	7.49E+00	
118-74-1	Hexachlorobenzene		580	U	UG/KG	5.80E+00	
87-68-3	Hexachlorobutadiene		580	U	UG/KG	1.22E+01	
77-47-4	Hexachlorocyclopentadiene		580	U	UG/KG	1.94E+02	
67-72-1	Hexachloroethane		580	U	UG/KG	8.53E+00	
193-39-5	Indeno(1,2,3-c,d)pyrene		580	U	UG/KG	3.41E+01	
78-59-1	Isophorone		580	U	UG/KG	5.06E-01	
621-64-7	N-Nitroso-di-n-propylamine		580	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		580	U	UG/KG	8.29E-01	
91-20-3	Naphthalene		580	U	UG/KG	3.30E+00	
87-86-5	Pentachlorophenol		2900	U	UG/KG	3.92E+01	
85-01-8	Phenanthrene		220	J	UG/KG	1.08E+00	YES
108-95-2	Phenol		580	U	UG/KG	1.21E+01	
129-00-0	Pyrene		130	J	UG/KG	6.67E-01	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		440	UJ	UG/KG	1.07E+01	
99-65-0	1,3-Dinitrobenzene		440	UJ	UG/KG	8.80E+01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		880	UJ	UG/KG	1.52E+00	
121-14-2	2,4-Dinitrotoluene		440	UJ	UG/KG	6.78E-01	
606-20-2	2,6-Dinitrotoluene		580	U	UG/KG	6.77E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		880	UJ	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		880	UJ	UG/KG	5.24E-02	
99-08-1	3-Nitrotoluene		880	UJ	UG/KG	7.39E-02	
19406-51-0	4-Amino-2,6-Dinitrotoluene		880	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		880	UJ	UG/KG	4.71E-02	
2691-41-0	HMX		880	UJ	UG/KG	8.80E+01	
98-95-3	Nitrobenzene		440	UJ	UG/KG	7.52E-01	
121-82-4	RDX		880	UJ	UG/KG	4.40E+00	
479-45-8	Tetryl		1300	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	11241	10700		MG/KG	4.12E-01	
7440-36-0	Antimony	1.9	8.8		MG/KG	2.93E+00	
7440-38-2	Arsenic	10.3	8.4		MG/KG	8.58E-01	
7440-39-3	Barium	196	472		MG/KG		
7440-41-7	Beryllium	1.6	0.68	J	MG/KG		
7440-42-8	Boron		19.4		MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-10
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AUS-0069**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SEDIMENT)	Max Result or Max Reporting Limit (RL)	Qualfler	Units	Direct Exposure Hazard Quotient (HQ) (SEDIMENT)	Retained as Potential Bioaccumulator
7440-43-9	Cadmium	1.6	9.4		MG/KG	9.49E+00	
7440-70-2	Calcium	1448	6940		MG/KG		
7440-47-3	Chromium	17.2	44.9		MG/KG	1.03E+00	
7440-48-4	Cobalt	9.1	9.1		MG/KG	1.82E-01	
7440-50-8	Copper	16.8	157		MG/KG	4.97E+00	
7439-89-6	Iron	20750	21500		MG/KG	1.13E-01	
7439-92-1	Lead	24	610		MG/KG	1.70E+01	
7439-95-4	Magnesium	1909	3130		MG/KG		
7439-96-5	Manganese	1043	1190		MG/KG	1.89E+00	
7439-97-6	Mercury	0.15	0.81		MG/KG	4.50E+00	YES
7440-02-0	Nickel	16.9	31.8		MG/KG	1.40E+00	
2023695	Potassium	1421	1000		MG/KG		
7782-49-2	Selenium	0.64	1.8	U	MG/KG		
7440-22-4	Silver	3	2.9		MG/KG	2.90E+00	
7440-23-5	Sodium	1450	170		MG/KG		
7440-28-0	Thallium	0.31	3.5	U	MG/KG		
7440-62-2	Vanadium	28	29.3		MG/KG		
7440-66-6	Zinc	57.1	1110		MG/KG	9.17E+00	
Other Parameters							
TOC	TOC	62778	142000	E	MG/KG		

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 28-11, AUS-0069
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	NA	NA	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,1-Dichloroethane	NA	NA	No	A	NA	NA	No	A
1,1-Dichloroethene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
2-Butanone (MEK)	NA	NA	No	A	NA	NA	No	A
2-Hexanone	NA	NA	No	C	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	NA	NA	No	A	NA	NA	No	A
Acetone	NA	NA	No	A	NA	NA	No	A
Benzene	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Bromodichloromethane	NA	NA	Uncertainty	B	NA	NA	No	A
Bromoform	NA	NA	No	A	NA	NA	No	A
Bromomethane	NA	NA	No	A	NA	NA	No	A
Carbon disulfide	NA	NA	No	A	NA	NA	No	A
Carbon tetrachloride	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Chlorobenzene	NA	NA	No	A	NA	NA	No	A
Chloroethane	NA	NA	No	A	NA	NA	No	A
Chloroform	NA	NA	Uncertainty	B	NA	NA	No	A
Chloromethane	NA	NA	No	A	NA	NA	No	A
cis-1,2-Dichloroethene	NA	NA	No	F	NA	NA	No	A
cis-1,3-Dichloropropene	NA	NA	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	NA	NA	Uncertainty	B	NA	NA	No	A
Ethylbenzene	NA	NA	No	A	NA	NA	No	A
Methylene chloride	NA	NA	No	A	NA	NA	Uncertainty	B
N-Hexane	NA	NA	No	A	NA	NA	No	A
Styrene	NA	NA	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	NA	NA	No	A	NA	NA	Yes	E
Toluene	NA	NA	No	A	NA	NA	No	A
total Xylenes	NA	NA	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	NA	NA	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	NA	NA	Uncertainty	B	NA	NA	No	A
Trichloroethylene (TCE)	NA	NA	No	A	NA	NA	Uncertainty	B
Vinyl chloride	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	NA	NA	No	A	No	A	No	A
1,3-Dichlorobenzene	NA	NA	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	NA	NA	No	A	No	A	No	A

TABLE 28-11, AUS-0069
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	NA	NA	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	NA	NA	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	NA	NA	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	NA	NA	No	A	No	A	No	A
2-Chlorophenol	NA	NA	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	No	A	No	A	No	F
2-Methylphenol	NA	NA	No	A	No	A	No	A
2-Nitroaniline	NA	NA	Uncertainty	B	No	A	No	A
2-Nitrophenol	NA	NA	No	A	No	A	No	A
3,3'-Dichlorobenzidine	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	NA	NA	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	NA	NA	No	C	No	C	No	C
4-Bromophenyl phenyl ether	NA	NA	No	C	No	C	No	C
4-Chloro-3-methylphenol	NA	NA	No	A	No	A	No	A
4-Chloroaniline	NA	NA	No	A	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	NA	NA	No	C	No	C	No	C
4-Methylphenol	NA	NA	No	A	No	A	No	A
4-Nitroaniline	NA	NA	Uncertainty	B	No	A	No	A
4-Nitrophenol	NA	NA	No	A	No	A	No	A
Acenaphthene	NA	NA	No	A	No	A	No	A
Acenaphthylene	NA	NA	No	A	No	A	No	A
Anthracene	NA	NA	No	A	No	A	No	F
Benzo(a)anthracene	NA	NA	Uncertainty	B	No	F	Yes	E
Benzo(a)pyrene	NA	NA	Uncertainty	B	No	F	Yes	E
Benzo(b)fluoranthene	NA	NA	Uncertainty	B	No	F	Yes	E
Benzo(g,h,i)perylene	NA	NA	No	A	No	A	No	F
Benzo(k)fluoranthene	NA	NA	Uncertainty	B	No	A	No	F
bis(2-Chloroethoxy)methane	NA	NA	No	C	No	C	No	C
bis(2-Chloroethyl) ether	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	NA	NA	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	NA	NA	No	F	No	A	No	F
Butyl benzyl phthalate	NA	NA	No	A	No	A	No	A
Carbazole	NA	NA	Uncertainty	B	Uncertainty	B	Yes	E
Chrysene	NA	NA	Uncertainty	B	No	F	No	F
Di-n-butyl phthalate	NA	NA	No	A	No	F	No	F
Di-n-octyl phthalate	NA	NA	No	A	No	A	No	A
Dibenz(a,h)anthracene	NA	NA	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	NA	NA	No	A	No	F	No	F
Diethyl phthalate	NA	NA	No	A	No	A	No	A
Dimethyl phthalate	NA	NA	No	A	No	A	No	A
Fluoranthene	NA	NA	No	A	No	F	No	F

TABLE 28-11, AUS-0069
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	NA	NA	No	A	No	A	No	A
Hexachlorobenzene	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	No	A	No	A	No	A
Hexachloroethane	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	NA	NA	Uncertainty	B	No	A	Yes	E
Isophorone	NA	NA	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	NA	NA	No	A	Uncertainty	B	Uncertainty	B
Naphthalene	NA	NA	Uncertainty	B	No	A	No	F
Pentachlorophenol	NA	NA	Uncertainty	B	Uncertainty	B	Uncertainty	B
Phenanthrene	NA	NA	No	A	No	F	No	F
Phenol	NA	NA	No	A	No	A	No	A
Pyrene	NA	NA	No	A	No	F	No	F
Metals and Inorganics								
Aluminum	NA	NA	Yes	E	No	F	No	F
Antimony	NA	NA	Yes	E	Yes	E	Yes	E
Arsenic	NA	NA	Yes	E	Yes	D	Yes	E
Barium	NA	NA	Yes	E	Yes	E	Yes	E
Beryllium	NA	NA	Yes	E	No	F	Yes	E
Boron	NA	NA	No	F	No	F	No	F
Cadmium	NA	NA	No	F	Yes	E	Yes	E
Calcium	NA	NA	No	H	No	H	No	H
Chromium	NA	NA	Yes	E	Yes	E	Yes	E
Cobalt	NA	NA	No	F	No	F	No	F
Copper	NA	NA	Yes	E	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	Yes	E	No	F	No	F
Lead	NA	NA	Yes	E	Yes	E	Yes	E
Magnesium	NA	NA	No	H	No	H	No	H
Manganese	NA	NA	Yes	E	No	F	No	F
Mercury	NA	NA	Yes	E	Yes	E	Yes	E
Nickel	NA	NA	Yes	E	Yes	E	Yes	E
Potassium	NA	NA	No	H	No	H	No	H
Selenium	NA	NA	No	A	Uncertainty	B	Yes	E
Silver	NA	NA	No	F	Yes	D	Yes	E
Sodium	NA	NA	No	H	No	H	No	H
Thallium	NA	NA	Yes	E	Uncertainty	B	Uncertainty	B
Vanadium	NA	NA	Yes	E	No	F	No	F
Zinc	NA	NA	No	F	Yes	E	Yes	E
Explosives								
1,3,5-Trinitrobenzene	NA	NA	No	A	No	A	No	A
1,3-Dinitrobenzene	NA	NA	No	A	No	A	No	A

**TABLE 28-11, AUS-0069
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Trench Water		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	No	A	No	A	No	F
2,4-Dinitrotoluene	NA	NA	No	A	Uncertainty	B	Uncertainty	B
2,6-Dinitrotoluene	NA	NA	No	A	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	No	C	No	C	Uncertainty	G
2-Nitrotoluene (ONT)	NA	NA	No	C	No	C	No	C
3-Nitrotoluene	NA	NA	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	NA	NA	No	C	No	C	Uncertainty	G
4-Nitrotoluene (PNT)	NA	NA	No	A	No	A	No	A
HMX	NA	NA	No	F	No	A	No	A
Nitrobenzene	NA	NA	No	A	Uncertainty	B	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	No	A	No	A	No	A
Tetryl	NA	NA	No	A	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

**TABLE 28-12, AUS-0069
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	No	A
1,1,2-Trichloroethane	NA	NA	NA	NA	No	A
1,1-Dichloroethane	NA	NA	NA	NA	No	A
1,1-Dichloroethene	NA	NA	NA	NA	No	A
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	NA	NA	NA	NA	No	A
2-Butanone (MEK)	NA	NA	NA	NA	No	A
2-Hexanone	NA	NA	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	No	A
Acetone	NA	NA	NA	NA	No	A
Benzene	NA	NA	NA	NA	No	A
Bromodichloromethane	NA	NA	NA	NA	No	A
Bromoform	NA	NA	NA	NA	No	A
Bromomethane	NA	NA	NA	NA	No	A
Carbon disulfide	NA	NA	NA	NA	No	A
Carbon tetrachloride	NA	NA	NA	NA	No	A
Chlorobenzene	NA	NA	NA	NA	No	A
Chloroethane	NA	NA	NA	NA	No	C
Chloroform	NA	NA	NA	NA	No	A
Chloromethane	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	NA	NA	NA	NA	No	A
Dibromochloromethane	NA	NA	NA	NA	No	A
Ethylbenzene	NA	NA	NA	NA	No	A
Methylene chloride	NA	NA	NA	NA	No	A
N-Hexane	NA	NA	NA	NA	No	C
Styrene	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	NA	NA	NA	NA	No	F
Toluene	NA	NA	NA	NA	No	A
total Xylenes	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	NA	NA	NA	NA	No	A
Vinyl chloride	NA	NA	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	NA	NA	No	A	No	A
1,2-Dichlorobenzene	NA	NA	Uncertainty	B	No	A
1,3-Dichlorobenzene	NA	NA	No	A	No	A
1,4-Dichlorobenzene	NA	NA	Uncertainty	B	No	A
2,4,5-Trichlorophenol	NA	NA	Uncertainty	B	No	A

**TABLE 28-12, AUS-0069
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	Uncertainty	B	No	A
2,4-Dichlorophenol	NA	NA	Uncertainty	B	No	A
2,4-Dimethylphenol	NA	NA	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	NA	NA	Uncertainty	B	No	A
2-Chloronaphthalene	NA	NA	No	A	Uncertainty	B
2-Chlorophenol	NA	NA	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	Uncertainty	B	Yes	E
2-Methylphenol	NA	NA	Uncertainty	B	No	A
2-Nitroaniline	NA	NA	No	A	No	A
2-Nitrophenol	NA	NA	No	A	No	A
3,3'-Dichlorobenzidine	NA	NA	No	A	No	A
3-Nitroaniline	NA	NA	No	A	No	A
4,6-Dinitro-2-methylphenol	NA	NA	Uncertainty	B	No	C
4-Bromophenyl phenyl ether	NA	NA	No	A	No	C
4-Chloro-3-methylphenol	NA	NA	Uncertainty	B	No	A
4-Chloroaniline	NA	NA	No	A	No	A
4-Chlorophenyl phenyl ether	NA	NA	No	A	No	C
4-Methylphenol	NA	NA	No	A	No	A
4-Nitroaniline	NA	NA	No	A	No	A
4-Nitrophenol	NA	NA	Uncertainty	B	No	A
Acenaphthene	NA	NA	Uncertainty	B	No	A
Acenaphthylene	NA	NA	Uncertainty	B	No	A
Anthracene	NA	NA	Uncertainty	B	Yes	E
Benzo(a)anthracene	NA	NA	Yes	E	Yes	E
Benzo(a)pyrene	NA	NA	Yes	E	Yes	E
Benzo(b)fluoranthene	NA	NA	Yes	E	Yes	E
Benzo(g,h,i)perylene	NA	NA	Uncertainty	B	Yes	E
Benzo(k)fluoranthene	NA	NA	Uncertainty	B	Yes	E
bis(2-Chloroethoxy)methane	NA	NA	No	A	Uncertainty	B
bis(2-Chloroethyl) ether	NA	NA	No	A	No	A
bis(2-Chloroisopropyl) ether	NA	NA	No	C	No	C
bis(2-Ethylhexyl) phthalate	NA	NA	No	A	Yes	E
Butyl benzyl phthalate	NA	NA	No	A	Uncertainty	B
Carbazole	NA	NA	No	A	Yes	E
Chrysene	NA	NA	Yes	E	Yes	E
Di-n-butyl phthalate	NA	NA	Yes	E	Yes	E
Di-n-octyl phthalate	NA	NA	No	A	No	A
Dibenz(a,h)anthracene	NA	NA	Uncertainty	B	Yes	E
Dibenzofuran	NA	NA	Yes	E	Yes	E
Diethyl phthalate	NA	NA	No	A	No	A
Dimethyl phthalate	NA	NA	No	A	No	A
Fluoranthene	NA	NA	Yes	E	Yes	E

**TABLE 28-12, AUS-0069
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	NA	NA	Uncertainty	B	No	A
Hexachlorobenzene	NA	NA	Uncertainty	B	No	A
Hexachlorobutadiene	NA	NA	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	Uncertainty	B	No	A
Hexachloroethane	NA	NA	Uncertainty	B	No	A
Indeno(1,2,3-c,d)pyrene	NA	NA	Uncertainty	B	Yes	E
Isophorone	NA	NA	No	A	No	A
N-Nitroso-di-n-propylamine	NA	NA	No	C	No	A
N-Nitrosodiphenylamine	NA	NA	No	A	No	A
Naphthalene	NA	NA	Uncertainty	B	No	F
Pentachlorophenol	NA	NA	Uncertainty	B	No	A
Phenanthrene	NA	NA	Yes	E	Yes	E
Phenol	NA	NA	Uncertainty	B	No	A
Pyrene	NA	NA	Yes	E	Yes	E
Metals and Inorganics						
Aluminum	NA	NA	No	F	Uncertainty	I
Antimony	NA	NA	Yes	E	Yes	E
Arsenic	NA	NA	No	F	Yes	E
Barium	NA	NA	Uncertainty	G	Yes	E
Beryllium	NA	NA	Uncertainty	G	No	F
Boron	NA	NA	Uncertainty	G	Yes	E
Cadmium	NA	NA	Yes	E	No	F
Calcium	NA	NA	Uncertainty	G,H	Uncertainty	G,H
Chromium	NA	NA	Yes	E	Yes	E
Cobalt	NA	NA	No	F	Yes	E
Copper	NA	NA	Yes	E	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	NA	NA	No	F	Yes	E
Lead	NA	NA	Yes	E	Yes	E
Magnesium	NA	NA	Uncertainty	G,H	Uncertainty	G,H
Manganese	NA	NA	Yes	E	Yes	D
Mercury	NA	NA	Yes	E	Yes	E
Nickel	NA	NA	Yes	E	Yes	E
Potassium	NA	NA	Uncertainty	G,H	Uncertainty	G,H
Selenium	NA	NA	No	C	Yes	E
Silver	NA	NA	Yes	D	Yes	E
Sodium	NA	NA	Uncertainty	G,H	Uncertainty	G,H
Thallium	NA	NA	No	C	Uncertainty	B
Vanadium	NA	NA	Uncertainty	G	Yes	E
Zinc	NA	NA	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	NA	NA	Uncertainty	B	Uncertainty	B
1,3-Dinitrobenzene	NA	NA	Uncertainty	B	No	A

TABLE 28-12, AUS-0069
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	Uncertainty	B	No	F
2,4-Dinitrotoluene	NA	NA	No	A	No	A
2,6-Dinitrotoluene	NA	NA	Uncertainty	B	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	No	C	No	F
2-Nitrotoluene (ONT)	NA	NA	No	A	No	C
3-Nitrotoluene	NA	NA	No	A	No	C
4-Amino-2,6-Dinitrotoluene	NA	NA	No	C	Uncertainty	G
4-Nitrotoluene (PNT)	NA	NA	No	A	No	C
HMX	NA	NA	Uncertainty	B	No	A
Nitrobenzene	NA	NA	No	A	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	NA	NA	Uncertainty	B	No	A
Tetryl	NA	NA	No	C	No	C

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

TABLE 28-13
 AUS-0069 - FORMER EMMA OU SITE COC-15
 CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
 (WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum ¹	Soil	Sediment	Trench Water	Surface Water
VOCs					
Tetrachloroethylene (PCE)		H	NA		NA
SVOCs					
2-Methylnaphthalene		E			NA
Anthracene		E			NA
Benzo(a)anthracene		H,E	E		NA
Benzo(a)pyrene		H,E	E		NA
Benzo(b)fluoranthene		H,E	E		NA
Benzo(g,h,i)perylene		E			NA
Benzo(k)fluoranthene		E			NA
bis(2-Ethylhexyl)phthalate (DEHP)		E			NA
Carbazole		H,E			NA
Chrysene		E	E		NA
Di-n-butyl phthalate		E	E		NA
Dibenz(a,h)anthracene		H,E			NA
Dibenzofuran		E	E		NA
Fluoranthene		E	E		NA
Indeno(1,2,3-c,d)pyrene		H,E			NA
Phenanthrene		E	E		NA
Pyrene		E	E		NA
Metals					
Aluminum				H	NA
Antimony		H,E	H,E	H	NA
Arsenic		H,E		H	NA
Barium		H,E	H	H	NA
Beryllium		H		H	NA
Boron		E			NA
Cadmium		H	H,E		NA
Chromium		H,E	H,E	H	NA
Cobalt		E			NA
Copper		E	E	H	NA
Iron		E		H	NA
Lead		H,E	H,E	H	NA
Manganese			E	H	NA
Mercury		H,E	H,E	H	NA
Nickel		H,E	H,E	H	NA
Selenium		H,E			NA
Silver		H,E			NA
Thallium				H	NA
Vanadium		E		H	NA
Zinc		H,E	H,E		NA

Key:

¹ Drums were not present at this site.

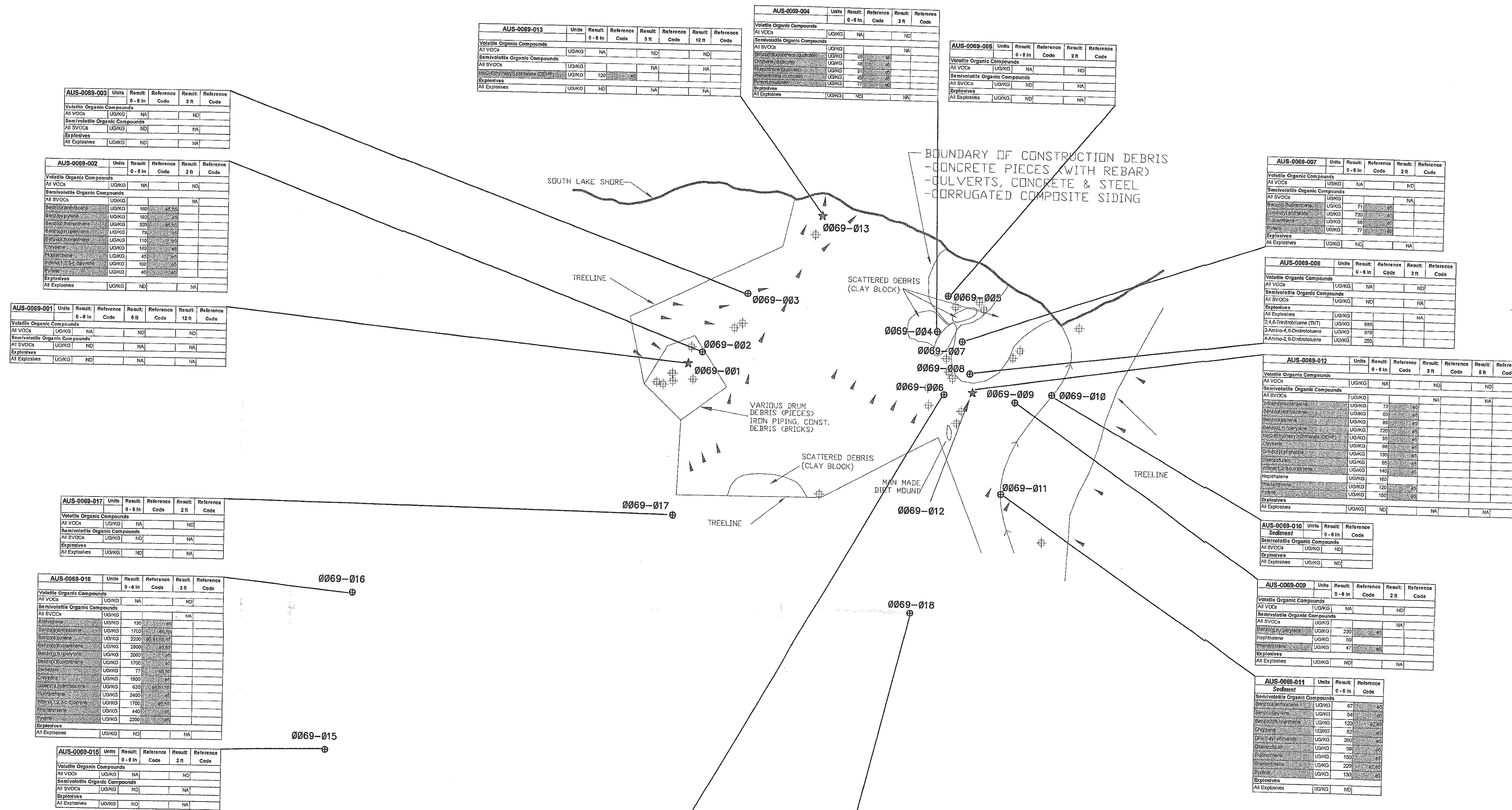
NA = not analyzed

H = human health screening criteria exceeded

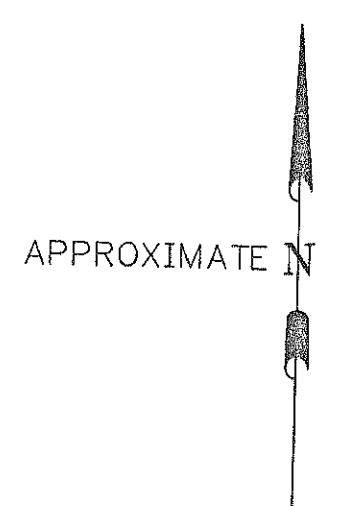
E = ecological screening criteria exceeded

LEGEND

- ★ TEST PIT LOCATION
- ⊕ HAND AUGER LOCATIONS
- DITCHLINE
- ⊕ 55 GALLON DRUM
- ↘ FLOW ARROWS



Screening Reference	Reference Code
AUR Background Soil UTL	31
Life Green Background Sediment UTL	32
Life Green Background Surface Water UTL	33
Ecological Direct Exposure Pathway TRV - Soil	34
Ecological Direct Exposure Pathway TRV - Sediment	35
Ecological Direct Exposure Pathway TRV - Surface Water	36
IEPA Chemical Use Surface Water Quality Life Toxicity	37
Roofed Chemical Data Matrix Key values (potential bioaccumulation)	38
USEPA Region IX Inertial Soil PRG - concentration	39
USEPA Region IX Industrial Soil PRG - concentration	40
USEPA Region IX Tap Water PRG - concentration	41
USEPA Region IX Tap Water PRG - concentration	42
USEPA Region IX Migration to Groundwater PRG (DAP-1)	43
USEPA MCL Drinking Water Standards	44
IEPA TACO Industrial/Commercial Soil Location	45
IEPA TACO Construction Worker Soil Location	46
IEPA TACO Class I Soil Component of Groundwater	47
IEPA General Use Surface Water Quality Human Health	48



NOTES:

- SAMPLE LOCATIONS ARE APPROXIMATE. SURVEY COORDINATES ARE FOUND IN TABLE 28-1.
- THE BASE MAP FOR THIS FIGURE IS A HAND SKETCH PREPARED DURING FIELD RECONNAISSANCE. THE DRAWING IS NOT TO SCALE. THE DIMENSIONS OF THE SITE AS SHOWN ARE APPROXIMATELY 500 BY 800 FEET.
- DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
- SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.
- THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

AUS-0069-FORMER EMMA OU SITE COC-15

Revision No.	Description	Date	By	App.

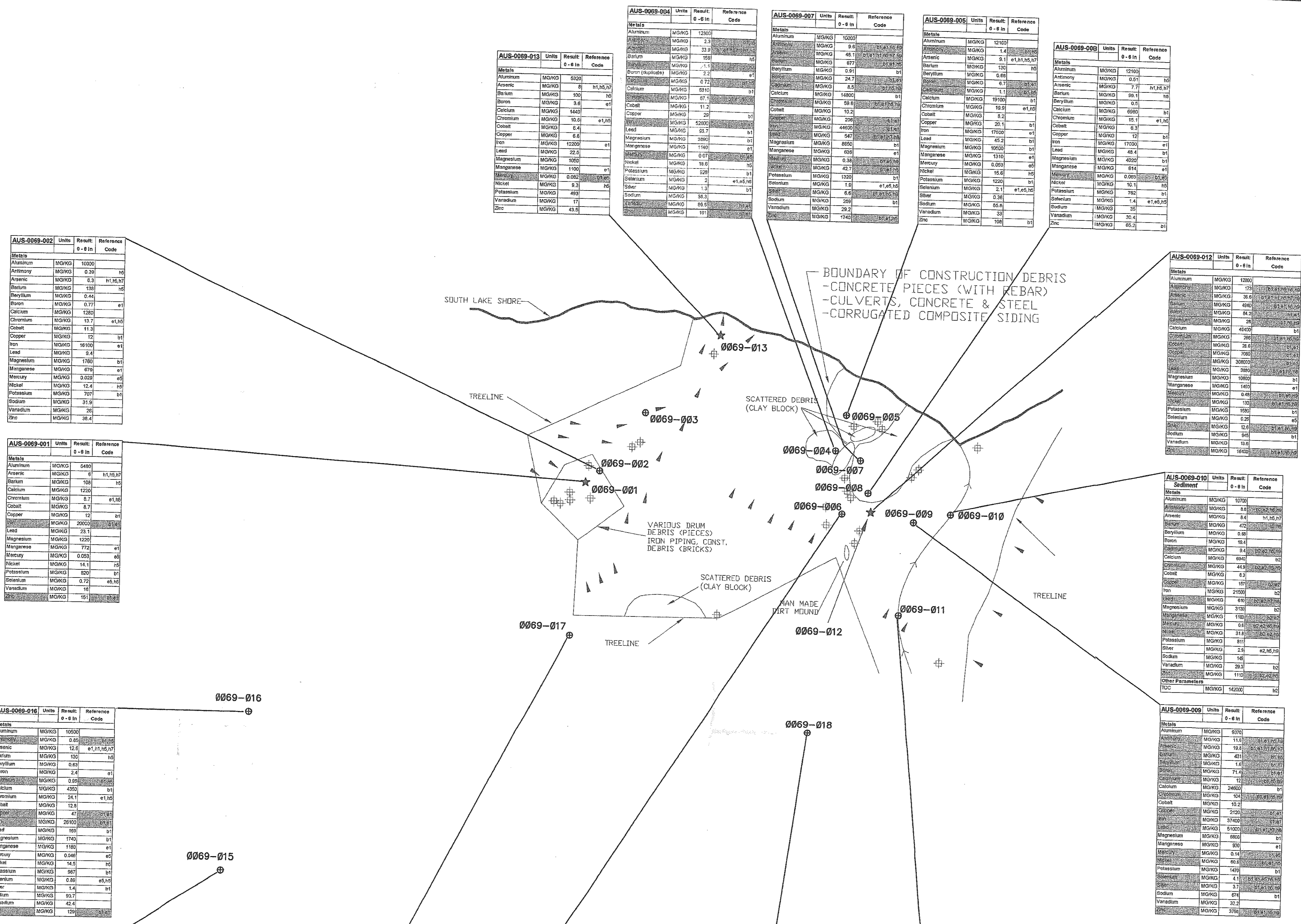
REVISIONS

PA/SI REPORT AU SOU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-0069
Sample Locations and Detections of
Organic Compounds in Soils/Sediments

Date: 12/20/00	Project Number: 232000026.00	Figure Number: 28-1
Drawn by: CHS	Design by: MAM	Checked by: MCH/CMW

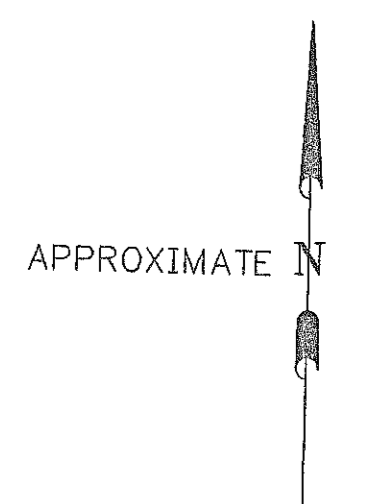




LEGEND

- ★ TEST PIT LOCATION
- ⊕ HAND AUGER LOCATIONS
- DITCHLINE
- ⊕ 55 GALLON DRUM
- ↘ FLOW ARROWS

Screening Reference	Reference Code
AUS Background Soil LTL	b1
Little Creek Background Surface Water LTL	b2
Little Creek Background Surface Water LTL	b3
Ecological Direct Exposure Pathway TRV - Soil	c1
Ecological Direct Exposure Pathway TRV - Sediment	c2
Ecological Direct Exposure Pathway TRV - Surface Water	c3
IRPA General Use Surface Water Quality Ambient Life Toxicity	e1
Superfund Chemical Data Matrix Risk Values (potential noncarcinogens)	e2
USEPA Region IX Industrial Soil PRG - carcinogen	b1
USEPA Region IX Industrial Soil PRG - noncarcinogen	b2
USEPA Region IX Tap Water PRG - carcinogen	b3
USEPA Region IX Tap Water PRG - noncarcinogen	b4
USEPA Region IX Migration to Groundwater PRG (DAP-1)	b5
USEPA MCL Drinking Water Standards	b6
IRPA TACO Industrial/Commercial Soil Ingestion	b7
IRPA TACO Construction Worker Soil Ingestion	b8
IRPA TACO Class I Soil Component of Groundwater	bp
IRPA General Use Surface Water Quality Human Health	b10



- NOTES:**
1. SAMPLE LOCATIONS ARE APPROXIMATE. SURVEY COORDINATES ARE FOUND IN TABLE 28-1.
 2. THE BASE MAP FOR THIS FIGURE IS A HAND SKETCH PREPARED DURING FIELD RECONNAISSANCE. THE DRAWING IS NOT TO SCALE. THE DIMENSIONS OF THE SITE AS SHOWN ARE APPROXIMATELY 500 BY 800 FEET.
 3. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
 4. SEDIMENT SAMPLES ARE NOTED AS SUCH IN THE LABEL, UNDERNEATH THE SAMPLE IDENTIFICATION NUMBER.

AUS-0069-FORMER EMMA OU SITE COC-15

Revision No.	Description	Date	By	App.

REVISIONS

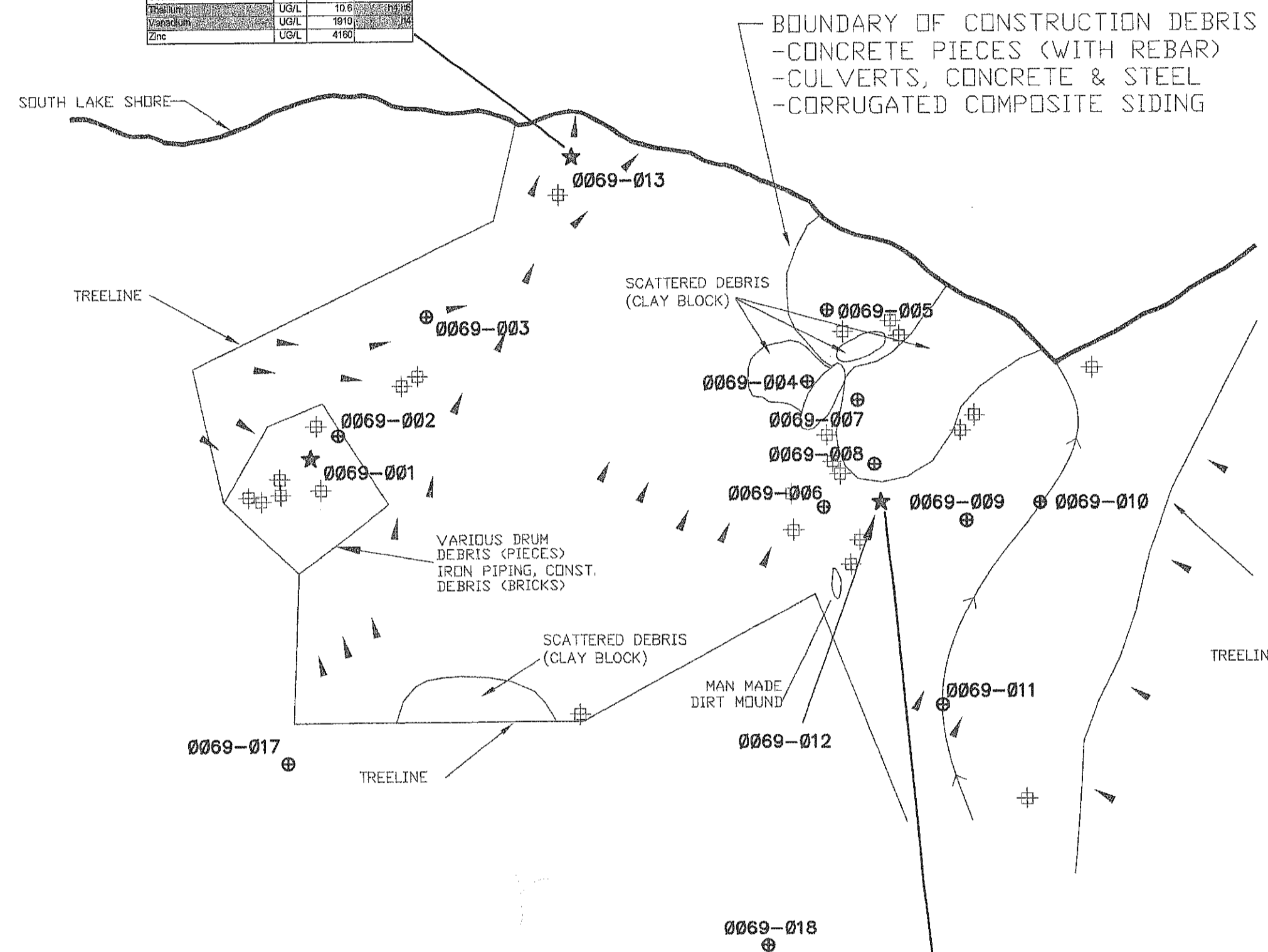
PA/SI REPORT AU SOU
CRAB ORCHARD NWR
MARION, ILLINOIS

AUS-0069
Sample Locations and Detections of
Inorganic Compounds in Soils/Sediments

Date: 12/20/00	Project Number: 232000026.00	Figure Number: 28-2
Drawn by: CHS	Design by: MAM	Checked by: MCH/CMW

URS

AUS-0069-013-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UGL	ND	
Semi-Volatile Organic Compounds			
All SVOCs	UGL	ND	
Explosives			
All Explosives	UGL	ND	
Metals			
Aluminum	UGL	143000	0214126
Antimony	UGL	ND	
Arsenic	UGL	307	1077422
Bismuth	UGL	1100	1077422
Boron	UGL	473	1077422
Calcium	UGL	800	1077422
Cadmium	UGL	17600	1077422
Chromium	UGL	1300	1077422
Cobalt	UGL	230	1077422
Copper	UGL	1500	1077422
Iron	UGL	107000	1077422
Magnesium	UGL	600	1077422
Manganese	UGL	20000	1077422
Molybdenum	UGL	4000	1077422
Nickel	UGL	50	1077422
Nitrogen	UGL	1300	1077422
Potassium	UGL	61000	1077422
Selenium	UGL	1100	1077422
Silver	UGL	2400	1077422
Sulfur	UGL	16000	1077422
Zinc	UGL	4100	1077422



AUS-0069-012-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
1,2-Dichloroethane	UGL	1	
Semi-Volatile Organic Compounds			
1,1-Dichloroethene	UGL	0.3	
1,1-Dibromoethene	UGL	0.7	
Metals			
Aluminum	UGL	6200	
Antimony	UGL	2.0	
Arsenic	UGL	3.0	0214126
Boron	UGL	340	
Calcium	UGL	7	
Cadmium	UGL	1000	
Chromium	UGL	10.2	
Cobalt	UGL	4.0	
Copper	UGL	60	
Iron	UGL	137000	0214126
Magnesium	UGL	1300	0214126
Manganese	UGL	3200	0214126
Molybdenum	UGL	7.0	0214126
Nickel	UGL	0.3	
Nitrogen	UGL	307	
Potassium	UGL	16.4	
Sulfur	UGL	400	

LEGEND

- ★ TEST PIT LOCATION
- ⊕ HAND AUGER LOCATIONS
- DITCHLINE
- ⊕ 55 GALLON DRUM
- ▲ FLOW ARROWS

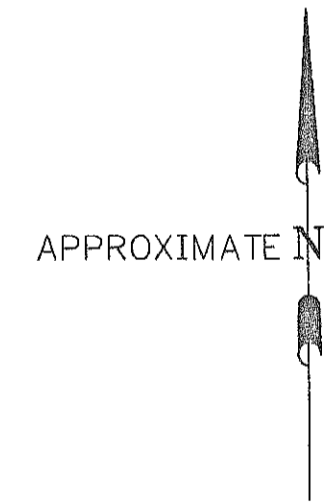
Screening Reference	Reference Code
AUS Background Soil LTT	b1
1 Mile Graney Background Sediment LTT	b2
1 Mile Graney Background Surface Water LTT	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
EPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix Key Values (potential noncumulative)	e5
USEPA Region IX Industrial Soil PRG - carcinogen	i1
USEPA Region IX Industrial Soil PRG - noncarcinogen	i2
USEPA Region IX Tap Water PRG - carcinogen	i3
USEPA Region IX Tap Water PRG - noncarcinogen	i4
USEPA Region IX Migration to Groundwater RWQ (DAP-1)	i5
USEPA MCL Drinking Water Standards	i6
EPA TACO Industrial/Commercial Soil Inspection	i7
EPA TACO Construction Worker Soil Inspection	i8
EPA TACO Class I Soil Component of Groundwater	i9
EPA General Use Surface Water Quality Human Health	i10

0069-016
⊕

0069-015
⊕

NOTES:

- SAMPLE LOCATIONS ARE APPROXIMATE. SURVEY COORDINATES ARE FOUND IN TABLE 28-1.
- THE BASE MAP FOR THIS FIGURE IS A HAND SKETCH PREPARED DURING FIELD RECONNAISSANCE. THE DRAWING IS NOT TO SCALE. THE DIMENSIONS OF THE SITE AS SHOWN ARE APPROXIMATELY 500 BY 800 FEET.
- DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
- THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.



AUS-0069-FORMER EMMA OU SITE COC-15

Revision No.	Description	Date	By	App.	
REVISIONS					
PA/SI REPORT AU SOU CRAB ORCHARD NWR MARION, ILLINOIS					
AUS-0069 Sample Locations and Detections in Trench Water					
Date:	12/20/00	Project Number:	232000026.00	Figure Number:	28-3
Drawn by:	CHS	Design by:	MAM	Checked by:	MCH/CMW
URS					

See the beginning of Section 22 for a general discussion of the Crab Orchard Cemetery (COC) Area and the Additional and Uncharacterized Sites Operable Unit (AUS OU) sites in that area. Figure 22-1 shows all eight AUS OU sites in the COC area. AUS-0109 is located about 0.2 mile south of the COC Area Road and 1.2 miles west of Wolf Creek Road (Figure 22-1).

AUS-0109 was included in the AUS OU because it was identified from the historical aerial photograph interpretation done by Entech, Inc. as a potential detonation area.¹

AUS Original Site Designations

AUS-0109 is not one of the original AUS OU sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS). It was added later based on aerial photography review.

29.1 HISTORIC SEARCH INFORMATION

29.1.1 Site Description

The 1951 aerial photograph interpretation identified several densely clustered craters in the location of AUS-0109.² The site was similar in appearance to COC 9, which was previously identified as an unexploded ordnance (UXO) detonation area. The craters appeared to be liquid-filled.³ By 1960, it appeared that detonation activity had ceased.⁴ By 1965, agricultural activity was encroaching on the cratered area.⁵ This site was observed in aerial photographs during the same time period as the rest of the COC Sites where explosives were detonated.

29.1.2 Operational History and Waste Characteristics

There were no known industrial lessees of this property.

¹ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-31 and Volume II (Maps) Page R. The Entech reports analyze historic aerial overflight photographs of industrial areas at the Refuge, from 1943 to 1993. The photos were obtained from the National Archives and Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

² Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-31 and Volume II (Maps) Page R.

³ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-31 and Volume II (Maps) Page R.

⁴ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-31 and Volume II (Maps) Page R.

⁵ Entech, Inc., 1999, Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, Volume I (Text) Page 3-31 and Volume II (Maps) Page R.

29.1.3 AUS-0109 Previous Sampling Results

There were no previous investigations done at this site.

29.1.4 Observations During Site Visit

The site is located in the center of a plowed field. A fenced area was located to the southwest of the site.

29.1.5 Recommendations Based on Preliminary Assessment

AUS-0109 was included in the Site Investigation (SI) since this site appears to have been a former explosives detonation area and there has been no previous investigation of this area. Similar sites (such as COC-9) have shown evidence of contamination; therefore, it is expected that this site might also contain contamination.

29.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0109 on April 13, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)⁶ for the AUS OU Preliminary Assessment/Site Investigation (PA/SI). AUS OU SI sample locations are shown on Figure 29-1. Survey coordinates for all sample locations in AUS-0109 are listed in Table 29-1. Table 29-2 lists the sample locations and the matrix sampled at that location. All samples are soil samples.

29.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. The intent of the field investigation was to sample the presumed crater areas that were identified on the aerial photos. Since there is no visible expression of the craters at the site, the coordinates of the craters had to be determined from the aerial photos.⁷

Test Pits 0109-001 and 0109-002 were located at two of the former potential crater areas. Soil samples were collected from the test pits to identify the potential for both explosives and metals residues in the area of the former craters. There is also the potential for organics contamination, if fuel oils or solvents were used to help ignite the explosives.

While groundwater was encountered in the test pits, no groundwater samples were taken. All other samples were taken in accordance with the Field Sampling Plan (FSP).

⁶ U.S. Fish & Wildlife Service, Department of the Interior, March 2000, Draft Final Field Sampling Plan Site Inspection, Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge Superfund Site, Marion, Illinois (Williamson County), prepared by URS Corporation.

⁷ At the beginning of the project, a test was conducted to estimate the accuracy of locating features from historic aerial photos. Using conventional methods, survey coordinates were obtained of a number of existing features at the Refuge that also appeared on a series of historic photos (for example, the corners of IOP buildings that are still existing). Entech independently obtained coordinates from the aerial photos. The coordinates obtained from the aerial photos were found to be in agreement with the coordinates obtained by conventional methods, within a few ft; acceptable for locating site features such as craters.

29.2.2 Field Results**29.2.2.1 Site Conditions****29.2.2.1.1 *Geologic Conditions***

No monitoring wells were installed in AUS-0109. Soil material from the upper foot (ft) at both test pit locations was described as fill material and/or topsoil. Below this layer to approximately eight ft below ground surface (bgs) the soil was described as loess (low plastic, silty clay, and silt). The loess changes to till (low plastic silty clay with trace sand) and continues to the bottom of both test pits, 12 ft bgs at 0109-001 and 10 ft bgs at 0109-002.

29.2.2.1.2 *Hydrogeologic Conditions*

Groundwater was encountered in both test pits during excavation. The groundwater was detected at nine ft bgs at location 0109-001 and eight ft bgs at location 0109-002.

29.2.2.1.3 *Hydrologic Conditions*

There was no surface water observed at the site.

29.2.2.2 Chemical Results

Table 29-3 lists the chemicals detected at AUS-0109 during this investigation, along with the frequency and range of detections. Tabulated results of all analyses are included in the Quality Control Summary Report (QCSR). Figure 29-1 presents the results for soil samples at this site.

29.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 29-4 and 29-5 as follows:

- Table 29-4--human health risk screening for soils, and
- Table 29-5--ecological risk screening for soils.

Each table lists the maximum detected concentration for each constituent analyzed at AUS-0109. The screening results are presented in the tables in terms of hazard quotients (HQs). The HQ for any chemical detected, for any particular screening criterion is simply the ratio of the maximum detected concentration to the screening concentration. For human health for carcinogens, a screening level "cancer risk" is calculated instead of an HQ.

Chemicals that are shaded in the tables are those that exceeded the screening criteria, and are identified as chemicals of potential concern (COPCs) for human health risk, and chemicals of potential ecological concern (COPECs) for ecological risk. The only COPCs/COPECs not shaded in the table are those inorganic constituents that exceeded the screening criteria but were detected at levels below Refuge background.

In cases where the chemical was analyzed but not detected, the HQ is the ratio between the maximum reporting limit and the screening concentration. Chemicals not detected are identified

with a “U” qualifier in the qualifier column. When these HQ values exceed one, they are not shaded. These constituents are not identified as COPCs/COPECs, but rather as uncertainties.

In Figure 29-1 the shading convention used is the same as for the tables discussed above. The particular screening criteria exceeded are indicated by the code in the analytical results labels. Duplicate results are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. Since in the screening process results which are qualified as estimated (coded with “J”) are treated the same as unqualified results, data qualifiers are not included in the results shown in the figures. Refer to the QCSR for data qualifiers.

Tables 29-6 (human health risk) and 29-7 (ecological risk) list all the analytes and corresponding media sampled and indicate whether each is a COPC (or COPEC), not a COPC (or COPEC), or an uncertainty. The codes in the tables indicate the rationale for each classification. All COPCs (Table 29-6) and COPECs (Table 29-7) are shaded in the tables.

29.3.1 Human Health Risk

29.3.1.1 Soil

Human health screening results for soil and samples are presented in Table 29-4. For carcinogens, a cancer risk was calculated using the USEPA Region 9 Industrial Soil Preliminary Remediation Goals (PRGs) as screening values. The cancer risk was derived by calculating a ratio of the maximum detected concentrations, or the maximum reporting limits, to their appropriate screening values. These ratios were then multiplied by 1×10^{-6} . In addition, ratios were calculated using the USEPA Region 9 Industrial Soil PRG for Toxins, the USEPA Region 9 Migration to Groundwater Criteria (Dilution Attenuation Factor (DAF)=1), the Illinois Tiered Approach to Corrective Action Objectives (TACO) Industrial/Commercial Soil Ingestion Criteria, the Illinois TACO Construction Worker Soil Ingestion Criteria, and the Illinois TACO Class I Soil Component of Groundwater Criteria.

29.3.2 Ecological Risk

29.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 29-5. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)⁸
- Environment Canada (1995)⁹
- Talmage *et al.* (1999)¹⁰

⁸ USEPA. 2000. Ecological Soil Screening Level Guidance (Draft). USEPA Office of Emergency and Remedial Response, Washington, DC.

⁹ Environment Canada. 1995. Toxicity Testing of NCSRP Priority Substances for Development of Soil Quality Guidelines for Contaminated Sites. Guidelines Division, Evaluation and Interpretation Branch, Environmental Conservation Directorate, Environment Canada. Hull, Quebec.

- Efroymsen *et al.* (1997a, 1997b)¹¹
- CCME (1999)¹²
- MHSPE (1994)¹³
- Other sources

A detailed discussion of the screening concentration selection is presented in Appendix G.

The screening approach for ingestion pathway exposures was based on the potential for a chemical to bioaccumulate. The potential for a chemical to bioaccumulate was based on the organic chemical-specific octanol-to-water partitioning coefficient (K_{ow}), which provides an indication of the lipophilicity of an organic chemical, and its potential for sequestration in biological tissue. The document *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (USEPA 1991)¹⁴ used a log K_{ow} of 3.5 as a target threshold value indicative of bioaccumulative chemicals to target organic chemicals of greatest concern. Using this as a guideline, organic chemicals with a log K_{ow} greater than 3.5 were considered potentially bioaccumulative chemicals. Among inorganics, mercury and selenium were considered as potentially bioaccumulative chemicals. Any potentially bioaccumulative chemical that is detected was retained as a COPEC.

29.4 SCIENTIFIC MANAGEMENT DECISION POINT

29.4.1 Human Health Risk Evaluation

This report recommends that inorganic constituents that exceeded project screening criteria but were within Refuge background levels not be retained as COPCs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 29-6, and include arsenic, barium, chromium, nickel and selenium in soil. Soil was the only media sampled at this site.

Of the COPCs listed in Table 29-6, only mercury exceeded the background soil value (0.06 milligrams per kilogram (mg/kg)). The maximum detected mercury concentration, 0.17 mg/kg, slightly exceeded the Illinois TACO Class I migration to groundwater screening value of 0.15 mg/kg. This site is very small, and any area of elevated mercury concentrations is expected to be very limited. No other screening values were exceeded. Based on this information, and the fact

¹⁰ Talmage, S.S., D.M. Opresko, C.J. Maxwell, C.J.E. Welsh, F. M. Cretella, P.H. Reno, and F. B. Daniel. 1999. Nitroaromatic Munition Compounds: Environmental Effects and Screening Values. *Rev Environ. Contam. Toxicol* 161:1-156.

¹¹ Efroymsen, 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, Oak Ridge, Tennessee. ES/ER/TM-85/R3.

Efroymsen, 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, Oak Ridge, Tennessee. ES/ER/TM-126/R2.

¹² Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

¹³ Ministry of Housing, Spatial Planning, and the Environment (MHSPE). 1994. *Intervention Values and Target Values – Soil Quality Standards*. Directorate General for Environmental Protection, Department of Soil Protection, The Hague, The Netherlands.

¹⁴ USEPA 1991. *Assessment and Control of Bioconcentratable Contaminants in Surface Waters* (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

that the screening criterion was only slightly exceeded, it is recommended that mercury not be retained for further evaluation for human health-based risk.

Several chemicals represent uncertainties for AUS-0109 because, while they were not detected, the reporting limit was equal to or exceeded the screening criteria. These are indicated as uncertainties on Table 29-6, and coded with a "B." The uncertainty associated with these chemicals is not considered to be significant.

In summary, results of the soil analyses at AUS-0109 indicate there are no chemicals present at levels of potential human health concern warranting further evaluation. It is recommended that none of the chemicals be retained as COPCs for this site.

29.4.2 Ecological Risk Evaluation

There were no COPECs identified among the organic constituents analyzed at AUS-0109. However, several were identified as uncertainties because the reporting limit was higher than the screening concentration. In fact, there were no volatile organic compounds, semivolatile organic compounds or explosives detected, lending weight of evidence that organic chemicals are not of ecological concern at AUS-0109.

Among the inorganic compounds chromium, iron, manganese, mercury, and selenium were identified as COPECs. This report recommends that inorganic constituents which exceeded project screening criteria but were within Refuge background levels not be retained as COPECs for further evaluation. These are the constituents coded with "D" on Table 29-6, and include chromium, manganese, and selenium. Other COPECs are each discussed below.

Iron – The maximum concentration of iron (20,400 mg/kg) was slightly (about 5 percent) above the background concentration (19,306 mg/kg -- Table 29-5). Though the maximum detection exceeded the screening value, iron is not considered a significant ecological concern since it is generally considered to have low toxicity, it is an essential nutrient, and is similar to the background concentration.

Mercury - The screening hazard quotient for mercury was less than one, indicating that mercury does not pose a risk associated with direct exposures in soils, but is discussed because it was detected and is a potential bioaccumulative constituent. The maximum concentration of mercury (0.17 mg/kg) was above background (0.06 mg/kg). Though mercury is a potentially bioaccumulative constituent, this is much less pronounced in terrestrial as compared to aquatic systems.¹⁵ Based on the small size of AUS-0109, mercury concentration relative to background, and a lower bioaccumulation potential in terrestrial systems, mercury is not believed to be sufficiently elevated as to warrant further evaluation of AUS-0109.

Several inorganic constituents were also identified as uncertainties at AUS-0109 (Table 29-7). Though not detected, the screening value for boron was below the reporting limit. Because it was not detected, boron is not considered a significant concern. Other inorganics were identified as uncertainties because they were detected but no screening values were identified. These

¹⁵ Lodenius, M. 1994. Mercury in terrestrial Ecosystems: A Review. In Mercury Pollution Integration and Synthesis, Carl J. Watras and John W. Huckabee, editors. Lewis Publishers, Boca Raton, Florida.

include calcium, magnesium, potassium, and sodium. Each of these constituents was below background concentrations. In addition, these are essential nutrients. Therefore, the uncertainty associated with these constituents is not considered significant. Aluminum was also characterized as an uncertainty. The screening criterion for aluminum is based on soil pH, and there are no site-specific pH data available for AUS-0109. However, the maximum concentration of aluminum is below background, and thus aluminum is not considered a significant ecological concern.

In summary, results of the soil analyses at AUS-0109 indicate there are no chemicals present at levels of potential ecological concern that would warrant further evaluation of the site. It is recommended that none of the chemicals be retained as COPECs for AUS-0109.

29.4.3 Summary of Recommendations

Based on the above discussions, it is recommended that none of the constituents detected at Site AUS-0109 be retained for further evaluation. Site AUS-0109 is judged to require no further action.

TABLE 29-1
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0109

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0109-001	376304.0	768298.0	885.33	NA	
0109-002				NA	No survey data for this point. The point was located in an agricultural field.

Sheet 1 of 1

NA = Not Applicable

**TABLE 29-2
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0109**

Soil
AUS-0109-001
AUS-0109-002

Sheet 1 of 1

TABLE 29-3
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituent	Number of Detections	Range of Detections
Metals		
Aluminum	2/2	5,850 mg/kg to 6,860 mg/kg
Arsenic	2/2	4.8 mg/kg to 5.3 mg/kg
Barium	2/2	140 mg/kg to 145 mg/kg
Cadmium	2/2	0.12 mg/kg to 0.21 mg/kg
Calcium	2/2	1,480 mg/kg to 1,670 mg/kg
Chromium, Total	2/2	9 mg/kg
Cobalt	2/2	8.2 mg/kg to 12.3 mg/kg
Copper	2/2	4.5 mg/kg to 7.6 mg/kg
Iron	2/2	10,300 mg/kg to 20,400 mg/kg
Lead	2/2	13.2 mg/kg to 16.5 mg/kg
Magnesium	2/2	777 mg/kg to 891 mg/kg
Manganese	2/2	1,820 mg/kg to 2,170 mg/kg
Mercury	2/2	0.08 mg/kg to 0.17 mg/kg
Nickel	2/2	10.2 mg/kg to 11.9 mg/kg
Potassium	2/2	467 mg/kg to 479 mg/kg
Selenium	2/2	1.4 mg/kg to 1.5 mg/kg
Silver	1/2	0.65 mg/kg
Thallium	1/2	0.17 mg/kg
Vanadium	2/2	17.2 mg/kg to 17.4 mg/kg
Zinc	2/2	22.6 mg/kg to 29.9 mg/kg

Sheet 1 of 1

mg/kg = milligrams per kilogram

Notes: This table was derived from the figures that show the analytical results. As a result, duplicates are shown only if the duplicate result for an analyte exceeded the screening criteria and the result from the original sample did not; or, if the analyte was detected in the duplicate and not in the original sample. There may be some duplicate results, not shown in the table, that are outside the range shown. In addition, the frequency and range of detections is based on the number of sample locations, not the total number of samples (the total number of samples includes originals plus duplicates).

Checked by: MMF 7/20/01

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
Volatile Organic Compounds								
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			1.80E-06	6.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG		6.68E-09	1.54E-06	3.00E+01
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG		3.16E-09	3.94E-05	6.67E+00
75-34-3	1,1-Dichloroethane	6	U	UG/KG			2.91E-06	6.00E-03
75-35-4	1,1-Dichloroethene	6	U	UG/KG		5.05E-08	8.91E-05	2.00E+00
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG		7.85E-09	1.70E-04	6.00E+00
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG			4.07E-05	3.00E-01
78-87-5	1,2-Dichloropropane	6	U	UG/KG		7.81E-09	2.82E-04	6.00E+00
78-93-3	2-Butanone (MEK)	12	U	UG/KG			4.33E-07	
591-78-6	2-Hexanone	12	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			4.16E-06	
67-64-1	Acetone	12	U	UG/KG			1.93E-06	1.50E-02
71-43-2	Benzene	6	U	UG/KG		4.10E-09	2.48E-04	3.00E+00
75-27-4	Bromodichloromethane	6	U	UG/KG		2.55E-09	5.75E-06	2.00E-01
75-25-2	Bromoform	6	U	UG/KG		1.92E-11	3.41E-07	1.50E-01
74-83-9	Bromomethane	6	U	UG/KG			4.57E-04	6.00E-01
75-15-0	Carbon disulfide	6	U	UG/KG			4.96E-06	3.00E-03
56-23-5	Carbon tetrachloride	6	U	UG/KG		1.13E-08	8.58E-04	2.00E+00
108-90-7	Chlorobenzene	6	U	UG/KG			1.11E-05	8.57E-02
75-00-3	Chloroethane	6	U	UG/KG		9.22E-10	3.18E-07	
67-66-3	Chloroform	6	U	UG/KG		1.15E-08	4.66E-03	2.00E-01
74-87-3	Chloromethane	6	U	UG/KG		2.25E-09		
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG			4.07E-05	3.00E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
124-48-1	Dibromochloromethane	6	U	UG/KG		2.26E-09	3.77E-06	3.00E-01
100-41-4	Ethylbenzene	6	U	UG/KG			1.00E-06	8.57E-03
75-09-2	Methylene chloride	6	U	UG/KG		2.92E-10	6.14E-07	6.00E+00
110-54-3	N-Hexane	6	U	UG/KG			1.49E-05	
100-42-5	Styrene	6	U	UG/KG			2.94E-07	3.00E-02
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG		3.21E-10	3.52E-06	2.00E+00
108-88-3	Toluene	6	U	UG/KG			3.02E-06	1.00E-02
1330-20-7	total Xylenes	6	U	UG/KG			1.35E-06	6.00E-04
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG			2.80E-05	2.00E-01
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG		3.37E-08	1.36E-04	
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG		9.81E-10	7.59E-05	2.00E+00
75-01-4	Vinyl chloride	6	U	UG/KG		1.23E-07		8.57E+00
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	440	U	UG/KG			5.78E-05	1.47E+00
95-50-1	1,2-Dichlorobenzene	440	U	UG/KG			1.33E-04	4.89E-01
541-73-1	1,3-Dichlorobenzene	440	U	UG/KG			8.50E-03	
106-46-7	1,4-Dichlorobenzene	440	U	UG/KG		5.41E-08	2.29E-04	4.40E+00
95-95-4	2,4,5-Trichlorophenol	2200	U	UG/KG			2.50E-05	2.20E-01
88-06-2	2,4,6-Trichlorophenol	440	U	UG/KG		1.96E-09		5.50E+01
120-83-2	2,4-Dichlorophenol	440	U	UG/KG			1.66E-04	8.80E+00
105-67-9	2,4-Dimethylphenol	440	U	UG/KG			2.50E-05	1.10E+00
51-28-5	2,4-Dinitrophenol	2200	U	UG/KG			1.25E-03	2.20E+02
91-58-7	2-Chloronaphthalene	440	U	UG/KG			1.61E-05	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
95-57-8	2-Chlorophenol	440	U	UG/KG			1.82E-03	2.20E+00
91-57-6	2-Methylnaphthalene	440	U	UG/KG			8.11E-06	2.20E-03
95-48-7	2-Methylphenol	440	U	UG/KG			9.99E-06	5.50E-01
88-74-4	2-Nitroaniline	2200	U	UG/KG			4.37E-02	
88-75-5	2-Nitrophenol	440	U	UG/KG			6.24E-05	
91-94-1	3,3'-Dichlorobenzidine	440	U	UG/KG		8.03E-08		1.47E+03
99-09-2	3-Nitroaniline	2200	U	UG/KG			4.37E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2200	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	440	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	440	U	UG/KG			9.99E-06	
106-47-8	4-Chloroaniline	880	U	UG/KG			2.50E-04	2.93E+01
7005-72-3	4-Chlorophenyl phenyl ether	440	U	UG/KG				
106-44-5	4-Methylphenol	440	U	UG/KG			9.99E-05	
100-01-6	4-Nitroaniline	2200	U	UG/KG			4.37E-02	
100-02-7	4-Nitrophenol	2200	U	UG/KG			3.12E-04	
83-32-9	Acenaphthene	440	U	UG/KG			1.15E-05	1.47E-02
208-96-8	Acenaphthylene	440	U	UG/KG			8.11E-06	2.20E-03
120-12-7	Anthracene	440	U	UG/KG			1.13E-06	7.33E-04
56-55-3	Benzo(a)anthracene	440	U	UG/KG		1.52E-07		5.50E+00
50-32-8	Benzo(a)pyrene	440	U	UG/KG		1.52E-06		1.10E+00
205-99-2	Benzo(b)fluoranthene	440	U	UG/KG		1.52E-07		2.20E+00
191-24-2	Benzo(g,h,i)perylene	440	U	UG/KG			8.11E-06	2.20E-03
207-08-9	Benzo(k)fluoranthene	440	U	UG/KG		1.52E-08		2.20E-01
111-91-1	bis(2-Chloroethoxy)methane	440	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
111-44-4	bis(2-Chloroethyl) ether	440	U	UG/KG		7.10E-07		2.20E+04
108-60-1	bis(2-Chloroisopropyl) ether	440	U	UG/KG		5.45E-08	1.04E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	440	U	UG/KG		2.50E-09	2.50E-05	
85-68-7	Butyl benzyl phthalate	440	U	UG/KG			2.50E-06	5.50E-04
86-74-8	Carbazole	440	U	UG/KG		3.57E-09		1.47E+01
218-01-9	Chrysene	440	U	UG/KG		1.52E-09		5.50E-02
84-74-2	Di-n-butyl phthalate	440	U	UG/KG			4.99E-06	1.47E-03
117-84-0	Di-n-octyl phthalate	440	U	UG/KG			2.50E-05	4.40E-05
53-70-3	Dibenz(a,h)anthracene	440	U	UG/KG		1.52E-06		5.50E+00
132-64-9	Dibenzofuran	440	U	UG/KG			8.69E-05	
84-66-2	Diethyl phthalate	440	U	UG/KG			6.24E-07	
131-11-3	Dimethyl phthalate	440	U	UG/KG			4.99E-08	
206-44-0	Fluoranthene	440	U	UG/KG			1.46E-05	2.20E-03
86-73-7	Fluorene	440	U	UG/KG			1.33E-05	1.47E-02
118-74-1	Hexachlorobenzene	440	U	UG/KG		2.85E-07	6.24E-04	4.40E+00
87-68-3	Hexachlorobutadiene	440	U	UG/KG		1.39E-08	2.50E-03	4.40E+00
77-47-4	Hexachlorocyclopentadiene	440	U	UG/KG			7.46E-05	2.20E-02
67-72-1	Hexachloroethane	440	U	UG/KG		2.50E-09	4.99E-04	2.20E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	440	U	UG/KG		1.52E-07		6.29E-01
78-59-1	Isophorone	440	U	UG/KG		1.69E-10	2.50E-06	1.47E+01
621-64-7	N-Nitroso-di-n-propylamine	440	U	UG/KG		1.25E-06		2.20E+05
86-30-6	N-Nitrosodiphenylamine	440	U	UG/KG		8.74E-10		7.33E+00
91-20-3	Naphthalene	440	U	UG/KG			2.33E-03	1.10E-01
87-86-5	Pentachlorophenol	2200	U	UG/KG		1.98E-07	1.54E-04	2.20E+03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
85-01-8	Phenanthrene	440	U	UG/KG			8.11E-06	2.20E-03
108-95-2	Phenol	440	U	UG/KG			8.32E-07	8.80E-02
129-00-0	Pyrene	440	U	UG/KG			8.11E-06	2.20E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	330	UJ	UG/KG			1.25E-05	
99-65-0	1,3-Dinitrobenzene	330	UJ	UG/KG			3.75E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	660	UJ	UG/KG		8.03E-09	1.50E-03	
121-14-2	2,4-Dinitrotoluene	330	UJ	UG/KG			1.87E-04	8.25E+03
606-20-2	2,6-Dinitrotoluene	440	U	UG/KG			4.99E-04	1.47E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	660	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	660	UJ	UG/KG				
99-08-1	3-Nitrotoluene	660	UJ	UG/KG			3.25E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	660	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	660	UJ	UG/KG			3.25E-04	
2691-41-0	HMX	660	UJ	UG/KG			1.50E-05	
98-95-3	Nitrobenzene	330	UJ	UG/KG			2.88E-03	
121-82-4	RDX	660	UJ	UG/KG		2.94E-08	2.50E-04	
479-45-8	Tetryl	990	UJ	UG/KG			1.12E-04	
Metals								
7429-90-5	Aluminum	6860		MG/KG	2.38E-01		4.09E-03	
7440-36-0	Antimony	0.79	U	MG/KG	9.52E-01		9.66E-04	2.63E+00
7440-38-2	Arsenic	5.3		MG/KG	3.93E-01	1.94E-06	1.21E-02	5.30E+00
7440-39-3	Barium	145		MG/KG	7.44E-01		1.16E-03	1.81E+00
7440-41-7	Beryllium	0.66	U	MG/KG	8.68E-01	2.94E-10	1.79E-04	2.20E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to Background (SOIL)	Cancer Risk Based on USEPA Region 9 Industrial Soil PRG for Carcinogens	Hazard Quotient (HQ) Based on USEPA Region 9 Industrial Soil PRG for Toxins	Ratio of Max Concentration (or Max RL) to Migration to Groundwater Criteria (DAF-1)
7440-42-8	Boron	13	U	MG/KG	2.45E+00		1.64E-04	
7440-43-9	Cadmium	0.21	J	MG/KG	1.11E+00	7.03E-11	2.59E-04	5.25E-01
7440-70-2	Calcium	1670		MG/KG	6.69E-01			
7440-47-3	Chromium	9		MG/KG	3.57E-01	2.01E-08		4.50E+00
7440-48-4	Cobalt	12.3		MG/KG	5.67E-01		1.00E-04	
7440-50-8	Copper	7.6		MG/KG	6.73E-01		1.00E-04	
7439-89-6	Iron	20400	J	MG/KG	1.06E+00		3.33E-02	
7439-92-1	Lead	16.5		MG/KG	7.05E-01			
7439-95-4	Magnesium	891		MG/KG	5.74E-01			
7439-96-5	Manganese	2170		MG/KG	5.96E-01		6.73E-02	
7439-97-6	Mercury	0.17		MG/KG	2.83E+00			
7440-02-0	Nickel	11.9		MG/KG	6.30E-01		2.91E-04	1.70E+00
2023695	Potassium	479		MG/KG	7.66E-01			
7782-49-2	Selenium	1.5		MG/KG	6.41E-01		1.47E-04	5.00E+00
7440-22-4	Silver	0.65	J	MG/KG	1.12E+00		6.36E-05	3.25E-01
7440-23-5	Sodium	130	U	MG/KG	7.65E-01			
7440-28-0	Thallium	0.17	J	MG/KG	4.15E-01		1.19E-06	
7440-62-2	Vanadium	17.4		MG/KG	3.69E-01		1.22E-03	5.80E-02
7440-66-6	Zinc	29.9		MG/KG	5.82E-01		4.88E-05	4.98E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane	6	U	UG/KG			3.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	6	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	6	U	UG/KG	7.32E-07	7.32E-07	3.00E-01
75-34-3	1,1-Dichloroethane	6	U	UG/KG	3.00E-08	3.00E-08	2.61E-04
75-35-4	1,1-Dichloroethene	6	U	UG/KG	3.33E-07	3.33E-06	1.00E-01
107-06-2	1,2-Dichloroethane (EDC)	6	U	UG/KG	9.52E-05	4.29E-06	3.00E-01
540-59-0	1,2-Dichloroethene (total)	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02
78-87-5	1,2-Dichloropropane	6	U	UG/KG	7.14E-05	3.33E-06	2.00E-01
78-93-3	2-Butanone (MEK)	12	U	UG/KG			
591-78-6	2-Hexanone	12	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	12	U	UG/KG			
67-64-1	Acetone	12	U	UG/KG	6.00E-08	6.00E-08	7.50E-04
71-43-2	Benzene	6	U	UG/KG	3.00E-05	1.40E-06	2.00E-01
75-27-4	Bromodichloromethane	6	U	UG/KG	6.52E-05	3.00E-06	1.00E-02
75-25-2	Bromoform	6	U	UG/KG	8.33E-06	3.75E-07	7.50E-03
74-83-9	Bromomethane	6	U	UG/KG	2.07E-06	6.00E-06	3.00E-02
75-15-0	Carbon disulfide	6	U	UG/KG	3.00E-08	3.00E-07	1.88E-04
56-23-5	Carbon tetrachloride	6	U	UG/KG	1.36E-04	1.46E-05	8.57E-02
108-90-7	Chlorobenzene	6	U	UG/KG	1.46E-07	1.46E-06	6.00E-03
75-00-3	Chloroethane	6	U	UG/KG			
67-66-3	Chloroform	6	U	UG/KG	6.38E-06	3.00E-06	1.00E-02
74-87-3	Chloromethane	6	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	6	U	UG/KG	3.00E-07	3.00E-07	1.50E-02

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
10061-01-5	cis-1,3-Dichloropropene	6	U	UG/KG			
124-48-1	Dibromochloromethane	6	U	UG/KG	1.46E-07	1.46E-07	1.50E-02
100-41-4	Ethylbenzene	6	U	UG/KG	3.00E-08	3.00E-07	4.62E-04
75-09-2	Methylene chloride	6	U	UG/KG	7.89E-06	5.00E-07	3.00E-01
110-54-3	N-Hexane	6	U	UG/KG			
100-42-5	Styrene	6	U	UG/KG	1.46E-08	1.46E-07	1.50E-03
127-18-4	Tetrachloroethylene (PCE)	6	U	UG/KG	5.45E-05	2.50E-06	1.00E-01
108-88-3	Toluene	6	U	UG/KG	1.46E-08	1.46E-08	5.00E-04
1330-20-7	total Xylenes	6	U	UG/KG	6.00E-09	1.46E-08	4.00E-05
156-60-5	trans-1,2-Dichloroethene	6	U	UG/KG	1.46E-07	1.46E-07	8.57E-03
10061-02-6	trans-1,3-Dichloropropene	6	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	6	U	UG/KG	1.15E-05	5.00E-06	1.00E-01
75-01-4	Vinyl chloride	6	U	UG/KG	2.00E-03	9.23E-05	6.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	440	U	UG/KG	2.20E-05	2.20E-04	8.80E-02
95-50-1	1,2-Dichlorobenzene	440	U	UG/KG	2.44E-06	2.44E-05	2.59E-02
541-73-1	1,3-Dichlorobenzene	440	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	440	U	UG/KG			2.20E-01
95-95-4	2,4,5-Trichlorophenol	2200	U	UG/KG	1.10E-05	1.10E-05	8.15E-03
88-06-2	2,4,6-Trichlorophenol	440	U	UG/KG	8.46E-04	4.00E-05	2.20E+00
120-83-2	2,4-Dichlorophenol	440	U	UG/KG	7.21E-05	7.21E-04	4.40E-01
105-67-9	2,4-Dimethylphenol	440	U	UG/KG	1.07E-05	1.07E-05	4.89E-02
51-28-5	2,4-Dinitrophenol	2200	U	UG/KG	5.37E-04	5.37E-03	1.10E+01
91-58-7	2-Chloronaphthalene	440	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
95-57-8	2-Chlorophenol	440	U	UG/KG	4.40E-05	4.40E-05	1.10E-01
91-57-6	2-Methylnaphthalene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
95-48-7	2-Methylphenol	440	U	UG/KG	4.40E-06	4.40E-06	2.93E-02
88-74-4	2-Nitroaniline	2200	U	UG/KG			
88-75-5	2-Nitrophenol	440	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	440	U	UG/KG	3.38E-02	1.57E-03	6.29E+01
99-09-2	3-Nitroaniline	2200	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2200	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	440	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	440	U	UG/KG			
106-47-8	4-Chloroaniline	880	U	UG/KG	1.07E-04	1.07E-03	1.26E+00
7005-72-3	4-Chlorophenyl phenyl ether	440	U	UG/KG			
106-44-5	4-Methylphenol	440	U	UG/KG			
100-01-6	4-Nitroaniline	2200	U	UG/KG			
100-02-7	4-Nitrophenol	2200	U	UG/KG			
83-32-9	Acenaphthene	440	U	UG/KG	3.67E-06	3.67E-06	7.72E-04
208-96-8	Acenaphthylene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
120-12-7	Anthracene	440	U	UG/KG	7.21E-07	7.21E-07	3.67E-05
56-55-3	Benzo(a)anthracene	440	U	UG/KG	5.50E-02	2.59E-03	2.20E-01
50-32-8	Benzo(a)pyrene	440	U	UG/KG	5.50E-01	2.59E-02	5.50E-02
205-99-2	Benzo(b)fluoranthene	440	U	UG/KG	5.50E-02	2.59E-03	8.80E-02
191-24-2	Benzo(g,h,i)perylene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
207-08-9	Benzo(k)fluoranthene	440	U	UG/KG	5.64E-03	2.59E-04	8.98E-03
111-91-1	bis(2-Chloroethoxy)methane	440	U	UG/KG			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
111-44-4	bis(2-Chloroethyl) ether	440	U	UG/KG	8.80E-02	5.87E-03	1.10E+03
108-60-1	bis(2-Chloroisopropyl) ether	440	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	440	U	UG/KG	1.07E-03	1.07E-04	1.22E-04
85-68-7	Butyl benzyl phthalate	440	U	UG/KG	1.07E-06	1.07E-06	4.73E-04
86-74-8	Carbazole	440	U	UG/KG	1.52E-03	7.10E-05	7.33E-01
218-01-9	Chrysene	440	U	UG/KG	5.64E-04	2.59E-05	2.75E-03
84-74-2	Di-n-butyl phthalate	440	U	UG/KG	2.20E-06	2.20E-06	1.91E-04
117-84-0	Di-n-octyl phthalate	440	U	UG/KG	1.07E-05	1.07E-04	4.40E-05
53-70-3	Dibenz(a,h)anthracene	440	U	UG/KG	5.50E-01	2.59E-02	2.20E-01
132-64-9	Dibenzofuran	440	U	UG/KG			
84-66-2	Diethyl phthalate	440	U	UG/KG	4.40E-07	4.40E-07	9.36E-04
131-11-3	Dimethyl phthalate	440	U	UG/KG			
206-44-0	Fluoranthene	440	U	UG/KG	5.37E-06	5.37E-06	1.02E-04
86-73-7	Fluorene	440	U	UG/KG	5.37E-06	5.37E-06	7.86E-04
118-74-1	Hexachlorobenzene	440	U	UG/KG	1.10E-01	5.64E-03	2.20E-01
87-68-3	Hexachlorobutadiene	440	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	440	U	UG/KG	3.14E-05	3.14E-05	1.10E-03
67-72-1	Hexachloroethane	440	U	UG/KG	2.20E-04	2.20E-04	8.80E-01
193-39-5	Indeno(1,2,3-c,d)pyrene	440	U	UG/KG	5.50E-02	2.59E-03	3.14E-02
78-59-1	Isophorone	440	U	UG/KG	1.07E-06	1.07E-06	5.50E-02
621-64-7	N-Nitroso-di-n-propylamine	440	U	UG/KG	5.50E-01	2.44E-02	8.80E+03
86-30-6	N-Nitrosodiphenylamine	440	U	UG/KG	3.67E-04	1.76E-05	4.40E-01
91-20-3	Naphthalene	440	U	UG/KG	5.37E-06	5.37E-05	5.24E-03
87-86-5	Pentachlorophenol	2200	U	UG/KG	9.17E-02	4.23E-03	7.33E+01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
85-01-8	Phenanthrene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
108-95-2	Phenol	440	U	UG/KG	4.40E-07	3.67E-06	4.40E-03
129-00-0	Pyrene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	330	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	330	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	660	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	330	UJ	UG/KG	3.93E-02	1.83E-03	4.13E+02
606-20-2	2,6-Dinitrotoluene	440	U	UG/KG	5.24E-02	2.44E-03	6.29E+02
35572-78-2	2-Amino-4,6-Dinitrotoluene	660	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	660	UJ	UG/KG			
99-08-1	3-Nitrotoluene	660	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	660	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	660	UJ	UG/KG			
2691-41-0	HMX	660	UJ	UG/KG			
98-95-3	Nitrobenzene	330	UJ	UG/KG	3.30E-04	3.30E-04	3.30E+00
121-82-4	RDX	660	UJ	UG/KG			
479-45-8	Tetryl	990	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	6860		MG/KG			
7440-36-0	Antimony	0.79	U	MG/KG	9.63E-04	9.63E-03	1.58E-01
7440-38-2	Arsenic	5.3		MG/KG	1.77E+00	8.69E-02	1.89E-01
7440-39-3	Barium	145		MG/KG	1.04E-03	1.04E-02	1.21E-01
7440-41-7	Beryllium	0.66	U	MG/KG	6.60E-01	2.28E-02	1.00E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-4
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Ratio of Max Concentration (or Max RL) to IEPA Industrial/Commercial Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Construction Worker Soil Ingestion Criteria	Ratio of Max Concentration (or Max RL) to IEPA Class I Soil Component of Groundwater Criteria
7440-42-8	Boron	13	U	MG/KG	7.22E-05	7.22E-04	
7440-43-9	Cadmium	0.21	J	MG/KG	1.05E-04	1.05E-03	5.68E-02
7440-70-2	Calcium	1670		MG/KG			
7440-47-3	Chromium	9		MG/KG	9.00E-04	2.20E-03	3.21E-01
7440-48-4	Cobalt	12.3		MG/KG	1.03E-04	1.03E-03	
7440-50-8	Copper	7.6		MG/KG	9.27E-05	9.27E-04	6.91E-04
7439-89-6	Iron	20400	J	MG/KG			
7439-92-1	Lead	16.5		MG/KG	4.13E-02	4.13E-02	
7439-95-4	Magnesium	891		MG/KG			
7439-96-5	Manganese	2170		MG/KG	2.26E-02	2.26E-01	
7439-97-6	Mercury	0.17		MG/KG	2.79E-04	2.79E-03	1.13E+00
7440-02-0	Nickel	11.9		MG/KG	2.90E-04	2.90E-03	1.57E-01
2023695	Potassium	479		MG/KG			
7782-49-2	Selenium	1.5		MG/KG	1.50E-04	1.50E-03	6.25E-01
7440-22-4	Silver	0.65	J	MG/KG	6.50E-05	6.50E-04	4.33E-01
7440-23-5	Sodium	130	U	MG/KG			
7440-28-0	Thallium	0.17	J	MG/KG	1.06E-03	1.06E-03	7.08E-02
7440-62-2	Vanadium	17.4		MG/KG	1.24E-03	1.24E-02	1.78E-02
7440-66-6	Zinc	29.9		MG/KG	4.90E-05	4.90E-04	8.31E-03

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
Volatile Organic Compounds							
71-55-6	1,1,1-Trichloroethane		6	U	UG/KG	2.01E-04	
79-34-5	1,1,2,2-Tetrachloroethane		6	U	UG/KG	4.72E-02	
79-00-5	1,1,2-Trichloroethane		6	U	UG/KG	2.10E-04	
75-34-3	1,1-Dichloroethane		6	U	UG/KG	2.99E-04	
75-35-4	1,1-Dichloroethene		6	U	UG/KG	7.25E-04	
107-06-2	1,2-Dichloroethane (EDC)		6	U	UG/KG	2.83E-04	
540-59-0	1,2-Dichloroethene (total)		6	U	UG/KG	7.62E-03	
78-87-5	1,2-Dichloropropane		6	U	UG/KG	8.57E-06	
78-93-3	2-Butanone (MEK)		12	U	UG/KG	1.34E-04	
591-78-6	2-Hexanone		12	U	UG/KG	9.52E-04	
108-10-1	4-Methyl-2-pentanone (MIBK)		12	U	UG/KG	2.71E-05	
67-64-1	Acetone		12	U	UG/KG	4.80E-03	
71-43-2	Benzene		6	U	UG/KG	3.75E-04	
75-27-4	Bromodichloromethane		6	U	UG/KG	1.11E-02	
75-25-2	Bromoform		6	U	UG/KG	3.77E-04	
74-83-9	Bromomethane		6	U	UG/KG	2.55E-02	
75-15-0	Carbon disulfide		6	U	UG/KG	6.37E-02	
56-23-5	Carbon tetrachloride		6	U	UG/KG	6.00E-06	
108-90-7	Chlorobenzene		6	U	UG/KG	1.50E-04	
75-00-3	Chloroethane		6	U	UG/KG		
67-66-3	Chloroform		6	U	UG/KG	5.04E-03	
74-87-3	Chloromethane		6	U	UG/KG	5.77E-04	
156-59-2	cis-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-01-5	cis-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
124-48-1	Dibromochloromethane		6	U	UG/KG	2.93E-03	
100-41-4	Ethylbenzene		6	U	UG/KG	1.20E-03	
75-09-2	Methylene chloride		6	U	UG/KG	1.48E-03	
110-54-3	N-Hexane		6	U	UG/KG		
100-42-5	Styrene		6	U	UG/KG	2.00E-05	
127-18-4	Tetrachloroethylene (PCE)		6	U	UG/KG	4.62E-04	
108-88-3	Toluene		6	U	UG/KG	2.00E-03	
1330-20-7	total Xylenes		6	U	UG/KG	1.00E-02	
156-60-5	trans-1,2-Dichloroethene		6	U	UG/KG	7.62E-03	
10061-02-6	trans-1,3-Dichloropropene		6	U	UG/KG	1.51E-02	
79-01-6	Trichloroethylene (TCE)		6	U	UG/KG	6.67E-04	
75-01-4	Vinyl chloride		6	U	UG/KG	9.29E-03	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		440	U	UG/KG	2.20E-02	
95-50-1	1,2-Dichlorobenzene		440	U	UG/KG	1.49E-01	
541-73-1	1,3-Dichlorobenzene		440	U	UG/KG	1.17E-02	
106-46-7	1,4-Dichlorobenzene		440	U	UG/KG	2.20E-02	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
95-95-4	2,4,5-Trichlorophenol		2200	U	UG/KG	5.50E-01	
88-06-2	2,4,6-Trichlorophenol		440	U	UG/KG	4.40E-02	
120-83-2	2,4-Dichlorophenol		440	U	UG/KG	5.03E-03	
105-67-9	2,4-Dimethylphenol		440	U	UG/KG	4.40E+01	
51-28-5	2,4-Dinitrophenol		2200	U	UG/KG	1.10E-01	
91-58-7	2-Chloronaphthalene		440	U	UG/KG	3.61E+01	
95-57-8	2-Chlorophenol		440	U	UG/KG	1.81E+00	
91-57-6	2-Methylnaphthalene		440	U	UG/KG	1.36E-01	
95-48-7	2-Methylphenol		440	U	UG/KG	1.09E-02	
88-74-4	2-Nitroaniline		2200	U	UG/KG	2.97E-02	
88-75-5	2-Nitrophenol		440	U	UG/KG	2.75E-01	
91-94-1	3,3'-Dichlorobenzidine		440	U	UG/KG	6.81E-01	
99-09-2	3-Nitroaniline		2200	U	UG/KG	6.96E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2200	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		440	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		440	U	UG/KG	5.53E-02	
106-47-8	4-Chloroaniline		880	U	UG/KG	8.00E-01	
7005-72-3	4-Chlorophenyl phenyl ether		440	U	UG/KG		
106-44-5	4-Methylphenol		440	U	UG/KG	2.70E-03	
100-01-6	4-Nitroaniline		2200	U	UG/KG	1.00E-01	
100-02-7	4-Nitrophenol		2200	U	UG/KG	3.14E-01	
83-32-9	Acenaphthene		440	U	UG/KG	6.45E-04	
208-96-8	Acenaphthylene		440	U	UG/KG	6.45E-04	
120-12-7	Anthracene		440	U	UG/KG	2.97E-04	
56-55-3	Benzo(a)anthracene		440	U	UG/KG	8.45E-02	
50-32-8	Benzo(a)pyrene		440	U	UG/KG	1.00E-04	
205-99-2	Benzo(b)fluoranthene		440	U	UG/KG	7.36E-03	
191-24-2	Benzo(g,h,i)perylene		440	U	UG/KG	3.70E-03	
207-08-9	Benzo(k)fluoranthene		440	U	UG/KG	7.36E-03	
111-91-1	bis(2-Chloroethoxy)methane		440	U	UG/KG	1.45E+00	
111-44-4	bis(2-Chloroethyl) ether		440	U	UG/KG	1.86E-02	
108-60-1	bis(2-Chloroisopropyl) ether		440	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		440	U	UG/KG	4.75E-01	
85-68-7	Butyl benzyl phthalate		440	U	UG/KG	1.84E+00	
86-74-8	Carbazole		440	U	UG/KG		
218-01-9	Chrysene		440	U	UG/KG	9.30E-02	
84-74-2	Di-n-butyl phthalate		440	U	UG/KG	2.20E-03	
117-84-0	Di-n-octyl phthalate		440	U	UG/KG	6.21E-04	
53-70-3	Dibenz(a,h)anthracene		440	U	UG/KG	2.39E-02	
132-64-9	Dibenzofuran		440	U	UG/KG		
84-66-2	Diethyl phthalate		440	U	UG/KG	4.40E-03	
131-11-3	Dimethyl phthalate		440	U	UG/KG	2.20E-03	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
206-44-0	Fluoranthene		440	U	UG/KG	3.61E-03	
86-73-7	Fluorene		440	U	UG/KG	1.47E-02	
118-74-1	Hexachlorobenzene		440	U	UG/KG	4.40E-04	
87-68-3	Hexachlorobutadiene		440	U	UG/KG	1.11E+01	
77-47-4	Hexachlorocyclopentadiene		440	U	UG/KG	4.40E-02	
67-72-1	Hexachloroethane		440	U	UG/KG	7.38E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		440	U	UG/KG	4.04E-03	
78-59-1	Isophorone		440	U	UG/KG	3.17E-03	
621-64-7	N-Nitroso-di-n-propylamine		440	U	UG/KG	8.09E-01	
86-30-6	N-Nitrosodiphenylamine		440	U	UG/KG	2.20E-02	
91-20-3	Naphthalene		440	U	UG/KG	1.77E-03	
87-86-5	Pentachlorophenol		2200	U	UG/KG	3.67E-01	
85-01-8	Phenanthrene		440	U	UG/KG	9.63E-03	
108-95-2	Phenol		440	U	UG/KG	1.10E-02	
129-00-0	Pyrene		440	U	UG/KG	5.61E-03	
Explosives							
99-35-4	1,3,5-Trinitrobenzene		330	UJ	UG/KG	8.77E-01	
99-65-0	1,3-Dinitrobenzene		330	UJ	UG/KG	5.04E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		660	UJ	UG/KG	2.20E-02	
121-14-2	2,4-Dinitrotoluene		330	UJ	UG/KG	2.58E-01	
606-20-2	2,6-Dinitrotoluene		440	U	UG/KG	1.34E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		660	UJ	UG/KG	8.25E-03	
88-72-2	2-Nitrotoluene (ONT)		660	UJ	UG/KG		
99-08-1	3-Nitrotoluene		660	UJ	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		660	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		660	UJ	UG/KG		
2691-41-0	HMX		660	UJ	UG/KG	2.64E-02	
98-95-3	Nitrobenzene		330	UJ	UG/KG	8.25E-03	
121-82-4	RDX		660	UJ	UG/KG	6.60E-03	
479-45-8	Tetryl		990	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	6860		MG/KG		
7440-36-0	Antimony	0.83	0.79	U	MG/KG	1.58E-01	
7440-38-2	Arsenic	13.5	5.3		MG/KG	5.89E-01	
7440-39-3	Barium	195	145		MG/KG	2.90E-01	
7440-41-7	Beryllium	0.76	0.66	U	MG/KG	6.60E-02	
7440-42-8	Boron	5.3	13	U	MG/KG	2.60E+01	
7440-43-9	Cadmium	0.19	0.21	J	MG/KG	7.24E-03	
7440-70-2	Calcium	2497	1670		MG/KG		
7440-47-3	Chromium	25.2	9		MG/KG	1.80E+00	
7440-48-4	Cobalt	21.7	12.3		MG/KG	6.15E-01	
7440-50-8	Copper	11.3	7.6		MG/KG	2.45E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

**TABLE 29-5
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AUS-0109**

**ADDITIONAL AND UNCHARACTERIZED SITES OU
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

CAS Number	Chemical	Background (SOIL)	Max Result or Max Reporting Limit (RL)	Qualifier	Units	Direct Exposure Hazard Quotient (HQ) (SOIL)	Retained as Potential Bioaccumulator
7439-89-6	Iron	19306	20400	J	MG/KG	1.02E+02	
7439-92-1	Lead	23.4	16.5		MG/KG	3.81E-02	
7439-95-4	Magnesium	1552	891		MG/KG		
7439-96-5	Manganese	3640	2170		MG/KG	2.17E+01	
7439-97-6	Mercury	0.06	0.17		MG/KG	2.43E-02	YES
7440-02-0	Nickel	18.9	11.9		MG/KG	3.97E-01	
2023695	Potassium	625	479		MG/KG		
7782-49-2	Selenium	2.34	1.5		MG/KG	1.50E+00	YES
7440-22-4	Silver	0.58	0.65	J	MG/KG	3.25E-01	
7440-23-5	Sodium	170	130	U	MG/KG		
7440-28-0	Thallium	0.41	0.17	J	MG/KG	1.70E-01	
7440-62-2	Vanadium	47.2	17.4		MG/KG	3.78E-01	
7440-66-6	Zinc	51.4	29.9		MG/KG	2.49E-01	

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
J = Estimated U = Nondetect

TABLE 29-6, AUS-0109
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Volatile Organic Compounds								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	Uncertainty	B
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	No	A
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	Uncertainty	B
2-Butanone (MEK)	NA	NA	NA	NA	NA	NA	No	A
2-Hexanone	NA	NA	NA	NA	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	NA	NA	No	A
Acetone	NA	NA	NA	NA	NA	NA	No	A
Benzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Bromodichloromethane	NA	NA	NA	NA	NA	NA	No	A
Bromoform	NA	NA	NA	NA	NA	NA	No	A
Bromomethane	NA	NA	NA	NA	NA	NA	No	A
Carbon disulfide	NA	NA	NA	NA	NA	NA	No	A
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	Uncertainty	B
Chlorobenzene	NA	NA	NA	NA	NA	NA	No	A
Chloroethane	NA	NA	NA	NA	NA	NA	No	A
Chloroform	NA	NA	NA	NA	NA	NA	No	A
Chloromethane	NA	NA	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	No	A
Dibromochloromethane	NA	NA	NA	NA	NA	NA	No	A
Ethylbenzene	NA	NA	NA	NA	NA	NA	No	A
Methylene chloride	NA	NA	NA	NA	NA	NA	Uncertainty	B
N-Hexane	NA	NA	NA	NA	NA	NA	No	A
Styrene	NA	NA	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	NA	NA	NA	NA	NA	NA	Uncertainty	B
Toluene	NA	NA	NA	NA	NA	NA	No	A
total Xylenes	NA	NA	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	NA	NA	NA	NA	NA	NA	Uncertainty	B
Vinyl chloride	NA	NA	NA	NA	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	No	A
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	No	A
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	No	A

**TABLE 29-6, AUS-0109
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	No	A
2-Chlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	No	A
2-Methylphenol	NA	NA	NA	NA	NA	NA	No	A
2-Nitroaniline	NA	NA	NA	NA	NA	NA	No	A
2-Nitrophenol	NA	NA	NA	NA	NA	NA	No	A
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	Uncertainty	B
3-Nitroaniline	NA	NA	NA	NA	NA	NA	No	A
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	No	C
4-Bromophenyl phenyl ether	NA	NA	NA	NA	NA	NA	No	C
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	No	A
4-Chloroaniline	NA	NA	NA	NA	NA	NA	Uncertainty	B
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	NA	NA	No	C
4-Methylphenol	NA	NA	NA	NA	NA	NA	No	A
4-Nitroaniline	NA	NA	NA	NA	NA	NA	No	A
4-Nitrophenol	NA	NA	NA	NA	NA	NA	No	A
Acenaphthene	NA	NA	NA	NA	NA	NA	No	A
Acenaphthylene	NA	NA	NA	NA	NA	NA	No	A
Anthracene	NA	NA	NA	NA	NA	NA	No	A
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	No	A
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	No	A
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	No	C
bis(2-Chloroethyl) ether	NA	NA	NA	NA	NA	NA	Uncertainty	B
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	NA	NA	No	A
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	NA	NA	No	A
Butyl benzyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Carbazole	NA	NA	NA	NA	NA	NA	Uncertainty	B
Chrysene	NA	NA	NA	NA	NA	NA	No	A
Di-n-butyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Di-n-octyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Dibenzofuran	NA	NA	NA	NA	NA	NA	No	A
Diethyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	No	A
Fluoranthene	NA	NA	NA	NA	NA	NA	No	A

**TABLE 29-6, AUS-0109
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	NA	NA	No	A
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	No	A
Hexachloroethane	NA	NA	NA	NA	NA	NA	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	NA	NA	No	A
Isophorone	NA	NA	NA	NA	NA	NA	Uncertainty	B
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	Uncertainty	B
N-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	Uncertainty	B
Naphthalene	NA	NA	NA	NA	NA	NA	No	A
Pentachlorophenol	NA	NA	NA	NA	NA	NA	Uncertainty	B
Phenanthrene	NA	NA	NA	NA	NA	NA	No	A
Phenol	NA	NA	NA	NA	NA	NA	No	A
Pyrene	NA	NA	NA	NA	NA	NA	No	A
Metals and Inorganics								
Aluminum	NA	NA	NA	NA	NA	NA	No	F
Antimony	NA	NA	NA	NA	NA	NA	Uncertainty	B
Arsenic	NA	NA	NA	NA	NA	NA	Yes	D
Barium	NA	NA	NA	NA	NA	NA	Yes	D
Beryllium	NA	NA	NA	NA	NA	NA	No	A
Boron	NA	NA	NA	NA	NA	NA	No	A
Cadmium	NA	NA	NA	NA	NA	NA	No	F
Calcium	NA	NA	NA	NA	NA	NA	No	H
Chromium	NA	NA	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	No	F
Lead	NA	NA	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	NA	NA	No	H
Manganese	NA	NA	NA	NA	NA	NA	No	F
Mercury	NA	NA	NA	NA	NA	NA	Yes	E
Nickel	NA	NA	NA	NA	NA	NA	Yes	D
Potassium	NA	NA	NA	NA	NA	NA	No	H
Selenium	NA	NA	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	NA	NA	No	F
Sodium	NA	NA	NA	NA	NA	NA	No	C
Thallium	NA	NA	NA	NA	NA	NA	No	F
Vanadium	NA	NA	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	NA	NA	No	F
Explosives								
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	No	A
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	No	A

**TABLE 29-6, AUS-0109
SUMMARY OF HUMAN HEALTH COPC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Groundwater		Sediment		Soil	
	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale	COPC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	No	C
2-Nitrotoluene (ONT)	NA	NA	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	No	A
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	NA	NA	No	A
HMX	NA	NA	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	NA	NA	Uncertainty	B
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	NA	NA	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- J - Chemical was classified as a COPC based on USEPA 1998 data but was not a COPC based on SI data.
- NA - Not Analyzed or not applicable.

**TABLE 29-7, AUS-0109
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Volatile Organic Compounds						
1,1,1-Trichloroethane	NA	NA	NA	NA	No	A
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	No	A
1,1,2-Trichloroethane	NA	NA	NA	NA	No	A
1,1-Dichloroethane	NA	NA	NA	NA	No	A
1,1-Dichloroethene	NA	NA	NA	NA	No	A
1,2-Dichloroethane (EDC)	NA	NA	NA	NA	No	A
1,2-Dichloroethene (total)	NA	NA	NA	NA	No	A
1,2-Dichloropropane	NA	NA	NA	NA	No	A
2-Butanone (MEK)	NA	NA	NA	NA	No	A
2-Hexanone	NA	NA	NA	NA	No	A
4-Methyl-2-pentanone (MIBK)	NA	NA	NA	NA	No	A
Acetone	NA	NA	NA	NA	No	A
Benzene	NA	NA	NA	NA	No	A
Bromodichloromethane	NA	NA	NA	NA	No	A
Bromoform	NA	NA	NA	NA	No	A
Bromomethane	NA	NA	NA	NA	No	A
Carbon disulfide	NA	NA	NA	NA	No	A
Carbon tetrachloride	NA	NA	NA	NA	No	A
Chlorobenzene	NA	NA	NA	NA	No	A
Chloroethane	NA	NA	NA	NA	No	C
Chloroform	NA	NA	NA	NA	No	A
Chloromethane	NA	NA	NA	NA	No	A
cis-1,2-Dichloroethene	NA	NA	NA	NA	No	A
cis-1,3-Dichloropropene	NA	NA	NA	NA	No	A
Dibromochloromethane	NA	NA	NA	NA	No	A
Ethylbenzene	NA	NA	NA	NA	No	A
Methylene chloride	NA	NA	NA	NA	No	A
N-Hexane	NA	NA	NA	NA	No	C
Styrene	NA	NA	NA	NA	No	A
Tetrachloroethylene (PCE)	NA	NA	NA	NA	No	A
Toluene	NA	NA	NA	NA	No	A
total Xylenes	NA	NA	NA	NA	No	A
trans-1,2-Dichloroethene	NA	NA	NA	NA	No	A
trans-1,3-Dichloropropene	NA	NA	NA	NA	No	A
Trichloroethylene (TCE)	NA	NA	NA	NA	No	A
Vinyl chloride	NA	NA	NA	NA	No	A
Semivolatile Organic Compounds						
1,2,4-Trichlorobenzene	NA	NA	NA	NA	No	A
1,2-Dichlorobenzene	NA	NA	NA	NA	No	A
1,3-Dichlorobenzene	NA	NA	NA	NA	No	A
1,4-Dichlorobenzene	NA	NA	NA	NA	No	A
2,4,5-Trichlorophenol	NA	NA	NA	NA	No	A

**TABLE 29-7, AUS-0109
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trichlorophenol	NA	NA	NA	NA	No	A
2,4-Dichlorophenol	NA	NA	NA	NA	No	A
2,4-Dimethylphenol	NA	NA	NA	NA	Uncertainty	B
2,4-Dinitrophenol	NA	NA	NA	NA	No	A
2-Chloronaphthalene	NA	NA	NA	NA	Uncertainty	B
2-Chlorophenol	NA	NA	NA	NA	Uncertainty	B
1-Methylnaphthalene	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	No	A
2-Methylphenol	NA	NA	NA	NA	No	A
2-Nitroaniline	NA	NA	NA	NA	No	A
2-Nitrophenol	NA	NA	NA	NA	No	A
3,3'-Dichlorobenzidine	NA	NA	NA	NA	No	A
3-Nitroaniline	NA	NA	NA	NA	No	A
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	No	C
4-Bromophenyl phenyl ether	NA	NA	NA	NA	No	C
4-Chloro-3-methylphenol	NA	NA	NA	NA	No	A
4-Chloroaniline	NA	NA	NA	NA	No	A
4-Chlorophenyl phenyl ether	NA	NA	NA	NA	No	C
4-Methylphenol	NA	NA	NA	NA	No	A
4-Nitroaniline	NA	NA	NA	NA	No	A
4-Nitrophenol	NA	NA	NA	NA	No	A
Acenaphthene	NA	NA	NA	NA	No	A
Acenaphthylene	NA	NA	NA	NA	No	A
Anthracene	NA	NA	NA	NA	No	A
Benzo(a)anthracene	NA	NA	NA	NA	No	A
Benzo(a)pyrene	NA	NA	NA	NA	No	A
Benzo(b)fluoranthene	NA	NA	NA	NA	No	A
Benzo(g,h,i)perylene	NA	NA	NA	NA	No	A
Benzo(k)fluoranthene	NA	NA	NA	NA	No	A
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	Uncertainty	B
bis(2-Chloroethyl) ether	NA	NA	NA	NA	No	A
bis(2-Chloroisopropyl) ether	NA	NA	NA	NA	No	C
bis(2-Ethylhexyl) phthalate	NA	NA	NA	NA	No	A
Butyl benzyl phthalate	NA	NA	NA	NA	Uncertainty	B
Carbazole	NA	NA	NA	NA	No	C
Chrysene	NA	NA	NA	NA	No	A
Di-n-butyl phthalate	NA	NA	NA	NA	No	A
Di-n-octyl phthalate	NA	NA	NA	NA	No	A
Dibenz(a,h)anthracene	NA	NA	NA	NA	No	A
Dibenzofuran	NA	NA	NA	NA	No	C
Diethyl phthalate	NA	NA	NA	NA	No	A
Dimethyl phthalate	NA	NA	NA	NA	No	A
Fluoranthene	NA	NA	NA	NA	No	A

**TABLE 29-7, AUS-0109
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
Fluorene	NA	NA	NA	NA	No	A
Hexachlorobenzene	NA	NA	NA	NA	No	A
Hexachlorobutadiene	NA	NA	NA	NA	Uncertainty	B
Hexachlorocyclopentadiene	NA	NA	NA	NA	No	A
Hexachloroethane	NA	NA	NA	NA	No	A
Indeno(1,2,3-c,d)pyrene	NA	NA	NA	NA	No	A
Isophorone	NA	NA	NA	NA	No	A
N-Nitroso-di-n-propylamine	NA	NA	NA	NA	No	A
N-Nitrosodiphenylamine	NA	NA	NA	NA	No	A
Naphthalene	NA	NA	NA	NA	No	A
Pentachlorophenol	NA	NA	NA	NA	No	A
Phenanthrene	NA	NA	NA	NA	No	A
Phenol	NA	NA	NA	NA	No	A
Pyrene	NA	NA	NA	NA	No	A
Metals and Inorganics						
Aluminum	NA	NA	NA	NA	Uncertainty	I
Antimony	NA	NA	NA	NA	No	A
Arsenic	NA	NA	NA	NA	No	F
Barium	NA	NA	NA	NA	No	F
Beryllium	NA	NA	NA	NA	No	A
Boron	NA	NA	NA	NA	Uncertainty	B
Cadmium	NA	NA	NA	NA	No	F
Calcium	NA	NA	NA	NA	Uncertainty	G,H
Chromium	NA	NA	NA	NA	Yes	D
Cobalt	NA	NA	NA	NA	No	F
Copper	NA	NA	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	Yes	E
Lead	NA	NA	NA	NA	No	F
Magnesium	NA	NA	NA	NA	Uncertainty	G,H
Manganese	NA	NA	NA	NA	Yes	D
Mercury	NA	NA	NA	NA	Yes	E
Nickel	NA	NA	NA	NA	No	F
Potassium	NA	NA	NA	NA	Uncertainty	G,H
Selenium	NA	NA	NA	NA	Yes	D
Silver	NA	NA	NA	NA	No	F
Sodium	NA	NA	NA	NA	No	C
Thallium	NA	NA	NA	NA	No	F
Vanadium	NA	NA	NA	NA	No	F
Zinc	NA	NA	NA	NA	No	F
Explosives						
1,3,5-Trinitrobenzene	NA	NA	NA	NA	No	A
1,3-Dinitrobenzene	NA	NA	NA	NA	No	A

**TABLE 29-7, AUS-0109
SUMMARY OF ECOLOGICAL COPEC EVALUATION**

**AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE**

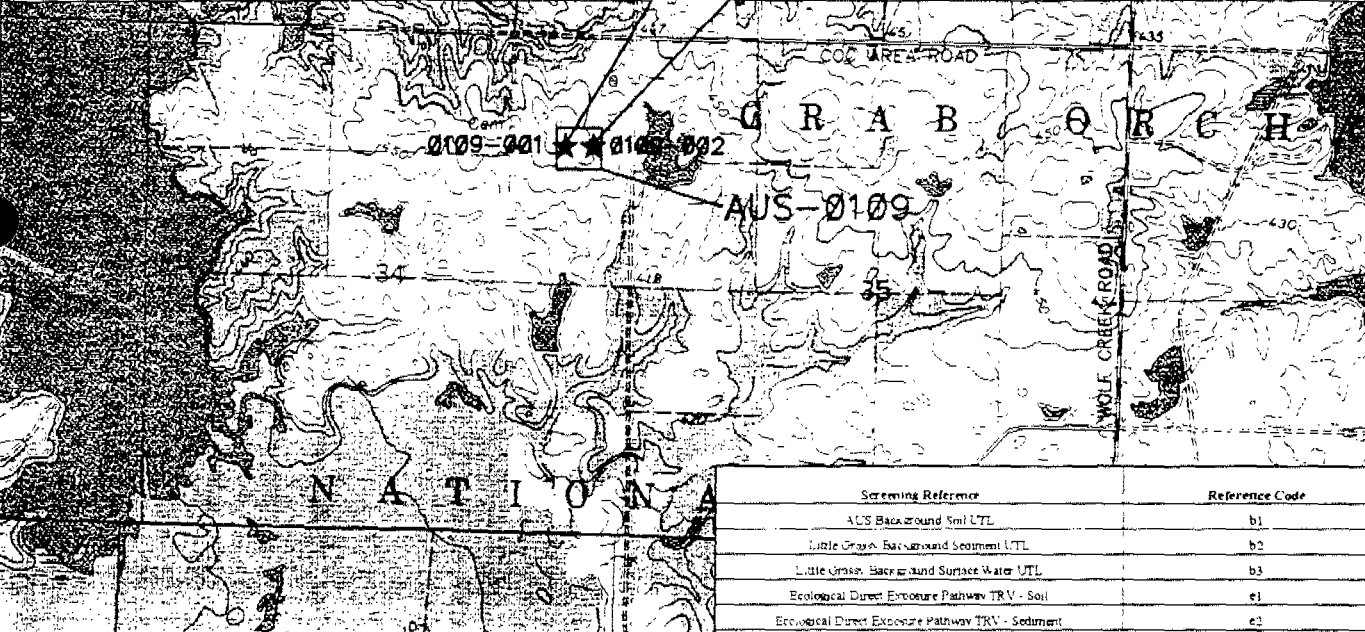
Chemical	Surface Water		Sediment		Soil	
	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale	COPEC (yes/no)	Rationale
2,4,6-Trinitrotoluene (TNT)	NA	NA	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	NA	NA	No	A
2,6-Dinitrotoluene	NA	NA	NA	NA	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA	NA	NA	No	A
2-Nitrotoluene (ONT)	NA	NA	NA	NA	No	C
3-Nitrotoluene	NA	NA	NA	NA	No	C
4-Amino-2,6-Dinitrotoluene	NA	NA	NA	NA	No	C
4-Nitrotoluene (PNT)	NA	NA	NA	NA	No	C
HMX	NA	NA	NA	NA	No	A
Nitrobenzene	NA	NA	NA	NA	No	A
Nitroglycerin	NA	NA	NA	NA	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA	NA	NA	NA	NA
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	No	A
Tetryl	NA	NA	NA	NA	No	C

- A - Chemical was not detected and the reporting limit does not exceed the screening concentration.
- B - Chemical was not detected, but reporting limit was equal to or exceeded screening concentration.
- C - Chemical was not detected and there is no screening concentration.
- D - Chemical was detected and was equal to or exceeded screening concentration, but did not exceed background.
- E - Chemical was detected and was equal to or exceeded screening concentration and background, if applicable.
- F - Chemical was detected and did not exceed screening concentration.
- G - Chemical was detected, but no screening value was available.
- H - Chemical was detected, but it is an essential nutrient.
- I - If pH<5.5, Aluminum is a COPEC, otherwise it is not.
- J - Chemical was classified as a COPEC based on USEPA 1998 data but was not a COPEC based on SI data.
- NA - Not Analyzed or not applicable.

AUS-0109-POSSIBLE FORMER EXPLOSIVES DETONATION AREA

AUS-0109-001		Units	Result:	Reference	Result:	Reference	Result:	Reference
			0-6 in	Code	5 ft	Code	10 ft	Code
Volatile Organic Compounds								
All VOCs	UG/KG	NA		ND		ND		ND
Semivolatile Organic Compounds								
All SVOCs	UG/KG	ND		NA		NA		NA
Explosives								
All Explosives	UG/KG	ND		NA		NA		NA
Metals								
All Metals	MG/KG			NA		NA		NA
Aluminum	MG/KG	8860						
Arsenic	MG/KG	5.3	e1	h5				
Barium	MG/KG	145		h5				
Cadmium	MG/KG	0.2						
Calcium	MG/KG	187						
Chromium	MG/KG	9	e1	h5				
Cobalt	MG/KG	12.3						
Copper	MG/KG	7.6						
Iron	MG/KG	20400	bt	e1				
Lead	MG/KG	5.5						
Magnesium	MG/KG	93						
Manganese	MG/KG	1800		e1				
Mercury	MG/KG	3.23	bt	e5				
Nickel	MG/KG	11.9		h5				
Potassium	MG/KG	487						
Selenium	MG/KG	1.5	e1	e5	h5			
Silver	MG/KG	0.85		e1				
Vanadium	MG/KG	17.2						
Zinc	MG/KG	28.9						

AUS-0109-002		Units	Result:	Reference	Result:	Reference	Result:	Reference
			0-6 in	Code	5 ft	Code	10 ft	Code
Volatile Organic Compounds								
All VOCs	UG/KG	NA		ND		ND		ND
Semivolatile Organic Compounds								
All SVOCs	UG/KG	ND		NA		NA		NA
Explosives								
All Explosives	UG/KG	ND		NA		NA		NA
Metals								
All Metals	MG/KG			NA		NA		NA
Aluminum	MG/KG	5850						
Arsenic	MG/KG	4.8	e1	h5	h7			
Barium	MG/KG	140		h5				
Cadmium	MG/KG	0.2		bt				
Calcium	MG/KG	1480						
Chromium	MG/KG	9	e1	h5				
Cobalt	MG/KG	8.2						
Copper	MG/KG	4.5						
Iron	MG/KG	20300		e1				
Lead	MG/KG	13.2						
Magnesium	MG/KG	77						
Manganese	MG/KG	2170		e1				
Mercury	MG/KG	6.17	bt	e5	h9			
Nickel	MG/KG	10.2		h5				
Potassium	MG/KG	479						
Selenium	MG/KG	1.4	e1	e5	h5			
Thallium	MG/KG	0.37						
Vanadium	MG/KG	17.4						
Zinc	MG/KG	22.8						



Screening Reference	Reference Code
AUS Background Soil UTL	b1
Little Gray Background Sediment UTL	b2
Little Gray Background Surface Water UTL	b3
Ecological Direct Exposure Pathway TRV - Soil	e1
Ecological Direct Exposure Pathway TRV - Sediment	e2
Ecological Direct Exposure Pathway TRV - Surface Water	e3
EPA General Use Surface Water Quality Aquatic Life Toxicity	e4
Superfund Chemical Data Matrix, Row values (potential bioaccumulative)	e5
USEPA Region IX Industrial Soil PRG - cancerous	h1
USEPA Region IX Industrial Soil PRG - noncancerous	h2
USEPA Region IX Tap Water PRG - cancerous	h3
USEPA Region IX Tap Water PRG - noncancerous	h4
USEPA Region IX Migration to Groundwater PRG (DAF-1)	h5
USEPA MCL Drinking Water Standards	h6
EPA TACO Industry/Commercial Soil Ingestion	h7
EPA TACO Construction Worker Soil Ingestion	h8
EPA TACO Class I Soil Component of Groundwater	h9
EPA General Use Surface Water Quality Human Health	h10

LEGEND

★ NOTES: TEST PIT LOCATION

1. SAMPLE LOCATIONS ARE APPROXIMATE. SURVEY COORDINATES CAN BE FOUND IN TABLE 29-1.
2. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
3. THE FOLLOWING COMPOUNDS ARE INCLUDED IN THE ANALYTE LIST FOR BOTH SVOCs AND EXPLOSIVES: 2,4-DINITROTOLUENE, 2,6-DINITROTOLUENE, AND NITROBENZENE. THESE COMPOUNDS MAY BE REPORTED AS EITHER SVOCs OR EXPLOSIVES.

PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS		PROJECT NO. 2320000026.00
URS		
DRN. BY: djc 9/7/99 DSGN. BY: mm CHKD. BY: mch/cm w	AUS-0109 Sample Locations and Detections in Soils	FIG. NO. 29-1



I:\EA\232000\9-00\PA-SI\REPORT-AUS OU\AUS-109.DWG last edited: 09/24 @ 09:15 a.m. @ WCC-SILIOUS