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.

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ACRONYM LIST
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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
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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
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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
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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

ACRONYM LIST
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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

Area 8, shown in Figure 12-1, is located just south of Ogden Road, approximately one mile east of Highway 148. Area 8 was the Illinois Ordnance Plant (IOP) Group III Load Line and was later used by industrial tenants.

AUS Original Site Designations

Eleven of the original sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS) as part of the Additional and Uncharacterized Sites Operable Unit (AUS OU) were located in Area 8 South (AUS-0023 through AUS-0033).

Of these 11 AUS OU Sites, only AUS-0025 was removed from the current Preliminary Assessment/Site Investigation (PA/SI) because it is part of the Miscellaneous Operable Unit (MISCA OU) (Site 14). The remaining sites were incorporated into the current Area 8 South, site designated as AUS-0A8S.

12.1 HISTORIC SEARCH INFORMATION

12.1.1 Site Description

IOP Group III Load Line (Figure 12-2) was designed and built for loading 500-lb bombs.

Diagraph Corporation currently occupies the only buildings remaining in the area. These are Buildings III-1-1 through III-1-5 and III-1-26 and III-1-27 in the northern portion of former Load Line III. This area was investigated as part of Site 14 in Miscellaneous Areas Operable Unit (MAOU), and is therefore not included in the AUS OU.

Site AUS-0A8S includes the southern portion of the former Group III Load Line building group as well as the former locations of the IOP boiler house (Building III-1-24) and the two IOP change houses (Buildings III-1-21 and III-1-23). None of these buildings are currently on site. Since the closing of the IOP, several tenants have operated in buildings in the south end of Area 8.

12.1.2 Operational History and Waste Characteristics

Figure 12-2 shows the original building configuration for Area 8.[1] Table 12-1 lists the buildings in the southern portion of Area 8 and their functions over the years.

12.1.2.1 IOP Load Line III Operations – General Information

SWDC/War Department constructed and operated Load Line III from 1942 through 1945. The following discussion of IOP operations was obtained from the 1944 War Department Facilities Inventory except as noted. The information about the production of 500-lb bombs was obtained

[1] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant Carbondale, Illinois, Part 1, Section 5, Page 9 (Plan No. 6544-101.15).

mostly from Mr. Kermit Troutman, a former SWDC employee, who described the bomb loading procedures he observed in the Group III Load Line.[2]

The following materials were used to produce 500-lb bombs:[3]

- Gasket, Body
- Lacquer, Olive Drab
- Thinner, Olive Drab
- Ammonium Nitrate
- TNT
- Booster, auxiliary, M104
- Booster, adapter, M115
- Caps and Casings
- Liner, fuse seat
- Metals parts assembly
- Sleeves, booster, auxiliary, M104.

The process of loading the bombs began on the north end of Load Line III where raw materials were delivered (Buildings III-1-1 and III-1-2) and the empty bomb casings were cleaned and painted (Building III-1-3). Buildings III-1-1, III-1-2, and III-1-3 are not included in the current AUS-0A8S.

The bomb casings were filled with melted explosives and cooled in Buildings III-1-11 and III-1-12, which are included in the current AUS-0A8S. After the bombs were filled, they were drilled out so that the boosters could be placed inside. Finally the bombs were loaded on rail cars and shipped off site. There were two rail spurs located along the east side of Building III-1-18.

IOP Decontamination

After the IOP operations ended at CONWR, the IOP was to be decontaminated in accordance with a manual developed by the Ordnance Field Director of Ammunition Plants (OFDAP), called "*Shut-Down and Decontamination Procedures for F.D.A.P Facilities.*"[4] This manual was to be used as a guide to develop a facility-specific plan for the decontamination of buildings, grounds and equipment.[5] According to this document, there were several cleaning compounds used for desensitizing various explosives (for a list of and brief discussion of the compounds, see section 3.1.2.3.).

Post-World War II military records are inadequate to determine if this area was decontaminated and, if so, whether it was adequately decontaminated, and if decontamination instructions were followed.

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[2] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Pages B-1 – B-5.
[3] NAR 000245. IOP, Illinois Ordnance Plant, Historical Record, April 1st, 1943 to August 17th, 1943, Exhibit #9.
[4] ACO-5047 through ACO-5109 – Office of Field Director of Ammunition Plants, "Shut-Down and Decontamination Procedures for F.D.A.P. Facilities."
[5] ACO-4979 through ACO-4980 – CONWR Former IOP Uncharacterized Sites Report, Pages 5 and 6.

All bombs and projectiles were removed from the IOP, soon after World War II ended.[6] Mr. Virgil Hollis, a former SWDC employee, also reported that leftover bombs and shells were shipped off site, and that the remaining anti-tank landmines were detonated in pits.[7]

12.1.2.2 Olin Mathieson Chemical Corporation – General Information

Olin occupied several of the former IOP buildings in Area 8 South from 1959 through 1960, for storage of ammonium nitrate fertilizer.[8] Lease information indicates that Olin occupied the entire southern portion of Area 8 (everything south of Buildings III-1-3 and III-1-23) from 1960[9] through 1962.[10]

12.1.2.3 Petrof Trading Company Operations – General Information

Petrof Trading Company (Petrof) occupied two Area 8 buildings from 1965[11] through 1968.[12] Julius Petrofsky ran the company.[13] Petrofs' operation in Area 8 involved grinding FNH[14] smokeless powder [flashless non-hydroscopic powder] or "old cannon powder" and then using the powder in a slurry which was sold as a commercial explosive.[15] Petrof's operation was shut down by USFWS in 1968 for failure to maintain the buildings as per the lease, and for failure to obtain liability insurance and to observe safety procedures.[16] Refuge employees reported that Petrof's business was terribly messy, that black powder could be found at his facility under benches, on the floors, in the yard, underneath motors, or just about anywhere in the area of his buildings.[17]

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[6] DPRA Document No. 00010780. US Army Toxic and Hazardous Materials Agency, 1980, Archive Search Report for the Former (Crab Orchard) Illinois Ordnance Plant, Marion Illinois, Report No. A008, Page 4.
[7] ACO 000128. Interview with Mr. Virgil Hollis as found in Appendix H, Page H-7, of an unknown report.
[8] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.
[9] DOI 001399 – DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[10] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[11] CRO 000492. Lease Contract No. 14-16-0003-12512 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Petrof Trading Company, Inc., dated December 7, 1965, Page 1.
[12] DPRA Document No. 00017899. Cancellation of Lease, Contract No. 14-16-0003-12152, Petrof Trading Company, Inc., effective December 31, 1968.
[13] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[14] The reference indicates "F&H" smokeless powder; this was probably an oral transcription of "FNH."
[15] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[16] DPRA Document No. 00017873. USFWS, Letter to Mr. Julius Petrofsky regarding a safety inspection report made of Petrof's buildings at the Refuge, dated October 22, 1968.
[17] CRO 000110. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1968, Page 58.

12.1.2.4 Central Technology, Inc. Operations – General Information

CTI leased the south end of Area 8 from June 1969[18] to November 1970,[19] when their lease was cancelled for nonpayment of rent.[20] CTI produced pyrotechnic devices for the military; their major product was the Mark II ground burst simulator.[21] They also produced cannon net traps.[22] According to USFWS, CTI purchased some of the powder left by Petrof, to extract nitroglycerin from the powder for use in the space program.[23] They also were involved in the manufacture of component parts for rocket separators.[24] CTI's principal operation was in Area 2; see discussion in Section 3 of this report. No building specific information was found for CTI's operation in Area 8.

12.1.2.5 American Fiber-Lite Operations – General Information

American Fiber-Glass, Incorporated began operations in Area 8 in April 1973.[25] The company changed its name to American Fiber-Lite, Incorporated (AFL) in January of 1974,[26] then to Marion Fiber-Lite, Incorporated in October of 1980.[27] AFL occupied this site until March 1981 when their leased buildings were destroyed by fire.[28] AFL manufactured fiberglass products including boats, hot tubs, satellite dishes, and canoes.[29] According to an accountant who worked for AFL from 1976 until the plant closed, the main products were canoes, which were sold to Sears.[30] Fiberglass is a fiber reinforced plastic, usually a polyester resin. The specific chemicals AFL used have not been determined; common compounds used to make fiberglass are listed in Table 12-3. A former employee reported that AFL used organic solvents, like toluene, for cleanup operations.[31]

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[18] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central Technology, Incorporated, dated May 16, 1969, Pages 1-2.
[19] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[20] CRO 000119. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1969, Table No. 1.
[21] CRO 000124. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1970, Page 44.
[22] CRO 000124. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1970, Page 44.
[23] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[24] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[25] CRO 001170. Lease Contract No. 14-16-0003-13,947 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and American Fiber-Glass, Incorporated, dated March 15, 1973, Page 1.
[26] CRO 001175. Amendment No. 1 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Incorporated formerly American Fiber-Glass, Incorporated, dated January 28, 1974.
[27] CRO 001180. Amendment No. 5 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Inc., dated September 30, 1980.
[28] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[29] DOI 000089. American Fiber-Lite, Inc, Response to Request for Information Regarding CONWR Site, Williamson County, IL., Page 1.
[30] Carl Randall, personal interview, June 16, 1999.
[31] Barbara Kerley, personal interview, June 30, 1999.

The 1981 fire destroyed the entire facility—88,000 square ft of building space and 25 acres burned.[32] After this facility was destroyed, the USFWS used the insurance money from the fire to restore the area to its natural state.[33] In 1982 and 1983, the site was cleaned up and the building debris remaining from the fire was buried, but removal of the 10,000 square ft melt pour building was not yet complete.[34] Currently no buildings remain in the southern portion of Area 8.[35,36]

12.1.2.6 Building Specific Information

Building III-1-6 – Booster Service Magazine

During the IOP era, the Booster Service Magazine (Building III-1-6) was used to store boosters prior to insertion into the bombs. It was located just northeast of the Melting and Pouring Building (Building III-1-7) and was connected to this building via a ramp.[37]

According to Olin lease information, Olin occupied the entire southern portion of Area 8 (which included Building III-1-6) from 1960[38] through 1962.[39]

Diagraph leased this building likely sometime between 1978 and 1980.[40]

Building III-1-7 – Melting and Pouring Building

The IOP Melting and Pouring Building (III-1-7) was located near the center of the loading line. Operations are summarized below.

Heating and Mixing

TNT and ammonium nitrate were delivered to the southern end of Building III-1-7, after they had been screened in Building III-1-8 (Screening Building). These two buildings were connected via rampways. At the southern end of the Melting and Pouring Building the TNT and ammonium nitrate were heated in four ammonium nitrate pre-heaters on the third floor and two TNT melting units on the second floor, and mixed in two amatol mixing kettles in the melt

[32] CRO 000159 – CRO 000160. U. S. Department of the Interior, Fish and Wildlife Service, National Wildlife Refuge system, Crab Orchard National Wildlife Refuge, Carterville, Illinois, Annual Narrative Report, Calendar Year 1981, Pages 26-28.
[33] U.S. Government Memorandum, dated April 6, 1982, regarding Insurance Proceeds from Crab Orchard Industrial Fire. Crab Orchard Database # 00025163.
[34] CRO 000170. Department of the Interior, Fish and Wildlife Service, National Wildlife System, Crab Orchard National Wildlife Refuge, Carterville, Illinois, Annual Narrative Report, Calendar Year 1983, Page 26.
[35] Current conditions of the Area 8 buildings were observed during the site reconnaissance on March 17-22, 1999.
[36] U.S. DOI contracts
[37] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.
[38] DOI 001399 – DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[39] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[40] DPRA Document No. 00006461. Special Areas Log showing tenant, building number, square ft, rental rate and building condition, Page 1.

mixing room on the second floor, to form amatol, a mixture of ammonium nitrate and TNT.[41] Amatol was used for loading into shells and bombs during the first year of production because of a shortage of TNT that ended possibly in May 1943,[42] when the ammonium nitrate plant shut down.[43] Later only TNT was used.

Cleaning Rooms

There was a draw-off room on the first floor, beneath the mixing room. Just south of the draw-off room was an attached, one-story structure that contained the equipment cleaning room, with a cleaning basin.[44] While the exact use of this room is unknown, it may have been used to clean explosives from equipment. If so, the cleaning water may have gone to the settling tanks and the evaporation basin shown on Figure 12-2, or to some other unidentified location.

Pour Rooms and Cleaning Operations

From south to north in the one-story area of the building, just west of the draw-off room, there were two pouring rooms (where bombs were filled), a cooling room and in the northernmost end, a cooling unit next to a TNT melt unit.[45]

The 250-lb bomb casings were loaded with 250 lbs of explosives to produce 500-lb bombs. The following discussion is based on the interview with Mr. Kermit Troutman.[46] The melted explosive was placed in the casings using long rubber hoses that fit into the open ends of the bomb casings. In the beginning, this was probably a messy operation because the shut-off valves on the hoses were difficult to manipulate. The hoses were later equipped with a metal collars and new shut-off valves, thus minimizing the spillage of explosive materials. Spilled explosives were immediately mopped up with water. The spilled explosive and the wash water were disposed of in a sump that was located just outside the Melting and Pouring Building. The sump Mr. Troutman was referring to was probably the settling tanks shown on Figure 12-2, which are discussed in more detail below. Troutman reported that the sump had a filtering screen and he speculated that waste from this sump was burned at the burning grounds located east of the load lines in a fairly remote area of IOP. Whenever a kettle was emptied, the entire area was thoroughly cleaned with water and the wash water was discharged to the sump. One kettle would fill approximately 7 to 9 bomb casings.

[41] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 8.
[42] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-2.
[43] NAR 0769. Memorandum to the Field Director of Ammunition Plants, regarding "Report on Status of Projects Submitted under Industrial Division Order No. 10," dated May 17, 1943.
[44] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.
[45] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.
[46] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Pages B-2 – B-3.

Cooling Room

The filled bomb casings were taken to the cooling rooms to cool. During bomb production this room may have been used for the same purpose as Building II-1-12, i.e. stirring pieces of solid explosive (TNT) into the hot explosive mixture in the bomb, to cool the mixture in the casing and to eliminate air pockets in the bomb by the stirring motion.[47] The solid TNT pieces used to cool the hot mixture in the bomb casings was obtained by melting TNT (possibly melted in the TNT melt unit located on the northernmost end of Building III-1-7[48]) and placing it into large flat pans to cool (possibly in the cooling unit on the northernmost end of the building[49]).[50] The solidified TNT was broken into pieces to be used inside the bomb casings.[51] The pans were probably steam cleaned near the sump.[52]

Settling Tanks and Evaporation Basin

Settling tanks (the sump) were located just off of the southern corner of the Melting and Pouring Building.[53] The settling tanks were about 12-ft long by 5-ft wide, and of undetermined depth. The drawings show an evaporating basin, about 50 ft long by 15 ft wide, just south of the settling tanks.[54] The evaporation basin may have received overflow from the settling tanks. The settling tank and evaporation were not observed during the site reconnaissance; this area was covered over with soil.

Olin had a special use permit for Building III-1-7 from February 1960 through July 1960, for storage of ammonium nitrate.[55] Lease information indicates that Olin occupied the entire southern portion of Area 8 (which included Building III-1-7) from 1960[56] through 1962.[57]

In April 1975, a safety inspection was done in this building.[58] Although the building was not under lease at this time, Diagraph Bradley Company (later Diagraph Corporation) was storing

[47] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-4.
[48] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.
[49] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.
[50] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-4.
[51] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-4.
[52] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-4.
[53] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.
[54] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.
[55] CRO 001457. Special Use Permit No. 30761, dated February 4, 1960.
[56] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[57] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

material in this facility.[59] It was also observed during the inspection that some decontamination had been done in several bays of this building which were marked with "XXX" (or three X's).[60] It was observed that much of the existing molten explosive piping was still in place inside this building; however, there was no evidence of explosive materials lying around the building.[61]

Building III-1-8 – Screening Building

During IOP operations, half this building, which contained four screening machines, was used for screening ammonium nitrate and the other half for screening TNT.[62,63] The first floor of the building contained the screening rooms and the second floor contained the ammonium nitrate and TNT charging rooms.[64]

Lease information indicates that Olin occupied the entire southern portion of Area 8 (which included Building III-1-8) from 1960[65] through 1962.[66]

CTI reportedly occupied Building III-1-8 from June 1969[67] to November 1970.[68] As noted above, there was no building-specific information found for CTI's operations in Area 8.

Building III-1-9 – Ammonium Nitrate Service Building

During IOP operations, ammonium nitrate was delivered to this building and staged here prior to use in the Melting and Pouring Building (III-1-7). This building was connected via ramps to both the TNT Service Building (III-1-10) and the Screening Building (III-1-8). This building may have been used later for staging TNT, after the use of ammonium nitrate ceased. This building was removed sometime between 1943 and 1951.[69]

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[58] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[59] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[60] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[61] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[62] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 33.
[63] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 8.
[64] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 33.
[65] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[66] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[67] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1.
[68] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[69] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 1 and 2. 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

Hoosier Cardinal Corporation leased Building III-1-9 from sometime after 1949,[70] through at least 1953, [71] and possibly as late as October of 1955.[72] Most of the buildings they leased were located in Area 11 (AUS-A11S). Hoosier manufactured and finished decorative equipment for stoves, refrigerators and automobiles.[73] According to a former Hoosier Cardinal employee,[74] they manufactured Ford emblems for automobiles from 1950-1952.

Olin occupied the entire southern portion of Area 8 (which included Building III-1-9) from 1960[75] through 1962.[76]

Building III-1-10 – TNT Service Building

Building III-1-10 was the TNT Service Building during the IOP era. TNT was delivered to this building and staged here prior to use in the Melting and Loading Building (III-1-7). This building was connected via ramps to both the Ammonium Nitrate Service Building (III-1-9) and the Screening Building (III-1-8).

Olin occupied the entire southern portion of Area 8 (which included Building III-1-10) from 1960[77] through 1962.[78] Information regarding their operations in this area was not found.

CTI reportedly occupied Building III-1-10 from June 1969[79] to November 1970.[80]

Building III-1-10a

Building III-1-10a was constructed during World War II (from August 1944 through June 1945)[81] and was used as a Service Magazine during the remainder of the war.[82] It was located

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Records Administration (NARA) and the U.S. Department of Agriculture Agricultural Stabilization and Conservation Service (ASCS).

[70] DPRA Document No. 00009059. Lease Data and Income Pertaining to Industrial Unit, Crab Orchard National Wildlife Refuge, April 12, 1949, Page 7.

[71] DPRA Document No. 00009039. Crab Orchard National Wildlife Refuge, Lease Data, Industrial Unit, June 1, 1951, Page 9.

[72] DPRA Document No. 00025093. U.S. Department of the Interior, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, September Thru December, 1955, Table No. VIII.

[73] CRO 001575A. Article from Herrin Daily Journal, dated March 30, 1949.

[74] Ray Almaroad, personal interview, September 8, 1999.

[75] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*

[76] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[77] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*

[78] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[79] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1.

[80] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

[81] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part II, Section 1, Page 1.

just northwest of Building II-1-9.[83] According to an original IOP drawing of this area (with notations later made by USFWS personnel)[84] and a 1951 aerial photograph,[85] a new road was also constructed in this area. The new road started near III-1-15 and ran somewhat parallel to the existing northwestern part of the outer road. It continued on around new Building III-1-10A and connected back to the original road just north of III-1-9.

A rail spur was constructed along the west side of this building.[86] This building was connected to Building III-1-10 via newly-constructed rampways. There were blast walls built around this building as observed in historical aerial photographs.[87]

Olin had a special use permit for Building III-1-10a from February 1960 through July 1960, for storage of ammonium nitrate.[88] Lease records indicate that Olin occupied the entire southern portion of Area 8 (which included Building III-1-10a) from 1960[89] through 1962.[90] Ground scarring was observed in the vicinity of this building in the 1960 aerial photograph.[91]

CTI reportedly occupied Building III-1-10a from June 1969[92] to November 1970.[93]

This building was razed by 1980.[94]

Building III-1-11 – TNT Cooling Building

There were two TNT Cooling Buildings (III-1-11 and III-1-12) which were connected via rampways to the Melting and Pouring Building (III-1-7).[95] It is assumed that the filled bombs cooled in these buildings.

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[82] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part I, Section 8, Page 1.
[83] Original IOP Plan No.6544-101.15-A, last revision June 30, 1942 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.
[84] Original IOP Plan No.6544-101.15-A, last revision June 30, 1942 with later notations added by Refuge personnel.
[85] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland (same photograph as used by Entech).
[86] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.
[87] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.
[88] CRO 001457. Special Use Permit No. 30761, dated February 4, 1960.
[89] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*
[90] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[91] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.
[92] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1.
[93] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[94] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.
[95] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.

The roof of this building was removed prior to 1960; all that remained standing from 1960 through 1970 were the concrete walls.[96] Olin occupied the entire southern portion of Area 8 (which included Building III-1-11) from 1960[97] through 1962.[98]

CTI reportedly occupied Building III-1-11 from June 1969[99] to November 1970.[100] This building was leased at a reduced rate, presumably because it had no roof. The foundation of this building appeared to be used as an open storage area/disposal site in 1971, with possible drum or crate-like features noted.[101] The possible storage/disposal area noted in the 1971 photograph was gone by 1980.[102]

Building III-1-11 was reportedly destroyed by fire on April 13, 1975. Since the 1971 aerial photo showed only concrete remaining at the building site, it is not known what actually burned. The fire was apparently caused by a lit cigarette igniting explosive residue in the building.[103] This building had been scheduled for decontamination by the U.S. Army Armament Command, starting on November 19, 1975.[104]

Building III-1-12 – TNT Cooling Building

This is the second of the two TNT Cooling Buildings, described above under Building III-1-11.

Olin had a special use permit for Building III-1-12 from December 1959 through July 1960, for storage of ammonium nitrate fertilizer.[105] Lease information indicates that Olin occupied the entire southern portion of Area 8 (which included Building III-1-12) from 1960[106] through 1962.[107]

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[96] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

[97] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*

[98] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[99] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1. DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

[100] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

[101] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.

[102] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.

[103] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.

[104] ACO 000028. USFWS, Letter to U.S. Army Armament Command regarding decontamination of Buildings III-1-11 and III-1-12a, dated October 22, 1975.

[105] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.

[106] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*

[107] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

CTI reportedly occupied Building III-1-12 from June 1969[108] to November 1970.[109]

AFL reportedly leased Building III-1-12 from September 1974[110] to March 1981 when the building was destroyed by fire.[111]

Building III-1-12a

Building III-1-12a was constructed from August 1944 through June 1945[112] and was used as a Cooling Building during the remainder of the war.[113] This building was located to the west of Building III-1-12[114] and was connected to Building III-1-12 via newly-constructed rampways.[115] Blast walls were built around this building as observed in historical aerial photographs.[116]

Olin had a special use permit for Building III-1-12A from December 1959 through July 1960, for storage of ammonium nitrate fertilizer.[117] Lease information indicates that Olin occupied the entire southern portion of Area 8 (which included Building III-1-12a) from 1960[118] through 1962.[119] Ground scarring was observed in the vicinity of this building in the 1960 aerial photograph.[120]

CTI reportedly occupied Building III-1-12a from June 1969[121] to November 1970.[122]

Decontamination was planned at this building by the U.S. Army Armament Command, starting on November 19, 1975.[123] It is assumed that this was done, since AFL began occupying this building in 1976, as discussed below.

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[108] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1.
[109] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[110] CRO 001176. Amendment No. 2 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Incorporated, dated September 1, 1974.
[111] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[112] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part II, Section 1, Page 1.
[113] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part I, Section 8, Page 2.
[114] Original IOP Plan No.6544-101.15-A, last revision June 30, 1942 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.
[115] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1.
[116] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.
[117] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.
[118] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*
[119] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[120] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.
[121] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1.
[122] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

AFL leased Building III-1-12a from January 1976[124] to March 1981 when the building was destroyed by fire.[125]

Building III-1-13 – TNT Melting Building

This building was connected via rampways to the two Cooling Buildings (III-1-11 and III-1-12).[126] The TNT Melting Building may have been used to top off the bombs with TNT. Melting procedures may have been similar to those described for the Melting and Pouring Building, III-1-7, described above.

Tetryl boosters were reportedly inserted into the bombs and metal base caps were placed on the bombs in this building.[127]

An addition to Building III-1-13 (TNT Melting Building)[128] was constructed from August 1944 through June 1945.[129]

Olin had a special use permit for Building III-1-13 from December 1959 through July 1960, for storage of ammonium nitrate fertilizer.[130] Lease records indicate that Olin occupied the entire southern portion of Area 8 (which included Building III-1-13) from 1960[131] through 1962.[132]

Petrof Trading Company reportedly occupied Building III-1-13 from 1965[133] to 1968.[134] Petrof's operation was described earlier in this section..

CTI reportedly occupied Building III-1-13 from June 1969[135] to November 1970.[136]

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[123] ACO 000028. USFWS, Letter to U.S. Army Armament Command regarding decontamination of Buildings III-1-11 and III-1-12a, dated October 22, 1975.
[124] CRO 001177. Amendment No. 3 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Incorporated, dated January 1, 1976.
[125] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[126] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.
[127] Interview with Kermit C. Troutman as found in TechLaw Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company Illinois Ordnance Plant, Page B-4.
[128] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part I, Section 8, Page 2.
[129] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory Supplement No. 2 of the Illinois Ordnance Plant – Carbondale, Illinois, Part II, Section 1, Page 1.
[130] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.
[131] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[132] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[133] CRO 000492. Lease Contract No. 14-16-0003-12152 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Petrof Trading Company, Inc., dated December 7, 1965, Page 1.
[134] DPRA Document No. 00017899. Cancellation of Lease Contract No. 14-16-0003-12512, Petrof Trading Company, Inc., dated December 31, 1968.
[135] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 1.
[136] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

A tank was observed to the northeast of Building III-1-13 in the 1971 aerial photograph, and it appears to have been heavily used.[137] There was much scarring visible around this facility.[138] Surrey Homes, Inc. leased Building III-1-13 either from June 1, 1971 to June 30, 1971 or from June 1, 1971 to June 30, 1972, for use as a manufacturing plant.[139] The end date on the special use permit is not clear. It is possible that the tank observed in the aerial photograph belonged to Surrey Homes, Inc.

AFL leased Building III-1-13 from April 1973[140] to March 1981 when the building was destroyed by fire.[141] The TNT Melting Building (Building III-1-13) was AFL's main manufacturing building. There were three open sumps identified next to Building III-1-13 during a safety inspection of the old bomb loading line buildings, done in April 1975.[142] These sumps apparently collected explosive materials from previous tenants; it did not appear they had been decontaminated prior to AFL's occupancy of this building.[143] A caved-in sump with water, soil, debris and a drum was observed just west of this building during the site reconnaissance.

In the 1980 aerial photograph, there was evidence of possible liquid releases in the area surrounding Building III-1-13; it appeared that the possible liquid originated at the building and flowed eastward toward the road.[144]

North of Building III-1-13 a trench and two possible pits were observed in the 1980 aerial photograph.[145] The trench appeared to be a concrete structure approximately 8-ft wide and 190-ft long, with ramps going in and out of the trench. The trench was empty and it may have been used for vehicular traffic.[146]

During the site reconnaissance, a caved-in sump pit was observed to the west of Building III-1-13—in between this building and Building I-1-14. The sump was not shown on IOP drawings, but sometimes field changes were made during construction and not recorded on drawings.

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[137] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.
[138] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.
[139] CRO 001460. Special Use Permit No. SUP-52-71, dated May 10, 1971.
[140] CRO 001170. Lease Contract No. 14-16-0003-13,947 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and American Fiber-Glass, Incorporated, dated March 15, 1973, Page 1.
[141] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[142] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[143] DPRA Document No. 00017896. U.S. Government Memorandum regarding the Accident to Contractor at Crab Orchard NWR, dated April 24, 1975.
[144] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.
[145] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.
[146] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.

Building III-1-14 – TNT Screening Building

This building had one room[147] that contained a screening machine.[148] From Building III-1-14, the TNT Screening Building, the TNT was taken to the TNT Melting Building (III-1-13).

Olin had a special use permit for Building III-1-14 from December 1959 through July 1960, for storage of ammonium nitrate fertilizer.[149] Lease records indicate that Olin occupied the entire southern portion of Area 8 (which included Building III-1-14) from 1960[150] through 1962.[151]

CTI reportedly occupied Building III-1-14 from June 1969[152] to November 1970.[153]

AFL reportedly leased Building III-1-14 from January 1976[154] to March 1981 when the building was destroyed by fire.[155]

Building III-1-15 – TNT Service Magazine

Building III-1-15 was the TNT Service Magazine during the IOP. TNT was delivered to this building and staged here prior to use in the TNT Melting Building (III-1-13). This building was connected via rampway to the TNT Screening Building (III-1-8).

Olin had a special use permit for Building III-1-15 from December 1959 through July 1960, for storage of ammonium nitrate fertilizer.[156] Lease records indicate that Olin occupied the entire southern portion of Area 8 (which included Building III-1-15) from 1960[157] through 1962.[158]

CTI reportedly occupied Building III-1-15 from June 1969[159] to November 1970.[160]

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[147] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 34.
[148] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 8.
[149] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.
[150] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*
[151] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[152] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.
[153] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[154] CRO 001177. Amendment No. 3 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Incorporated, dated January 1, 1976.
[155] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[156] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.
[157] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[158] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[159] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.
[160] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

AFL leased Building III-1-15 from January 1976[161] to March 1981 when the building was destroyed by fire.[162]

Building III-1-16 – Booster Service Magazine

This building was presumably used for temporary storage of boosters and may have also been used for installation of boosters. This building was located just south of Building III-1-13, the TNT Melting Building.

Olin had a special use permit for Building III-1-16 from December 1959 through July 1960, for storage of ammonium nitrate fertilizer.[163] Lease records indicate that Olin occupied the entire southern portion of Area 8 (which included Building III-1-16) from 1960[164] through 1962.[165]

Petrof Trading Company occupied Building III-1-16 from 1965[166] to 1968.[167] Petrof's operations were discussed previously in this section.

CTI reportedly occupied Building III-1-16 from June 1969[168] to November 1970.[169]

AFL leased Building III-1-16 from April 1973[170] to March 1981 when the building was destroyed by fire.[171] The 1980 aerial photograph showed evidence of possible liquid releases in the area surrounding Building III-1-16.[172]

Building III-1-17 – Component Service Magazine

No specifics on IOP use of this building were found.

Olin leased the entire southern portion of Area 8 (which included Building III-1-17) from 1960[173] through 1962.[174]

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[161] CRO 001177. Amendment No. 3 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Incorporated, dated January 1, 1976.
[162] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[163] DPRA Document No. 00003319. Special Use Permit No. 33149, dated December 24, 1959.
[164] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*
[165] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[166] CRO 000492. Lease Contract No. 14-16-0003-12152 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Petrof Trading Company, Inc., dated December 7, 1965, Page 1.
[167] DPRA Document No. 00017899. Cancellation of Lease Contract No. 14-16-0003-12512, Petrof Trading Company, Inc., dated December 31, 1968.
[168] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.
[169] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[170] CRO 001170. Lease Contract No. 14-16-0003-13,947 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and American Fiber-Glass, Incorporated, dated March 15, 1973, Page 1.
[171] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.
[172] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.

CTI reportedly occupied Building III-1-17 from June 1969[175] to November 1970.[176]

AFL leased Building III-1-17 from January 1976[177] to March 1981 when the building was destroyed by fire.[178]

Building III-1-18 – Assembly, Packing and Shipping Building

This building was used for inspection and shipping of bombs.[179] The building contained one printing and stripping unit.[180] It is likely that the 500-lbs bombs were touched up with paint in this building prior to shipment. This paint may have been stored in the Paint Storage Magazine (Building III-1-19), discussed below. Two rail spurs ran along the east side of Building III-1-18.[181] These rail spurs appear to have been abandoned by 1951.[182]

This building was razed prior to 1960 and only the foundation remained.[183]

Lease records indicate that Olin occupied the entire southern portion of Area 8 (which included former Building III-1-18) from 1960[184] through 1962.[185]

CTI reportedly occupied Building III-1-18 from June 1969[186] to November 1970.[187] This building was leased at a reduced rate, which may mean the lease was for open storage at the former Building III-1-18 location.

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[173] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*

[174] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[175] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.

[176] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

[177] CRO 001177. Amendment No. 3 to Lease Contract No. 14-16-0003-13947, American Fiber-Lite, Incorporated, dated January 1, 1976.

[178] CRO 000439. U.S. Government Memorandum, dated April 6, 1982.

[179] Interview with Kermit C. Troutman as found in TechLaw Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company Illinois Ordnance Plant, Page B-4.

[180] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 8.

[181] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.

[182] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.

[183] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

[184] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*

[185] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[186] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.

[187] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

Building III-1-19 – Paint Storage Magazine

Building III-1-19 was a Paint Storage Magazine associated with Building III-1-18 (Assembly, Packing and Shipping Building). There were two main rooms in this building.[188] The paint stored in this building may have been used for touching up the bombs prior to packaging and shipping them.

Olin leased the entire southern portion of Area 8 (which included Building III-1-19) from 1960[189] through 1962.[190]

CTI reportedly occupied Building III-1-19 from June 1969[191] to November 1970.[192]

This building was razed by 1980.[193]

Building III-1-20 – Guard House

This guard house was at the southern gate entrance to Area 8.[194]

Olin occupied the entire southern portion of Area 8 (which included Building III-1-20) from 1960[195] through 1962.[196]

Building III-1-21 – Change House

East of the main loading line were two Change Houses. The Change Houses (Buildings III-1-21 and III-1-23) contained locker rooms and lunchrooms.[197] Drains inside the change houses were connected to the sewers.

Olin leased the entire southern portion of Area 8 (which included Building III-1-21) from 1960[198] through 1962.[199]

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[188] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 13.
[189] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*
[190] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[191] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.
[192] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.
[193] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.
[194] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.
[195] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*
[196] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[197] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 28.

CTI reportedly occupied Building III-1-21 from June 1969[200] to November 1970.[201]

A tank was observed north of Building III-1-21 in the 1971 aerial photograph.[202]

From May 1972[203] through January 1973,[204] International Sign and Manufacturing Company leased Building III-1-21.

The Department of Justice-Bureau of Prisons had a special use permit for this building from February 1976 through January 1977, for use as an emergency detention center for prisoners.[205]

In 1980, this building was demolished and the debris was covered with 3 ft of soil fill material.[206]

Building III-1-22 – Timekeepers Building

East of the main loading line, there was also a Timekeepers Buildings (Building III-1-22). The Timekeepers Building contained office space, utility rooms, and time clock rooms.[207] This building was razed sometime between 1951 and 1960.[208]

One of the original employee parking lots was located east of Building III-1-22. There were 14 cylinder-like objects (possible drums) observed in this parking area in the 1960 aerial photograph,[209] possibly associated with pipeline construction in the area. These objects were gone by 1965.[210]

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[198] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease.)*

[199] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[200] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.

[201] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

[202] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.

[203] CRO 000424. Lease Contract No. 14-16-0003-13,631 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and International Sign and Manufacturing company, dated May 1, 1972, Page 1.

[204] CRO 000426. Cancellation of Lease Contract No. 14-16-0003-13,631, International Sign and Manufacturing Company, Herrin, Illinois, dated June 11, 1973.

[205] DPRA Document No. 00019086. Special Use Permit No. SUP-35-76, dated January 21, 1976.

[206] DPRA Document No. 00009450. U. S. Department of the Interior, Fish and Wildlife Service, National Wildlife Refuge System, Crab Orchard National Wildlife Refuge, Carterville, Illinois, Annual Narrative Report, Calendar Year 1980, Page 9.

[207] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 31.

[208] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figures 2 and 3.

[209] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.

[210] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.

Olin leased the entire southern portion of Area 8 (which included Building III-1-22) from 1960[211] through 1962.[212]

Building III-1-23 – Change House

East of the main loading line were two Change Houses. The Change Houses (Buildings III-1-21 and III-1-23) contained locker rooms and lunchrooms.[213] Drains inside the change houses were connected to the sewers.

Prior to 1951, a berm (possible blast wall) was built around the western and southern sides of Building III- 1-23.[214] It was presumably constructed as part of the IOP, since there were no tenants in this area before 1951.

Also in the 1951 photograph, there was a vivid scarred area without vegetative cover observed to the southeast of Building III-1-23.[215] This scarred area could have been the result of a liquid release due to its irregular nature.[216] A portion of this scarred area is still visible on 2000 aerial photos.[217] A "ring road" or "track" was observed in the area of this scarred area in the 1965 aerial photograph.[218] This feature was not observed in the 1971 aerial photograph.[219]

Diagraph leased this building likely sometime between 1978 and 1980.[220] No information was found regarding their operations in this building.

In 1980, USFWS demolished this building and the debris was covered with 3 ft of soil fill material.[221]

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[211] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*

[212] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[213] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 28.

[214] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.

[215] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.

[216] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.

[217] Walker Associates. 2000. Aerial photographs of Area 8. Photo 528-41.

[218] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.

[219] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 6.

[220] DPRA Database No. 00006461. Special Areas Log showing tenant, building number, square ft, rental rate and building condition.

[221] DPRA Document No. 00009450. U. S. Department of the Interior, Fish and Wildlife Service, National Wildlife Refuge System, Crab Orchard National Wildlife Refuge, Carterville, Illinois, Annual Narrative Report, Calendar Year 1980, Page 9.

Building III-1-24 – Boiler House

East of the Receiving and Storage Building (III-1-2) was the Boiler House (III-1-24).[222] The Boiler House contained a sump pit, a fuel oil pump, a compressor, a feedwater heater tank, two boilers and a condensate storage tank.[223] This boiler house had four underground oil[224] storage tanks (USTs) associated with it, which were located on the southwest side of the building.[225] It was not determined if these USTs were removed or if they are still in place. There was a railroad spur that ran along the northwest side of the UST and next to this spur was an unloading rack for unloading fuel oil into the USTs.[226]

In the 1951 aerial photographs, an area of surficial discoloration was observed in the area of the unloading rack.[227] This discoloration could have been the result of spillage during unloading activities.

In the 1943 aerial photograph, there was a circular pad for a yet-to-be constructed fuel aboveground storage tank (AST) that had a low berm surrounding it.[228] This fuel AST was in-place by 1951;[229] it was likely constructed shortly after the 1943 aerial photograph was taken. The 1951 aerial photograph showed standing liquid inside the bermed area surrounding the fuel tank.[230] In 1988, ESE observed several black oily pools, and bare patches of black sediment and tars inside the bermed area.[231] These pools and patches were not observed by Golder in 1992, during their site reconnaissance. By that time, the area was overgrown with trees and vegetation.[232]

There was a vivid scarred area (which lacked vegetation) observed in historical aerial photographs, to the northeast of the former aboveground storage tank. This scarred area which may have been due to a liquid release[233] was first observed in the 1951 aerial photograph. This

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[222] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 9.
[223] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 30.
[224] Original IOP Plan No.6544-101.15-B, last revision June 30, 1942 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.
[225] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 30.
[226] ACO 4991. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Figure 3-5.
[227] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.
[228] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 1.
[229] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.
[230] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 2.
[231] O'Brien and Gere, 1988, Remedial Investigation Report, Crab Orchard National Wildlife Refuge, Volume 1, Final Report, Page 19-1.
[232] Golder Associates, 1993, Phase I Remedial Investigation of the Miscellaneous Areas Operable Unit, Page 11.
[233] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois.

scarred area was visible on aerial photos up to 1965.[234] By 1971, this scarred area was no longer evident.[235]

By 1960, it appears that the boiler house was inactive and that the rail spur next to the boiler house was abandoned. [236] The boiler house and associated fuel AST were removed from the site sometime between 1960 and 1965.[237]

Building III-1-28 – Condensate Pump House

This Condensate Pump House (III-1-28) was located just west of Building III-1-7, the Melting and Pouring Building.

Olin leased the entire southern portion of Area 8 (which included Building III-1-28) from 1960[238] through 1962.[239]

Building III-1-29 – Condensate Pump House

This Condensate Pump House (III-1-29) was located just west of Building III-1-13, the TNT Melting Building.

Olin occupied the entire southern portion of Area 8 (which included Building III-1-29) from 1960[240] through 1962.[241]

CTI reportedly occupied Building III-1-29 from June 1969[242] to November 1970.[243]

Building III-1-30 – Condensate Pump House

This Condensate Pump House (III-1-30) was located just northwest of Building III-1-18, the Assembly, Packing and Shipping Building.

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[234] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[235] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 5.
[236] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 3.
[237] Entech, Inc., 1999, Site Specific Report on Area 8 at the Former Illinois Ordnance Plant, Crab Orchard National Wildlife Refuge, Marion, Illinois, Figure 4.
[238] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[239] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[240] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*
[241] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.
[242] DPRA Document No. 00017740. Lease Contract No. 14-16-0003-13018 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Central technology, Incorporated, dated May 16, 1969, Page 2.
[243] DPRA Document No. 00017745. Cancellation of 2 Leases and 1 Special Use Permit, dated November 30, 1970.

Olin occupied the entire southern portion of Area 8 (which included Building III-1-30) from 1960[244] through 1962.[245]

Buried Black Powder Area

According to former Refuge manager Wayne Adams, when Petrof left Area 8, black powder was likely left in the buildings he occupied, possibly in cardboard containers.[246] According to Mr. Adams, the buildings were not properly cleaned and decontaminated after he left. [247] The remaining black powder was buried in a hole by the USFWS and the area was fenced off and marked.[248] According to a USFWS memorandum, the powder was buried in 110-lb boxes.[249] This area has been described as the "buried black powder area".

Miscellaneous Drainage and Ponded Areas

Sometime between 1965 and 1971, a large pond appeared between the outer and inner service roads at the south end of Area 8. Sometime between 1971 and 1980, a second smaller pond appeared just to the north of this pond and inside the inner service road. In 1993, a third pond appeared to the southeast of former Building III-1-21, outside the outermost east service road.

12.1.3 Area 8 South Previous Sampling Results

O'Brien & Gere Remedial Investigation, 1988

Three sites located in Area 8 were investigated during the 1988 O'Brien & Gere Remedial Investigation (RI). These were Site 12 (called the Area 14 Impoundment), Site 13 (called the Area 14 Change House) and Site 14 (called Solvent Storage). This report mistakenly refers to Area 8 as Area 14. Site locations are shown in Figure 12-4.[250] A description of each site follows. Soil and sediment results are reported in dry weight.

Site 12 – Area 8 [sic] Impoundment

Site 12, "The Area 14 Impoundment", was the bermed area to the east of Building III-1-23 which previously held a fuel AST for the Load Line III Boiler House, as identified in aerial photographs. According to the RI report, several black oily pools were evident in and around the bermed area.[251] There were also bare patches of black sediment and tars observed inside the

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[244] DOI 001399, DOI 001401, & DOI 001421. Seventh Amendment and Codification of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated August 1, 1960, Pages 1 and 3, and Page 3 of Exhibit B. (*Area 8 is described as "Tract F" in this lease as determined on Page 3 of Exhibit B of this amendment.)*

[245] DOI 001422 – DOI 001425. Eight Amendment of Lease, between USFWS and Olin Mathieson Chemical Corporation, dated December 14, 1962.

[246] Wayne Adams, personal interview, March 23, 2000.

[247] Wayne Adams, personal interview, March 23, 2000.

[248] Wayne Adams, personal interview, March 23, 2000.

[249] DPRA Document No. 00017892. U.S. Government Memorandum Regarding the Fire and Apparent Explosion at Building III-1-11, dated April 21, 1975, Page 3.

[250] Note that Figure 12-4 describes these as MISCA OU sites. The same sites were investigated in both the O'Brien and Gere RI and the MISCA OU RI (Woodward-Clyde, 1996).

[251] O'Brien and Gere, 1988, Remedial Investigation Report, Page 19-1.

bermed area.[252] One soil and one sediment sample were analyzed. Some results reported by O'Brien and Gere are not included here because they were determined to be not useable.[253]

Site 13 – Area 8 [sic] Change House

Site 13 was the location of one of the Area 8 Change Houses (Building III-1-23). The site did not include the other change house (Building III-1-21). Six composite soil samples (0-1 ft) were collected from Site 13 along north-south transect lines (Figure 20-1; O'Brien & Gere, 1988). Samples were screened for priority pollutants, metals, cyanide, and explosives. Results reported here are estimated.[254] Alpha-BHC (443 micrograms per kilogram (ug/kg)) was detected above USEPA SSLs.

Site 14 – Solvent Storage

Site 14 is planned to be remediated as part of the MISCA OU and is not addressed in this report.

Woodward Clyde Consultants, 1996

Sites 12, 13 and 14 were included in the MISCA OU RI.[255]

Site 12 – Area 8 Impoundment

Two composite/discrete soil sample pairs and a duplicate pair were collected at Site 12. All samples were collected from about two ft below ground surface (bgs). The discrete samples were analyzed for the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Target Compound List (TCL) of volatile organic compounds (VOCs). The composite samples were analyzed for the CERCLA Target Analyte List (TAL) of inorganics, TCL organics (except VOCs), and explosives. Some results reported by O'Brien and Gere are not included here because they were determined to be not useable. Results reported here are estimated.[256]

Acetone (1,700 ug/kg), and methylene chloride (9 ug/kg) were detected above USEPA SSLs (but below the preliminary levels of concern (PLCs) established for the 1996 RI). Thallium (0.46

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[252] O'Brien and Gere, 1988, Remedial Investigation Report, Page 19-1.

[253] DPRA Document No. 00018887. Letter from Richard Boice to Dick Ruelle of USFWS regarding Crab Orchard Lake RI/FS, dated February 18, 1987. The letter reports that the data for the following constituents are not useable: 2-butanone, vinyl acetate, 4-methyl-2-pentanone, aniline, bis(2-chloro-isopropyl)ether, 4-chloroaniline, 2-nitro-sodiphenylamine, benzidine, di-n-octyl-phthalate, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, cyanide, Ag, As, Be, Cd, Cu, Ni, Pb, Se, Zn, and Hg.

[254] DPRA Document No. 00018887. Letter from Richard Boice to Dick Ruelle of USFWS regarding Crab Orchard Lake RI/FS, dated February 18, 1987.

[255] Woodward-Clyde, 1996. Remedial Investigation Report, Miscellaneous Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois.

[256] DPRA Document No. 00018887. Letter from Richard Boice to Dick Ruelle of USFWS regarding Crab Orchard Lake RI/FS, dated February 18, 1987. The letter reports that the data for the following constituents are not useable: 2-butanone, vinyl acetate, 4-methyl-2-pentanone, aniline, bis(2-chloro-isopropyl)ether, 4-chloroaniline, 2-nitro-sodiphenylamine, benzidine, di-n-octyl-phthalate, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, cyanide, Ag, As, Be, Cd, Cu, Ni, Pb, Se, Zn, and Hg.

mg/kg) exceeded both USEPA SSLs and Refuge background values[257] (but was also within PLCs established for the 1996 RI).[258] The 1996 RI concluded that no further investigations were necessary at this site.[259]

Site 13 – Area 8 Change House

This site was recommended for inclusion in the Explosives and Munitions Manufacturing Operable Unit (EMMA OU), and no samples were collected.[260]

Site 14 – Solvent Storage

Site 14 was investigated and is planned to be remediated as part of the MISCA OU. Primary contaminants of concern are benzene, ethylbenzene, toluene, and xylenes in the soil and groundwater.

USEPA Sampling, 1998

The USEPA collected samples from the original AUS OU Sites AUS-0026, -0027, -0029, and -0032. Locations for samples from AUS-0026, -0029 and –0032 are shown in Figures 12-5, 12-6, and 12-7. All samples are presumed to be soil. Locations of samples from AUS-0027 are not known. The results for all detected constituents are listed in Table 12-3A.

According to USEPA field notes, original Site AUS-0026 (Area 8 Load Line III Evaporation Basin) is a swampy area. The single sample (26-01) from this site was analyzed for semi-volatile organic compounds (SVOCs) and metals. All SVOCs were below previous screening levels and all metals were below Refuge background levels.[261]

USEPA collected two samples from AUS-0027 (Area 8 Load Line III Change House Sewers) which were analyzed for polynuclear aromatic hydrocarbons (PAHs). All results were nondetect.

At AUS-0029 (Area 8 Load Line III Areas Around Buildings) two samples (29-01 and 29-02) were collected and analyzed for PAHs and metals. Indeno[1,2,3-c,d]pyrene (1.8 mg/kg) exceeded USEPA SSLs in sample 29-1. Barium (maximum 200 mg/kg) exceeded USEPA SSLs and Refuge background values in both samples.

The USEPA collected one sample (32-01C) from AUS-0032 (Former Fiberlite Buildings), at a site described in the field logbook as "by rusty pipe of some kind." No PAHs, VOCs or metals were detected above the USEPA SSLs.

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[257] See Table 1-11 of this report for Refuge background soil values used for the PA.
[258] Woodward-Clyde, 1996. Remedial Investigation Report, Miscellaneous Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, page 5-10 and 5-11.
[259] Woodward-Clyde, 1996. Remedial Investigation Report, Miscellaneous Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, page ES-ii.
[260] Woodward-Clyde, 1996. Remedial Investigation Report, Miscellaneous Areas Operable Unit, Crab Orchard National Wildlife Refuge, Marion, Illinois, page 1-12.
[261] See Table 1-11 of this report for Refuge background soil values used for the PA.

12.1.4 Observations During Site Visit

There are currently no buildings in Area 8 South. Many of them were demolished (Figure 12-3) and the building debris was buried on site. Most of the area was covered with vegetation. There were numerous soil mounds throughout the area, as a result of the burial of building debris.

Debris was scattered throughout Area 8 South. Miscellaneous construction debris, crushed drums, fiberglass boat pieces, etc. were observed during the site reconnaissance in March 1999.

There was an area of stained soil with little to no vegetation observed during the site reconnaissance, to the north of Building III-1-13. There was also a caved-in sump pit observed during the site reconnaissance, to the west of this building (between Buildings III-1-13 and III-1-14).

Several mounds were present near the assumed location of the former evaporation basin. The exact location of the basin was not discernible.

12.1.5 Recommendations Based on Preliminary Assessment

All the original AUS OU sites (AUS-0023 through AUS-0033) and the rest of Area 8 South were included in the current Site Investigation (SI), except for AUS-0025 – Area 8 Load Line III Cleaning and Painting Building which is part of Site 14 of the MISCA OU.

The remainder of Area 8 outside of Diagraph's facility was included in the SI because it is an area of past industrial use that has not been fully addressed by past investigations.

12.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0A8S from April 7 through May 19, 2000. The rationale for sample locations, media, and analytes is presented in the Field Sampling Plan (FSP)[262] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 12.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 12-5, 12-6, and 12-7. Survey coordinates for all sample locations in Area 8S are listed in Table 12-4. Table 12-7 lists the sample locations and the matrix sampled at that location. All samples are soil except where otherwise noted.

12.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. The field investigation is summarized in this section, following the same order of description of site features as Section 12.1.2.6 of this report.

[262] 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.

Building III-1-7 – IOP Melting and Pouring Building

Sample locations 0A8S-011, 0A8S-012, 0A8S-013, 0A8S-014, 0A8S-015 and monitoring well 0A8S-W01 (soil and groundwater) were all located near Building III-1-7—the IOP Melting and Pouring Building. Note that sample location 0A8S-014 was actually taken within the footprint of the building instead of along side the building as originally planned. This building was used for loading bombs with both amatol and TNT during the IOP era, and spillage was common in this building.

Sample 0A8S-015 was located in a drainage ditch to the east of this building that received runoff from the eastern portion of this building. Sample 0A8S-011 was located in a drainage ditch to the west of this building that received runoff from the western portion of this building. Sample 0A8S-012 was located in a drainage ditch to the south of this building that received runoff from the southern portion of this building.

Sample 0A8S-013 was located near the southwest corner of this building—this was located near the former machine and equipment cleaning rooms that were a part of the IOP operations. Sample 0A8S-014 was located along the northernmost side of the building in an area where the soils may have been impacted by the activities in this building.

Monitoring well 0A8S-W01 was located in the area of the former evaporation basin and settling tanks (sump). The settling tanks received wash water from IOP explosives loading operations; therefore, it is expected that the settling tanks received explosives-contaminated and possibly solvent-contaminated wash water. The evaporation basin probably received overflow from the settling tanks.

All samples were collected in accordance with the tables in the Field Sampling Plan except that Sample No. AUS-0A8S-014-SS-05 was not taken because auger refusal was encountered at 18 to 24 inches, on bricks.

Building III-1-8 – IOP Screening Building

Post-WWII industrial tenants leased this building. Sample 0A8S-011 was located in a southwest-flowing drainage ditch to the east of this building that received runoff from around the eastern portion of this building. Sample 0A8S-007 was located in a northwest-flowing drainage ditch observed on the west side of this building that received runoff from around the western portion of this building. Sample 0A8S-010 was located near the southeast corner of Building III-1-8, to determine if IOP TNT screening activities or CTI explosives-related activities impacted the soils in this area.

Building III-1-10 – IOP TNT Service Building

Post-WWII industrial tenants leased this building. Sample 0A8S-003 was located in a drainage ditch to the southwest of this building, to determine if activities in this building impacted the drainageways in this area.

Building III-1-11 – IOP TNT Cooling Building

The foundation of this building appeared to have been used as an open storage area/disposal site (with possible drums or crates) in 1971. Sample 0A8S-016 was collected from the fill material that was used to cover former Building III-1-11 after it was razed. The origin of the fill material was not determined, and it is possible that soil from the surrounding area was used to cover the former building. Sample 0A8S-017 was collected from a drainage ditch that was located to the southeast of former Building III-1-11, on the southeast side of the roadway. It is likely that this drainage ditch received runoff from the area surrounding the east side of this building.

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

- AUS-0A8S-016-SS-04 Unable to sample. Refusal was encountered at approximately 2 ft.
- AUS-0A8S-017-SW-00 This surface water sample was not taken because no surface water was present at this location at the time of the investigation.

Building III-1-12 – IOP TNT Cooling Building

Post-WWII industrial tenants leased this building. AFL was reported to have used organic solvents for cleaning in this building. Sample 0A8S-008 was collected from the fill material that was used to cover former Building III-1-12 after it was razed. The origin of the fill material was not determined, and it is possible that soil from the surrounding area was used to cover the former building. Sample 0A8S-009 was collected from an area of exposed construction debris located east of former Building III-1-12. It is possible that the soil in this area was not covered with fill material and therefore the exposed soil may have been impacted by production activities in this building.

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

- AUS-0A8S-008-SS-05 The sample was not taken because refusal was encountered somewhere between 1.5 and 3ft.
- AUS-0A8S-009-SS-0X Dioxins were not analyzed for as planned in the FSP.

Building III-1-13 – IOP TNT Melting Building

Post-WWII industrial tenants engaged in explosive-related activities leased this building. AFL leased this building for manufacturing fiberglass products and reportedly used organic solvents in its cleanup operations. During AFL's tenure at the site, there was evidence of possible liquid releases in the area surrounding Building III-1-13. The flow appeared to have originated at the building, and flowed eastward toward the road. During the period between Petrof and AFL's tenure, a heavily-used tank was observed to the northeast of Building III-1-13 in aerial photographs. There was much scarring visible around this facility at the time. Sample 0A8S-019 was collected from the drainage ditch located to the east of this building that received runoff from the possible liquid flows. Sample 0A8S-028 was located in the drainage ditch across the roadway from (to the southeast of) the drainage ditch where 0A8S-019 was located. Sample 0A8S-018 was located to the southwest of Building III-1-13, in an area that may have been impacted by production activities in this building. There was some debris in this area.

Monitoring well 0A8S-W03 (soil and groundwater) was located just north of a "sump pit" that was located on the west side of this building, to detect possible leakage or spillage of contaminated waters from the sump.

To the north of Building III-1-13, there was a concrete trench and two possible pits observed in the aerial photographs, which were used for undetermined purposes. Test pit 0A8S-031 was excavated in the location of the former trench that was identified during AFL's tenure in this location. Sample 0A8S-027 was a surficial sample that was also collected from the former trench location. Sample 0A8S-025 and 0A8S-026 were each collected from one of the two possible former pits that were identified in the aerial photographs.

There was an area of stained soil with little to no vegetation observed to the north of Building III-1-13. Monitoring well 0A8S-W02 (soil and groundwater) was placed in this location to determine whether the stained soil was a result of contamination.

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

- AUS-0A8S-018-SS-05 Concrete foundation. Unable to sample. Refusal was encountered at approximately 2ft.
- AUS-0A8S-027-SS-0X Explosives were not analyzed for as planned in the FSP.

Building III-1-18 – IOP Assembly, Packing and Shipping Building

This building was also leased by Post-WWII industrial tenants. Sample 0A8S-021 was collected on the west side of former Building III-1-18 in an area that may have been impacted by the explosives-related activities done in this building. Sample 0A8S-022 was located in the drainage ditch to the east of this building, which likely received runoff from the eastern side of the building. Sample 0A8S-020 was collected from a west-flowing drainage ditch to the northwest of Building III-1-18 that also received runoff from the areas surrounding this building. Monitoring well 0A8S-W05 (soil and groundwater) was installed along the north side of Building III-1-18.

All samples were collected in accordance with the tables in the Field Sampling Plan except that Sample AUS-0A8S-022-SW-00 was not taken because no surface water was present at the time of the SI.

Building III-1-21– IOP Change House

Post-WWII industrial tenants occupied this building. A tank was observed to the north of this building in 1971 photographs. Sample 0A8S-032 (sediment) was collected from a drainage ditch north of this building. Sample 0A8S-030 was collected from sewer manholes that just to the north and west of this building. This sewer line probably received the wash waters from the change house.

Building III-1-23 – IOP Change House

Sample 0A8S-033 (sediment) was collected from a drainage ditch northeast of this building. Sample 0A8S-034 was collected from sewer manholes northwest of this building. This sewer line probably received the wash waters from the change house.

A vivid scarred area, possibly the result of a liquid release, was observed in the historic aerial photographs, to the southeast of Building III-1-23. Sample 0A8S-029 was collected from this formerly scarred area.

Building III-1-24 – Boiler House and Associated Storage Tanks

Four USTs were associated with this boiler houses, which were located on the southwest side of the building. It was not determined if these USTs were removed. A railroad spur ran along the northwest side of the USTs and next to this spur was an unloading rack for unloading fuel oil into the USTs. An area of surficial discoloration was observed in the 1951 aerial photograph, in the likely fuel unloading area. Monitoring well 0A8S-W06 was planned to be located to the southwest of Building III-1-24, in the area of the USTs, to determine if contamination still exists in the soil as a result of UST operations. However, 0A8S-W06 was installed slightly to the west of the former location of the USTs.

East of Building III-1-24 was a former fuel oil AST located within a bermed area that was likely used as an additional fuel source for the boiler house. Standing liquid was observed inside this bermed area in one of the historical aerial photographs. In 1988, ESE investigated this bermed area and observed several black oily pools, and bare patches of black sediment and tars inside the bermed area. There was a vivid scarred area located to the northeast of the former aboveground storage tank. This scarred area may have been due to a possible liquid release.

Buried Black Powder Area

As noted above, black powder was buried in the area south of Building III-1-18. Monitoring well 0A8S-W04 (soil and groundwater) was placed next to the burial area to determine if there was any impact to the surrounding subsurface soils and groundwater in this area.

Debris/Disposal Areas

Sample 0A8S-004 was collected from a marshy area just west of former Building III-1-12. Some pieces of fiberglass debris were present in this area.

Sample 0A8S-005 (drum and soil) was collected from an area of three abandoned drums that were located to the north of former Building III-1-12. The contents of one of the drums was also sampled.

Miscellaneous Drainage and Ponded Areas

Sample 0A8S-023 (sediment and surface water) was from the large pond between the outer and inner service roads at the south end of Area 8. Sample 0A8S-024 (sediment and surface water) was from a smaller pond just to the north of the large pond and inside the inner service road.

Sample 0A8S-001 was collected from a west-flowing drainage ditch that appears to originate somewhere near former Building III-1-14

Sample 0A8S-002 (soil and surface water) was collected from a northwest-flowing drainage ditch that flows along the west side of Buildings III-1-7, III-1-8 and III-1-10. Sample 0A8S-006 was collected from this same drainage ditch, only further to the east.

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

- AUS-0A8S-001-SW-00 This surface water sample was not collected because no surface water was present at this location at the time of the SI.
- AUS-0A8S-023-SD-0X Dioxins were not analyzed for as planned in the FSP.
- AUS-0A8S-024-SD-0X Dioxins were not analyzed for as planned in the FSP.

12.2.2 Field Results

12.2.2.1 Site Conditions

12.2.2.1.1 Geologic Conditions

Figure 12-8 is a geologic cross section using the soil boring information obtained from the six monitoring wells installed at this site. The cross section location is shown in Figure 12-9. Boring depths ranged from 19 to 35 ft bgs.

As seen in the geologic cross-section in Figure 12-8, a 0.5 to 3.5 ft thick layer of fill material (topsoil, gravel, etc.) overlays the site. Beneath the fill is a 10 to 13 ft layer of silty clay loess which overlies a highly variable till layer. The till includes layers of sand, silt with and without sand, and silty clay with and without sand and/or gravel.

One test pit was installed in Area 8, 0A8S-031. During installation of the test pit, a 4.5-ft thick layer of fill material (silt with some clay, brick and steel debris) was encountered. Beneath the fill layer was a loess layer (silt with some clay) that continued to the bottom of test pit at 8.0 ft bgs.

Boring logs and monitoring well construction diagrams are included in Appendices A and B, respectively.

12.2.2.1.2 Hydrogeologic Conditions

Groundwater was encountered in all six of the soil borings during drilling at depths ranging from 13.5 to 20.5 ft bgs as shown in Figure 12-8. Groundwater elevations from October 2000 are shown in Figure 12-9. Table 12-6 presents the groundwater elevations measured in the wells in May, July, September, and October 2000. Because there was little gradient information in the east-west direction, contours were not drawn. Based on the information shown, there appears to be a gentle groundwater mound or ridge near the center part of the site. Groundwater flow directions probably reflect surface water flow directions, with groundwater in the northern part

of the site flowing to the north toward Crab Orchard Lake and the groundwater in the southern part of the site flowing southwest toward Wolf Creek. (Wolf Creek is shown in Figure 12-1).

Slug tests were performed on each of the six wells that were installed in Area 8 South during the AUS OU investigation, resulting in hydraulic conductivities that ranged from $6.17x10^{-5}$ to $7.10x10^{-04}$ centimeters per second (cm/sec). Slug tests are listed in Table 12-5. Some of the hydraulic conductivity values from slug tests are greater than the trigger values for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)).

12.2.2.1.3 Hydrologic Conditions

There is a low relief drainage divide near the middle of Area 8, with the northern part of the site draining to an unnamed intermittent stream to the northeast, and the southern part of the site draining to Wolf Creek to the southwest (Figure 12-1). Ditches that date from the IOP era mostly drain the interior part of the site. There are a number of small seasonally ponded areas on site created by earthmoving, most of which is probably related to the demolition of the buildings in the southern part of the area. There is a fairly large impoundment near the south end of the site (Figure 12-9).

12.2.2.2 Chemical Results

The following tables list all the chemicals detected in Area 8 South during this investigation, along with the frequency and range of detections:

- Table 12-8 – soil sample results,
- Table 12-9 – sediment sample results,
- Table 12-10 – drum sample results,
- Table 12-11 – groundwater sample results, and
- Table 12-12 – surface water sample results.

Tabulated results of all analyses are included in the Quality Control Summary Report (QCSR).

Tetrachlorodibenzo-p-Dioxin (TCDD) equivalent results for Area 8S are not shown in the screening tables. They are instead included in Table 12-22, and are discussed in the following human health and ecological risk sections.

Sample results are presented on figures as follows:

- Figure 12-5 – organic results for soil, sediment, and drum samples,
- Figure 12-6 – inorganic results for soil and sediment samples, and
- Figure 12-7 – all results for surface water and groundwater samples at this site.

12.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 12-13 through 12-21 as follows:

- Table 12-13—human health risk screening for soils,
- Table 12-14—human health risk screening for sediment,

- Table 12-15—human health risk screening for drum samples,
- Table 12-16—human health risk screening for groundwater,
- Table 12-17—human health risk screening for surface water,
- Table 12-18—ecological risk screening for soils,
- Table 12-19—ecological risk screening for sediment,
- Table 12-20—ecological risk screening for drum samples, and
- Table 12-21—ecological risk screening for surface water.

Each table lists the maximum detected concentration for each constituent analyzed at Area 8 South. The screening results are presented 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 12-5 through 12-7, 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.

Tables 12-23 and 12-23A (human health risk), and 12-24 and 12-24A (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 (Tables 12-23 and 12-23A) and COPECs (Tables 12-24 and 12-24A) are shaded in the tables.

12.3.1 Human Health Risk

12.3.1.1 Soil/Sediment/Drum

Human health screening results for soil, sediment, and drum samples are presented in Tables 12-13, 12-14, and 12-15, respectively. Soil screening values were conservatively used to screen drum and 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 x 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.

Dioxin/furan congener concentrations were converted to 2,3,7,8-TCDD equivalents, for comparison against a 2,3,7,8-TCDD screening value. A toxic equivalency (TEQ) was calculated for each dioxin/furan congener by multiplying a congener-specific toxic equivalency factor (TEF) value by the congener's observed concentration. The TEQs for all congeners in a sample were summed. The summed TEQ values were then compared to the 2,3,7,8-TCDD screening value of 1 ppb. Refer to Table 12-22.

There were nine soil samples and one drum content sample analyzed for dioxin/furan congeners with detections noted in all 10 samples. However, none of the TEQ values calculated for the congeners exceeded the 2,3,7,8-TCDD screening level. Therefore, none of the dioxin/furan congeners detected within Area 8S are assumed to pose potential risk to human health.

12.3.1.2 Groundwater

Human health screening results for groundwater are presented in Table 12-16. The maximum groundwater concentrations from Area 8S were screened against maximum contaminant levels (MCLs) and Illinois Class I groundwater standards.

12.3.1.3 Surface Water

Human health risk screening results for chemicals in surface water at Area 8S are presented in Table 12-17. The maximum concentrations from Area 8S were screened against the Illinois Environmental Protection Agency (IEPA) General Use Surface Water Quality Criteria – Human Health.

12.3.2 Ecological Risk

12.3.2.1 Soil/Drum

Ecological screening results for soil and drum samples are presented in Tables 12-18 and 12-20, respectively. Soil screening values were conservatively used to screen the drum samples.

Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[263]
- Environment Canada (1995)[264]

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

[264] 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.

- Talmage *et al.* (1999)[265]
- Efroymson *et al.* (1997a, 1997b)[266]
- CCME (1999)[267]
- MHSPE (1994)[268]
- 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)[269] 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.

Direct exposure screening concentrations in soils were available for 2,3,7,8-TCDD, but not for other dioxin/furan congeners. Therefore, the potential for direct exposure effects were only screened in conjunction with 2,3,7,8-TCDD (Table 12-18). Based on the screening results in Table 12-18, 2,3,7,8-TCDD is not a concern relative to direct exposures, but is a potential bioaccumulative concern. Other congeners, if detected, were retained as potentially bioaccumulative COPECs. Results of the dioxin/furan analyses are presented in Table 12-22. Congeners detected are summarized below:

Summary of Dioxins/Furans Detected in Soils (AUS-0A8S)	
2,3,7,8-TCDD	1,2,3,4,6,7,8-HpCDF
1,2,3,7,8-PeCDD	OCDF
1,2,3,4,7,8-HxCDD	
1,2,3,6,7,8-HxCDD	

[265] 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.

[266] 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.

[267] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.

[268] 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.

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

Summary of Dioxins/Furans Detected in Soils (AUS-0A8S)
1,2,3,7,8,9-HxCDD
1,2,3,4,6,7,8-HpCDD
OCDD

Each of these congeners is retained as a COPEC (note that the individual congeners are not included in the COPEC summary of Table 12-24).

12.3.2.2 Sediment

Ecological screening results for sediment samples are presented in Table 12-19. Sources of TRVs for evaluating direct exposures to aquatic organisms in sediments included:

- Consensus-based freshwater sediment criteria (MacDonald et al. 1999)[270]
- USEPA (1996 – summarized by Ingersoll *et al.* 1996)[271]
- Ontario Ministry of the Environment and Energy (1995)[272]
- NOAA (1999)[273]
- Ecotox (USEPA 1996)[274]
- Long *et al.* (1995)[275]
- 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

[270] 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.

[271] Ingersoll, C.G., P.S. Haverland, E.L. Brunson, T.C. Canfirld, 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 *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22(3):602-623.

[272] 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.

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

[274] 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.

[275] 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.

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 for soils as presented in Section 12.3.2.1.

12.3.2.3 Surface Water

Ecological screening results for surface water samples are presented in Table 12-21. 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)[276]
- EcoTox (USEPA 1996)[277]
- USEPA Region IV Freshwater Screening Values (1999b)[278]
- 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)[279]
- 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.

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

[277] 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.

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

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

The screening approach for ingestion pathway exposures was the same as for soils as presented in Section 12.3.2.1.

12.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-0A8S, 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 be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 12-23; and on the COPEC list, Table 12-24. COPCs in this category include mercury in surface water; beryllium, mercury and silver in sediment; and antimony, chromium, and nickel in soil. COPECs coded with "D" on Table 12-24 include cobalt and mercury in surface water; mercury and silver in sediment; and boron, chromium, and cobalt in soil. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) 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 and drum sample Tables 12-23A and 12-24A should be evaluated 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 12-25.

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. The discussion of past usage included in this section should be carefully reviewed during work plan development, since this information was updated after the field investigation, and all potential release areas at this site may not have been investigated in the SI.

TABLE 12-1
AREA 8 SOUTH OPERATORS/LESSEES AND BUILDING USES

Building Number	Date	Operator/Lessee	Industrial Activity
III-1-6	1942-1945	SWDC/War Department	Booster Service Magazine
	1960-1962	Olin	Unknown
	Sometime between 1978 and1980	Diagraph	Unknown
III-1-7	1942-1945	SWDC/War Department	Melting and Pouring Building
	1960-1962	Olin	Storage of ammonium nitrate
	1975	Diagraph	Storage of materials
III-1-8	1942-1945	SWDC/War Department	Screening Building
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-9	1942-1945	SWDC/War Department	Ammonium Nitrate Service Magazine
	Sometime after 1949 up to possibly 1953	Hoosier Cardinal Corporation	Manufacturer and finisher of decorative equipment; manufacturer of Ford emblems
	1960-1962	Olin	Unknown
III-1-10	1942-1945	SWDC/War Department	TNT Service Magazine
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-10A	1945	SWDC/War Department	Service magazine
	1960-1962	Olin	Storage of ammonium nitrate
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-11	1942-1945	SWDC/War Department	TNT Cooling Building
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-12	1942-1945	SWDC/War Department	TNT Cooling Building
	1959-1962	Olin	Storage of ammonium nitrate
	1969-1970	CTI	Pyrotechnic and explosive products
	1974-1981	American Fiber Lite	Fiberglass products manufacturer
III-1-12A	1945	SWDC/War Department	Cooling Building
	1959-1962	Olin	Storage of ammonium nitrate fertilizer
	1969-1970	CTI	Pyrotechnic and explosive products
	1976-1981	American Fiber Lite	Fiberglass products manufacturer

Sheet 1 of 3

TABLE 12-1
AREA 8 SOUTH OPERATORS/LESSEES AND BUILDING USES

Building Number	Date	Operator/Lessee	Industrial Activity
III-1-13	1942-1945	SWDC/War Department	TNT Melting Building
	1959-1962	Olin	Storage of ammonium nitrate fertilizer
	1965-1968	Petrof Trading Company	Grinding of smokeless powder
	1969-1970	CTI	Pyrotechnic and explosive products
	1971-1972	Surrey Homes Inc.	Manufacturing plant
	1973-1981	American Fiber Lite	Fiberglass products manufacturer
III-1-14	1942-1945	SWDC/War Department	TNT Screening Building
	1959-1962	Olin	Storage of ammonium nitrate fertilizer
	1969-1970	CTI	Pyrotechnic and explosive products
	1976-1981	American Fiber Lite	Fiberglass products manufacturer
III-1-15	1942-1945	SWDC/War Department	TNT Service Magazine
	1959-1962	Olin	Storage of ammonium nitrate fertilizer
	1969-1970	CTI	Pyrotechnic and explosive products
	1976-1981	American Fiber Lite	Fiberglass products manufacturer
III-1-16	1942-1945	SWDC/War Department	Booster Service Magazine
	1959-1962	Olin	Storage of ammonium nitrate fertilizer
	1965-1968	Petrof Trading Company	Grinding smokeless powder
	1969-1970	CTI	Pyrotechnic and explosive products
	1973-1981	American Fiber Lite	Fiberglass products manufacturer
III-1-17	1942-1945	SWDC/War Department	Component Service Magazine
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
	1976-1981	American Fiber Lite	Fiberglass products manufacturer
III-1-18	1942-1945	SWDC/War Department	Assembly, Packing, and Shipping
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-19	1942-1945	SWDC/War Department	Paint Storage Magazine
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-20	1942-1945	SWDC/War Department	Guard House
	1960-1962	Olin	Unknown

TABLE 12-1
AREA 8 SOUTH OPERATORS/LESSEES AND BUILDING USES

Building Number	Date	Operator/Lessee	Industrial Activity
III-1-21	1942-1945	SWDC/War Department	Change House
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
	1972-1973	International Sign and Manufacturing Company	Unknown
	1976-1977	USDOJ-Bureau of Prisons	Emergency detention center for prisoners
III-1-22	1942-1945	SWDC/War Department	Timekeepers Building
	1960-1962	Olin	Unknown
III-1-23	1942-1945	SWDC/War Department	Change House
	Sometime between 1978 and 1980	Diagraph	Unknown
III-1-24	1942-1945	SWDC/War Department	Boiler House
III-1-28	1942-1945	SWDC/War Department	Condensate Pump House
	1960-1962	Olin	Unknown
III-1-29	1942-1945	SWDC/War Department	Condensate Pump House
	1960-1962	Olin	Unknown
	1969-1970	CTI	Pyrotechnic and explosive products
III-1-30	1942-1945	SWDC/War Department	Condensate Pump House
	1960-1962	Olin	Unknown

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TABLE 12-2

-- NOT USED --

TABLE 12-3
COMMON INGREDIENTS FOR FIBERGLASS PRODUCTION

Compound	Chemical Family
Maleic anhydride	Unsaturated acid
Fumaric acid	Unsaturated acid
Phthalic anhydride	Saturated acids
Isophthalic acid	Saturated acids
Adipic acid	Saturated acids
Propylene glycol	Polyfunctional alcohol
Ethylene glycol	Polyfunctional alcohol
Diethylene glycol	Polyfunctional alcohol
Dipropylene glycol	Polyfunctional alcohol
Neopentyl glycol	Polyfunctional alcohol
Pentaerythritol	Polyfunctional alcohol
Dimethyl aniline	Monomer
Styrene	Monomers
Methyl methacrylate	Monomers
Vinyl toluene	Monomers
Vinyl acetate	Monomers
Diallyl phthalate	Monomers
Acrylamide	Monomers
2-Ethlyl hexylacrylate	Monomers
Methyl ethyl ketone peroxide	Organic peroxide (catalyst)
Benzoyl peroxide	Organic peroxide (catalyst)

Sheet 1 of 1

References: USEPA AP-42 Section 4.4.

TABLE 12-3A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
26-01	Bis(2-Ethylhexyl)phthalate	0.29J
	Butylbenzylphthalate	0.15J
	Di-n-butylphthalate	0.11J
	Aluminum	12,000
	Barium	120
	Beryllium	0.6
	Calcium	1,500
	Chromium	15
	Cobalt	13
	Copper	9.8
	Iron	15,000
	Magnesium	2,200
	Manganese	770
	Mercury	0.05
	Nickel	14
	Potassium	690
	Sodium	390
	Vanadium	29
	Zinc	37
29-01	2,4-Dinitrotoluene	0.23J
	Bis(2-Ethylhexyl)phthalate	0.18J
	Di-n-butylphthalate	0.82
	Indeno[1,2,3-c,d]pyrene	1.8J
	Aluminum	14,000
	Barium	200
	Beryllium	0.7
	Calcium	13,000
	Chromium	20
	Cobalt	18
	Copper	15
	Iron	21,000
	Lead	24
	Magnesium	5,700
	Manganese	640
	Mercury	0.05
	Nickel	18
	Potassium	1,200
	Vanadium	34
	Zinc	68
29-02	Aluminum	12,000
	Barium	170
	Beryllium	0.7
	Calcium	1,900
	Chromium	17
	Cobalt	8
	Copper	12
	Iron	18,000
	Lead	17

TABLE 12-3A
1998 USEPA SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Sample ID	Constituent	Result (mg/kg)
29-02	Magnesium	2,500
	Manganese	500
	Nickel	17
	Potassium	930
	Vanadium	30
	Zinc	46
32-01C	Bis(2-Ethylhexyl)phthalate	1.2
	Aluminum	13,000
	Barium	68
	Beryllium	0.5
	Calcium	3,500
	Chromium	16
	Cobalt	7.8
	Copper	14
	Iron	25,000
	Magnesium	3,300
	Manganese	530
	Nickel	16
	Potassium	910
	Vanadium	28
	Zinc	57

Sheet 2 of 2

mg/kg = milligrams per kilogram
J = Estimated

TABLE 12-4
SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0A8S

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0A8S-001	365560.3	788027.6	428.06	NA	
0A8S-002	366519.6	788068.5	423.92	NA	
0A8S-003	366355.6	788291.7	429.01	NA	
0A8S-004	366017.3	788362.1	433.55	NA	
0A8S-005	366233.3	788582.1	430.41	NA	
0A8S-006	366259.7	788561.7	428.29	NA	
0A8S-007	366539.5	788547.2	434.81	NA	
0A8S-008	366048.1	788588.8	439.15	NA	
0A8S-009	366145.6	788830.4	432.75	NA	
0A8S-010	366383	788815.4	435.7	NA	Point location uncertain
0A8S-011	366373.8	788896.2	433.7	NA	Point location uncertain
0A8S-012	366220.3	788950.4	431.86	NA	
0A8S-013	366269.5	788901.4	434.9	NA	Point location uncertain
0A8S-014	366345.1	788948.4	437.3	NA	Point location uncertain
0A8S-015	366281.6	789020.0	432.93	NA	
0A8S-016	365836.1	788956.0	439.90	NA	
0A8S-017	365793.7	789041.5	436.32	NA	
0A8S-018	365505.6	788489.2	439.48	NA	
0A8S-019	365508.4	788602.6	437.40	NA	
0A8S-020	365241.0	788227.6	432.00	NA	
0A8S-021	365081.8	788282.7	438.55	NA	
0A8S-022	365033.9	788365.4	433.80	NA	
0A8S-023	364644.1	788226.7	430.68	NA	
0A8S-024	364592.0	788493.9	430.33	NA	
0A8S-025	365758.4	788735.0	434.74	NA	
0A8S-026	365698.1	788758.5	436.17	NA	
0A8S-027	365721.3	788715.5	434.79	NA	
0A8S-028	365443.8	788622.5	436.19	NA	
0A8S-029	366328.1	789678.4	437.31	NA	
0A8S-030	365279.8	789370.9	450.56	NA	
0A8S-031	365733.8	788697.1	437.74	NA	
0A8S-032	365195.0	789372.0	450.66	NA	
0A8S-033	366806.2	789600.2	434.84	NA	
0A8S-034	366882.9	789410.6	436.38	NA	
0A8S-W01	366265.3	789021.1	433.18	435.97	New monitoring well
0A8S-W02	365690.8	788656.3	435.72	438.34	New monitoring well
0A8S-W03	365596.5	788497.9	438.40	441.04	New monitoring well
0A8S-W04	364779.7	788135.2	432.69	435.31	New monitoring well
0A8S-W05	365142.7	788351.7	438.64	441.34	New monitoring well
0A8S-W06	367511.9	789780.8	435.95	438.45	New monitoring well

Sheet 1 of 1

NA = Not Applicable

TABLE 12-5
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
0A8S-W01	1.58E-04
0A8S-W02	6.17E-05
0A8S-W03	2.47E-04
0A8S-W04	6.55E-04
0A8S-W05	7.10E-04
0A8S-W06	1.59E-04

Sheet 1 of 1

cm/sec centimeters per second

TABLE 12-6
WATER LEVEL ELEVATIONS FOR AREA 8

Monitoring Well	Ground Surface Elevation (ft MSL)	TOC Elevation (ft MSL)	May-00		July-00		September-00		October-00	
			DTW (ft BTOC)	Water Elev. (ft MSL)	DTW (ft BTOC)	Water Elev. (ft MSL)	DTW (ft BTOC)	Water Elev. (ft MSL)	DTW (ft BTOC)	Water Elev. (ft MSL)
A8S-W01	433.18	435.97	3.02	432.95	4.46	431.51	8.95	427.02	9.24	426.73
A8S-W02	435.72	438.34	5.52	432.82	7.11	431.23	14.19	424.15	14.92	423.42
A8S-W03	438.40	441.04	9.61	431.43	11.31	429.73	18.11	422.93	18.94	422.10
A8S-W04	432.69	435.31	6.60	428.71	8.93	426.38	14.22	421.09	14.52	420.79
A8S-W05	438.64	441.34	12.20	429.14	14.03	427.31	19.78	421.56	20.32	421.02
A8S-W06	435.95	438.45	9.82	428.63	10.46	427.99	12.81	425.64	12.26	426.19

Sheet 1 of 1

MSL = Mean Sea Level
BTOC = Below Top of Casing
NA = Not Analyzed
DTW = Depth to Water

TABLE 12-7
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0A8S

Drum	Soil		Sediment	Groundwater	Surface Water
AUS-0A8S-005	AUS-0A8S-001*	AUS-0A8S-020	AUS-0A8S-023	AUS-0A8S-W01	AUS-0A8S-002
	AUS-0A8S-002*	AUS-0A8S-021	AUS-0A8S-024	AUS-0A8S-W02	AUS-0A8S-023
	AUS-0A8S-003*	AUS-0A8S-022*	AUS-0A8S-032	AUS-0A8S-W03	AUS-0A8S-024
	AUS-0A8S-004*	AUS-0A8S-025	AUS-0A8S-033	AUS-0A8S-W04	
	AUS-0A8S-005	AUS-0A8S-026		AUS-0A8S-W05	
	AUS-0A8S-006*	AUS-0A8S-027		AUS-0A8S-W06	
	AUS-0A8S-007*	AUS-0A8S-028*			
	AUS-0A8S-008	AUS-0A8S-029			
	AUS-0A8S-009	AUS-0A8S-030			
	AUS-0A8S-010	AUS-0A8S-031			
	AUS-0A8S-011*	AUS-0A8S-034			
	AUS-0A8S-012*	AUS-0A8S-W01			
	AUS-0A8S-013	AUS-0A8S-W02			
	AUS-0A8S-014	AUS-0A8S-W03			
	AUS-0A8S-015*	AUS-0A8S-W04			
	AUS-0A8S-016	AUS-0A8S-W05			
	AUS-0A8S-017*	AUS-0A8S-W06			
	AUS-0A8S-018				
	AUS-0A8S-019				

Sheet 1 of 1

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

TABLE 12-8
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Anthracene	1/31	160 ug/kg
Benzo(a)anthracene	2/31	63 ug/kg to 240 ug/kg
Benzo(a)pyrene	3/31	57 ug/kg to 300 ug/kg
Benzo(b)fluoranthene	3/31	87 ug/kg to 280 ug/kg
Benzo(g,h,i)perylene	2/31	49 ug/kg to 210 ug/kg
Benzo(k)fluoranthene	3/31	61 ug/kg to 200 ug/kg
Bis(2-ethylhexyl) phthalate	10/28	43 ug/kg to 120 ug/kg
Butyl benzyl phthalate	1/28	290 ug/kg
Carbazole	1/28	170 ug/kg
Chrysene	3/31	100 ug/kg to 270 ug/kg
Bibenz(a,h)anthracene	1/31	240 ug/kg
Di-n-butyl phthalate	6/28	45 ug/kg to 2,200 ug/kg
Di-n-octyl phthalate	1/28	200 ug/kg
Fluoranthene	2/31	100 ug/kg to 370 ug/kg
Indeno(1,2,3-c,d)pyrene	1/31	190 ug/kg
N-nitrosodiphenylamine	2/28	65 ug/kg to 280 ug/kg
Phenanthrene	2/31	46 ug/kg to 170 ug/kg
Pyrene	3/31	61 ug/kg to 360 ug/kg
Explosives		
2,4-Dinitrotoluene	2/43	610 ug/kg to 1,400 ug/kg
2,6-Dinitrotoluene	1/43	100 ug/kg
Dioxins		
2,3,7,8-TCDD	1/9	0.000176 ug/kg
Metals		
Aluminum	25/25	4,690 mg/kg to 10,600 mg/kg
Antimony	4/25	0.27 mg/kg to 0.34 mg/kg
Arsenic	25/25	2.8 mg/kg to 16.3 mg/kg
Barium	25/25	36.6 mg/kg to 392 mg/kg
Boron	3/25	1.6 mg/kg to 4.3 mg/kg
Cadmium	11/25	0.05 mg/kg to 1.2 mg/kg
Calcium	25/25	571 mg/kg to 45,300 mg/kg
Chromium, Total	25/25	6.4 mg/kg to 14.8 mg/kg
Cobalt	11/25	2.7 mg/kg to 20.4 mg/kg
Copper	24/25	3.5 mg/kg to 33.2 mg/kg
Iron	25/25	7,630 mg/kg to 35,700 mg/kg
Lead	25/25	7 mg/kg to 29.4 mg/kg
Magnesium	25/25	1,170 mg/kg to 11,500 mg/kg
Manganese	25/25	54.2 mg/kg to 6,940 mg/kg
Mercury	2/25	0.07 mg/kg to 0.12 mg/kg
Nickel	25/25	3.6 mg/kg to 14.7 mg/kg
Potassium	25/25	227 mg/kg to 771 mg/kg
Selenium	17/25	0.27 mg/kg to 3.8 mg/kg

TABLE 12-8
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Silver	4/25	0.22 mg/kg to 1.9 mg/kg
Sodium	1/25	633 mg/kg
Thallium	3/25	0.19 mg/kg to 1.9 mg/kg
Vanadium	25/25	12 mg/kg to 33.8 mg/kg
Zinc	25/25	16.9 mg/kg to 176 mg/kg
Other Inorganics		
Nitrogen, Ammonia (as N)	4/4	7.4 mg/kg to 63.8 mg/kg
Nitrogen, Nitrate-Nitrite	3/3	0.53 mg/kg to 35 mg/kg
Total Organic Carbon	2/2	14,700 mg/kg to 23,800 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: ARE 5/30/01

TABLE 12-9
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	2/3	110 ug/kg to 3,700 ug/kg
Anthracene	1/3	140 ug/kg
Benzo(a)anthracene	2/3	170 ug/kg to 210 ug/kg
Benzo(a)pyrene	2/3	120 ug/kg to 260 ug/kg
Benzo(b)fluoranthene	2/3	130 ug/kg to 340 ug/kg
Benzo(g,h,i)perylene	1/3	300 ug/kg
Benzo(k)fluoranthene	1/3	280 ug/kg
Bis(2-ethylhexyl) phthalate	1/3	180 ug/kg
Carbazole	1/3	170 ug/kg
Chrysene	2/3	190 ug/kg to 290 ug/kg
Dibenzofuran	2/3	97 ug/kg to 1,200 ug/kg
Di-n-butyl phthalate	1/3	87 ug/kg
Fluoranthene	2/3	150 ug/kg to 170 ug/kg
Indeno(1,2,3-c,d)pyrene	1/3	180 ug/kg
Naphthalene	2/3	130 ug/kg to 1,700 ug/kg
Phenanthrene	2/3	140 ug/kg to 1,400 ug/kg
Pyrene	2/3	340 ug/kg to 370 ug/kg
Explosives		
2,6-Dinitrotoluene	1/4	540 ug/kg
Metals		
Aluminum	3/3	4,630 mg/kg to 27,900 mg/kg
Antimony	3/3	0.39 mg/kg to 3.8 mg/kg
Arsenic	3/3	7 mg/kg to 63.2 mg/kg
Barium	3/3	54.9 mg/kg to 433 mg/kg
Beryllium	1/3	1.2 mg/kg
Boron	3/3	3.3 mg/kg to 60.5 mg/kg
Cadmium	1/3	5.5 mg/kg
Calcium	3/3	1,860 mg/kg to 26,000 mg/kg
Chromium, Total	3/3	14.2 mg/kg to 59.7 mg/kg
Cobalt	3/3	4.9 mg/kg to 17.2 mg/kg
Copper	3/3	12.9 mg/kg to 3,330 mg/kg
Iron	3/3	20,600 mg/kg to 103,000 mg/kg
Lead	3/3	14.3 mg/kg to 665 mg/kg
Magnesium	3/3	456 mg/kg to 11,400 mg/kg
Manganese	3/3	94 mg/kg to 1,180 mg/kg
Mercury	2/3	0.035 mg/kg to 0.15 mg/kg
Nickel	3/3	14.9 mg/kg to 58.9 mg/kg
Potassium	3/3	483 mg/kg to 597 mg/kg
Selenium	2/3	2.9 mg/kg to 3 mg/kg
Silver	1/3	1.9 mg/kg
Sodium	1/3	152 mg/kg

Sheet 1 of 2

TABLE 12-9
SEDIMENT SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Thallium	1/3	0.72 mg/kg
Vanadium	3/3	18.3 mg/kg to 70.1 mg/kg
Zinc	3/3	46.7 mg/kg to 1,800 mg/kg

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: ARE 5/30/01

TABLE 12-10
DRUM SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Bis(2-ethylhexyl) phthalate	1/1	870 ug/kg
Di-n-butyl phthalate	1/1	430 ug/kg
Di-n-octyl phthalate	1/1	160 ug/kg
Phenol	1/1	490 ug/kg

Sheet 1 of 1

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: ARE 5/30/01

TABLE 12-11
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
Chloromethane	1/6	0.6 ug/L
Explosives		
2-Amino-4,6-dinitrotoluene	1/5	1.1 ug/L
4-Amino-2,6-dinitrotoluene	1/5	0.91 ug/L
Metals		
Aluminum	4/5	180 ug/L to 769 ug/L
Barium	2/5	21.5 ug/L to 73.4 ug/L
Boron	2/5	36.8 ug/L to 96.4 ug/L
Calcium	5/5	76,600 ug/L to 344,000 ug/L
Copper	1/5	1.4 ug/L
Iron	4/5	202 ug/L to 879 ug/L
Magnesium	5/5	38,100 ug/L to 165,000 ug/L
Manganese	4/5	9.5 ug/L to 259 ug/L
Nickel	1/5	2.1 ug/L
Potassium	2/5	1,230 ug/L to 1,320 ug/L
Selenium	3/5	5.1 ug/L to 12.7 ug/L
Sodium	5/5	25,800 ug/L to 190,000 ug/L
Vanadium	1/5	3.3 ug/L
Other Inorganics		
Alkalinity, Total (as CACO3)	1/1	646 mg/L
Suspended Solids (Residue, Non-Filterable)	1/1	13 mg/L
Total Dissolved Solids (Residue, Filterable)	1/1	6,450 mg/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: ARE 5/29/01

TABLE 12-12
SURFACE WATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
Bis(2-ethylhexyl) phthalate	1/3	3.1 ug/L
Metals		
Aluminum	2/3	437 ug/L to 1,300 ug/L
Barium	3/3	31.5 ug/L to 54.7 ug/L
Calcium	3/3	11,900 ug/L to 114,000 ug/L
Chromium, Total	1/3	2.2 ug/L
Cobalt	1/3	3.9 ug/L
Copper	2/3	4.4 ug/L to 21.4 ug/L
Iron	3/3	312 ug/L to 5,290 ug/L
Magnesium	3/3	5,380 ug/L to 68,300 ug/L
Manganese	3/3	80.8 ug/L to 461 ug/L
Mercury	1/3	0.1 ug/L
Potassium	1/3	1,710 ug/L
Selenium	1/3	4.4 ug/L
Sodium	2/3	4,510 ug/L to 98,500 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: ARE 5/29/01

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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	8	U	UG/KG			2.40E-06	8.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG		8.91E-09	2.05E-06	4.00E+01
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG		4.21E-09	5.26E-05	8.89E+00
75-34-3	1,1-Dichloroethane	8	U	UG/KG			3.88E-06	8.00E-03
75-35-4	1,1-Dichloroethene	8	U	UG/KG		6.74E-08	1.19E-04	2.67E+00
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG		1.05E-08	2.27E-04	8.00E+00
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG			5.43E-05	4.00E-01
78-87-5	1,2-Dichloropropane	8	U	UG/KG		1.04E-08	3.76E-04	8.00E+00
78-93-3	2-Butanone (MEK)	16	U	UG/KG			5.77E-07	
591-78-6	2-Hexanone	16	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			5.54E-06	
67-64-1	Acetone	16	U	UG/KG			2.57E-06	2.00E-02
71-43-2	Benzene	8	U	UG/KG		5.46E-09	3.30E-04	4.00E+00
75-27-4	Bromodichloromethane	8	U	UG/KG		3.39E-09	7.66E-06	2.67E-01
75-25-2	Bromoform	8	U	UG/KG		2.56E-11	4.54E-07	2.00E-01
74-83-9	Bromomethane	8	U	UG/KG			6.09E-04	8.00E-01
75-15-0	Carbon disulfide	8	U	UG/KG			6.62E-06	4.00E-03
56-23-5	Carbon tetrachloride	8	U	UG/KG		1.51E-08	1.14E-03	2.67E+00
108-90-7	Chlorobenzene	8	U	UG/KG			1.47E-05	1.14E-01
75-00-3	Chloroethane	8	U	UG/KG		1.23E-09	4.24E-07	
67-66-3	Chloroform	8	U	UG/KG		1.54E-08	6.21E-03	2.67E-01
74-87-3	Chloromethane	8	U	UG/KG		3.01E-09		
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG			5.43E-05	4.00E-01

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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	8	U	UG/KG		4.50E-08	1.82E-04	
124-48-1	Dibromochloromethane	8	U	UG/KG		3.01E-09	5.02E-06	4.00E-01
100-41-4	Ethylbenzene	8	U	UG/KG			1.34E-06	1.14E-02
75-09-2	Methylene chloride	12	U	UG/KG		5.85E-10	1.23E-06	1.20E+01
110-54-3	N-Hexane	8	U	UG/KG			1.98E-05	
100-42-5	Styrene	8	U	UG/KG			3.91E-07	4.00E-02
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG		4.29E-10	4.70E-06	2.67E+00
108-88-3	Toluene	8	U	UG/KG			4.03E-06	1.33E-02
1330-20-7	total Xylenes	8	U	UG/KG			1.80E-06	8.00E-04
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG			3.74E-05	2.67E-01
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG		1.31E-09	1.01E-04	2.67E+00
75-01-4	Vinyl chloride	8	U	UG/KG		1.64E-07		1.14E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	480	U	UG/KG			6.30E-05	1.60E+00
95-50-1	1,2-Dichlorobenzene	480	U	UG/KG			1.45E-04	5.33E-01
541-73-1	1,3-Dichlorobenzene	480	U	UG/KG			9.27E-03	
106-46-7	1,4-Dichlorobenzene	480	U	UG/KG		5.91E-08	2.50E-04	4.80E+00
95-95-4	2,4,5-Trichlorophenol	2400	U	UG/KG			2.72E-05	2.40E-01
88-06-2	2,4,6-Trichlorophenol	480	U	UG/KG		2.14E-09		6.00E+01
120-83-2	2,4-Dichlorophenol	480	U	UG/KG			1.82E-04	9.60E+00
105-67-9	2,4-Dimethylphenol	480	U	UG/KG			2.72E-05	1.20E+00
51-28-5	2,4-Dinitrophenol	2400	U	UG/KG			1.36E-03	2.40E+02
91-58-7	2-Chloronaphthalene	480	U	UG/KG			1.76E-05	

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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	480	U	UG/KG			1.99E-03	2.40E+00
90-12-0	1-Methylnaphthalene	41	U	UG/KG			2.17E-04	1.03E-02
91-57-6	2-Methylnaphthalene	480	U	UG/KG			8.85E-06	2.40E-03
95-48-7	2-Methylphenol	480	U	UG/KG			1.09E-05	6.00E-01
88-74-4	2-Nitroaniline	2400	U	UG/KG			4.77E-02	
88-75-5	2-Nitrophenol	480	U	UG/KG			6.81E-05	
91-94-1	3,3'-Dichlorobenzidine	480	U	UG/KG		8.76E-08		1.60E+03
99-09-2	3-Nitroaniline	2400	U	UG/KG			4.77E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2400	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	480	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	480	U	UG/KG			1.09E-05	
106-47-8	4-Chloroaniline	970	U	UG/KG			2.75E-04	3.23E+01
7005-72-3	4-Chlorophenyl phenyl ether	480	U	UG/KG				
106-44-5	4-Methylphenol	480	U	UG/KG			1.09E-04	
100-01-6	4-Nitroaniline	2400	U	UG/KG			4.77E-02	
100-02-7	4-Nitrophenol	2400	U	UG/KG			3.41E-04	
83-32-9	Acenaphthene	480	U	UG/KG			1.25E-05	1.60E-02
208-96-8	Acenaphthylene	480	U	UG/KG			8.85E-06	2.40E-03
120-12-7	Anthracene	160	J	UG/KG			4.11E-07	2.67E-04
56-55-3	Benzo(a)anthracene	940	J	UG/KG		3.26E-07		1.18E+01
50-32-8	Benzo(a)pyrene	1100	J	UG/KG		3.81E-06		2.75E+00
205-99-2	Benzo(b)fluoranthene	1400	J	UG/KG		4.85E-07		7.00E+00
191-24-2	Benzo(g,h,i)perylene	490	J	UG/KG			9.04E-06	2.45E-03
207-08-9	Benzo(k)fluoranthene	1100	J	UG/KG		3.81E-08		5.50E-01

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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)
111-91-1	bis(2-Chloroethoxy)methane	480	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	480	U	UG/KG		7.74E-07		2.40E+04
108-60-1	bis(2-Chloroisopropyl) ether	480	U	UG/KG		5.94E-08	1.13E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	570		UG/KG		3.24E-09	3.24E-05	
85-68-7	Butyl benzyl phthalate	290	J	UG/KG			1.65E-06	3.63E-04
86-74-8	Carbazole	170	J	UG/KG		1.38E-09		5.67E+00
218-01-9	Chrysene	1100	J	UG/KG		3.81E-09		1.38E-01
84-74-2	Di-n-butyl phthalate	2200		UG/KG			2.50E-05	7.33E-03
117-84-0	Di-n-octyl phthalate	200	J	UG/KG			1.14E-05	2.00E-05
53-70-3	Dibenz(a,h)anthracene	240	J	UG/KG		8.31E-07		3.00E+00
132-64-9	Dibenzofuran	480	U	UG/KG			9.48E-05	
84-66-2	Diethyl phthalate	480	U	UG/KG			6.81E-07	
131-11-3	Dimethyl phthalate	480	U	UG/KG			5.45E-08	
206-44-0	Fluoranthene	1600	J	UG/KG			5.32E-05	8.00E-03
86-73-7	Fluorene	480	U	UG/KG			1.45E-05	1.60E-02
118-74-1	Hexachlorobenzene	480	U	UG/KG		3.11E-07	6.81E-04	4.80E+00
87-68-3	Hexachlorobutadiene	480	U	UG/KG		1.52E-08	2.72E-03	4.80E+00
77-47-4	Hexachlorocyclopentadiene	480	U	UG/KG			8.14E-05	2.40E-02
67-72-1	Hexachloroethane	480	U	UG/KG		2.72E-09	5.45E-04	2.40E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	500	J	UG/KG		1.73E-07		7.14E-01
78-59-1	Isophorone	480	U	UG/KG		1.85E-10	2.72E-06	1.60E+01
621-64-7	N-Nitroso-di-n-propylamine	480	U	UG/KG		1.36E-06		2.40E+05
86-30-6	N-Nitrosodiphenylamine	280	J	UG/KG		5.56E-10		4.67E+00
91-20-3	Naphthalene	480	U	UG/KG			2.55E-03	1.20E-01

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J = Estimated U = Nondetect

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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)
87-86-5	Pentachlorophenol	2400	U	UG/KG		2.16E-07	1.68E-04	2.40E+03
85-01-8	Phenanthrene	810	J	UG/KG			1.49E-05	4.05E-03
108-95-2	Phenol	480	U	UG/KG			9.08E-07	9.60E-02
129-00-0	Pyrene	1700	J	UG/KG			3.14E-05	8.50E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	490	UJ	UG/KG			1.85E-05	
99-65-0	1,3-Dinitrobenzene	490	UJ	UG/KG			5.56E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	980	UJ	UG/KG		1.19E-08	2.22E-03	
121-14-2	2,4-Dinitrotoluene	1400		UG/KG			7.95E-04	3.50E+04
606-20-2	2,6-Dinitrotoluene	100	J	UG/KG			1.14E-04	3.33E+03
	Dinitrotoluene Mixture	1500		UG/KG		4.17E-07		3.75E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	980	UJ	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	980	UJ	UG/KG				
99-08-1	3-Nitrotoluene	980	UJ	UG/KG			4.82E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	980	UJ	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	980	UJ	UG/KG			4.82E-04	
2691-41-0	HMX	980	UJ	UG/KG			2.22E-05	
98-95-3	Nitrobenzene	490	UJ	UG/KG			4.28E-03	
55-63-0	Nitroglycerin	1200	U	UG/KG		6.81E-09		
78-11-5	Pentaerythritol tetranitrate (PETN)	2500	U	UG/KG				
121-82-4	RDX	980	UJ	UG/KG		4.37E-08	3.71E-04	
479-45-8	Tetryl	1500	UJ	UG/KG			1.70E-04	
Metals								
7429-90-5	Aluminum	10600	J	MG/KG	3.68E-01		6.32E-03	

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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)
7440-36-0	Antimony	0.34	J	MG/KG	4.10E-01		4.16E-04	1.13E+00
7440-38-2	Arsenic	17.3		MG/KG	1.28E+00	6.34E-06	3.94E-02	1.73E+01
7440-39-3	Barium	392	J	MG/KG	2.01E+00		3.15E-03	4.90E+00
7440-41-7	Beryllium	0.71	U	MG/KG	9.34E-01	3.17E-10	1.92E-04	2.37E-01
7440-42-8	Boron	5.1	J	MG/KG	9.62E-01		6.45E-05	
7440-43-9	Cadmium	1.2		MG/KG	6.32E+00	4.02E-10	1.48E-03	3.00E+00
7440-70-2	Calcium	45300		MG/KG	1.81E+01			
7440-47-3	Chromium	14.8		MG/KG	5.87E-01	3.30E-08		7.40E+00
7440-48-4	Cobalt	20.4	J	MG/KG	9.40E-01		1.66E-04	
7440-50-8	Copper	33.2		MG/KG	2.94E+00		4.37E-04	
7439-89-6	Iron	35700		MG/KG	1.85E+00		5.83E-02	
7439-92-1	Lead	29.4		MG/KG	1.26E+00			
7439-95-4	Magnesium	11500		MG/KG	7.41E+00			
7439-96-5	Manganese	6940		MG/KG	1.91E+00		2.15E-01	
7439-97-6	Mercury	0.12	J	MG/KG	2.00E+00			
7440-02-0	Nickel	15.6		MG/KG	8.25E-01		3.82E-04	2.23E+00
2023695	Potassium	771		MG/KG	1.23E+00			
7782-49-2	Selenium	3.8	J	MG/KG	1.62E+00		3.72E-04	1.27E+01
7440-22-4	Silver	1.9		MG/KG	3.28E+00		1.86E-04	9.50E-01
7440-23-5	Sodium	633		MG/KG	3.72E+00			
7440-28-0	Thallium	1.9		MG/KG	4.63E+00		1.33E-05	
7440-62-2	Vanadium	36.8		MG/KG	7.80E-01		2.57E-03	1.23E-01
7440-66-6	Zinc	176		MG/KG	3.42E+00		2.87E-04	2.93E-01

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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)
Dioxins								
1746-01-6	2,3,7,8-TCDD	0.000176	J	UG/KG				
Other Parameters								
7664-41-7	Nitrogen, Ammonia (as N)	63.8		MG/KG				
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	35		MG/KG				
TOC	TOC	23800		MG/KG	7.58E-01			

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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	8	U	UG/KG			4.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG	9.76E-07	9.76E-07	4.00E-01
75-34-3	1,1-Dichloroethane	8	U	UG/KG	4.00E-08	4.00E-08	3.48E-04
75-35-4	1,1-Dichloroethene	8	U	UG/KG	4.44E-07	4.44E-06	1.33E-01
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG	1.27E-04	5.71E-06	4.00E-01
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02
78-87-5	1,2-Dichloropropane	8	U	UG/KG	9.52E-05	4.44E-06	2.67E-01
78-93-3	2-Butanone (MEK)	16	U	UG/KG			
591-78-6	2-Hexanone	16	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	16	U	UG/KG			
67-64-1	Acetone	16	U	UG/KG	8.00E-08	8.00E-08	1.00E-03
71-43-2	Benzene	8	U	UG/KG	4.00E-05	1.86E-06	2.67E-01
75-27-4	Bromodichloromethane	8	U	UG/KG	8.70E-05	4.00E-06	1.33E-02
75-25-2	Bromoform	8	U	UG/KG	1.11E-05	5.00E-07	1.00E-02
74-83-9	Bromomethane	8	U	UG/KG	2.76E-06	8.00E-06	4.00E-02
75-15-0	Carbon disulfide	8	U	UG/KG	4.00E-08	4.00E-07	2.50E-04
56-23-5	Carbon tetrachloride	8	U	UG/KG	1.82E-04	1.95E-05	1.14E-01
108-90-7	Chlorobenzene	8	U	UG/KG	1.95E-07	1.95E-06	8.00E-03
75-00-3	Chloroethane	8	U	UG/KG			
67-66-3	Chloroform	8	U	UG/KG	8.51E-06	4.00E-06	1.33E-02
74-87-3	Chloromethane	8	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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	8	U	UG/KG			
124-48-1	Dibromochloromethane	8	U	UG/KG	1.95E-07	1.95E-07	2.00E-02
100-41-4	Ethylbenzene	8	U	UG/KG	4.00E-08	4.00E-07	6.15E-04
75-09-2	Methylene chloride	12	U	UG/KG	1.58E-05	1.00E-06	6.00E-01
110-54-3	N-Hexane	8	U	UG/KG			
100-42-5	Styrene	8	U	UG/KG	1.95E-08	1.95E-07	2.00E-03
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG	7.27E-05	3.33E-06	1.33E-01
108-88-3	Toluene	8	U	UG/KG	1.95E-08	1.95E-08	6.67E-04
1330-20-7	total Xylenes	8	U	UG/KG	8.00E-09	1.95E-08	5.33E-05
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG	1.95E-07	1.95E-07	1.14E-02
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG	1.54E-05	6.67E-06	1.33E-01
75-01-4	Vinyl chloride	8	U	UG/KG	2.67E-03	1.23E-04	8.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	480	U	UG/KG	2.40E-05	2.40E-04	9.60E-02
95-50-1	1,2-Dichlorobenzene	480	U	UG/KG	2.67E-06	2.67E-05	2.82E-02
541-73-1	1,3-Dichlorobenzene	480	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	480	U	UG/KG			2.40E-01
95-95-4	2,4,5-Trichlorophenol	2400	U	UG/KG	1.20E-05	1.20E-05	8.89E-03
88-06-2	2,4,6-Trichlorophenol	480	U	UG/KG	9.23E-04	4.36E-05	2.40E+00
120-83-2	2,4-Dichlorophenol	480	U	UG/KG	7.87E-05	7.87E-04	4.80E-01
105-67-9	2,4-Dimethylphenol	480	U	UG/KG	1.17E-05	1.17E-05	5.33E-02
51-28-5	2,4-Dinitrophenol	2400	U	UG/KG	5.85E-04	5.85E-03	1.20E+01
91-58-7	2-Chloronaphthalene	480	U	UG/KG			

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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	480	U	UG/KG	4.80E-05	4.80E-05	1.20E-01
90-12-0	1-Methylnaphthalene	41	U	UG/KG	5.00E-07	5.00E-06	4.88E-04
91-57-6	2-Methylnaphthalene	480	U	UG/KG	7.87E-06	7.87E-06	1.14E-04
95-48-7	2-Methylphenol	480	U	UG/KG	4.80E-06	4.80E-06	3.20E-02
88-74-4	2-Nitroaniline	2400	U	UG/KG			
88-75-5	2-Nitrophenol	480	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	480	U	UG/KG	3.69E-02	1.71E-03	6.86E+01
99-09-2	3-Nitroaniline	2400	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2400	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	480	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	480	U	UG/KG			
106-47-8	4-Chloroaniline	970	U	UG/KG	1.18E-04	1.18E-03	1.39E+00
7005-72-3	4-Chlorophenyl phenyl ether	480	U	UG/KG			
106-44-5	4-Methylphenol	480	U	UG/KG			
100-01-6	4-Nitroaniline	2400	U	UG/KG			
100-02-7	4-Nitrophenol	2400	U	UG/KG			
83-32-9	Acenaphthene	480	U	UG/KG	4.00E-06	4.00E-06	8.42E-04
208-96-8	Acenaphthylene	480	U	UG/KG	7.87E-06	7.87E-06	1.14E-04
120-12-7	Anthracene	160	J	UG/KG	2.62E-07	2.62E-07	1.33E-05
56-55-3	Benzo(a)anthracene	940	J	UG/KG	1.18E-01	5.53E-03	4.70E-01
50-32-8	Benzo(a)pyrene	1100	J	UG/KG	1.38E+00	6.47E-02	1.38E-01
205-99-2	Benzo(b)fluoranthene	1400	J	UG/KG	1.75E-01	8.24E-03	2.80E-01
191-24-2	Benzo(g,h,i)perylene	490	J	UG/KG	8.03E-06	8.03E-06	1.17E-04
207-08-9	Benzo(k)fluoranthene	1100	J	UG/KG	1.41E-02	6.47E-04	2.24E-02

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
111-91-1	bis(2-Chloroethoxy)methane	480	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	480	U	UG/KG	9.60E-02	6.40E-03	1.20E+03
108-60-1	bis(2-Chloroisopropyl) ether	480	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	570		UG/KG	1.39E-03	1.39E-04	1.58E-04
85-68-7	Butyl benzyl phthalate	290	J	UG/KG	7.07E-07	7.07E-07	3.12E-04
86-74-8	Carbazole	170	J	UG/KG	5.86E-04	2.74E-05	2.83E-01
218-01-9	Chrysene	1100	J	UG/KG	1.41E-03	6.47E-05	6.88E-03
84-74-2	Di-n-butyl phthalate	2200		UG/KG	1.10E-05	1.10E-05	9.57E-04
117-84-0	Di-n-octyl phthalate	200	J	UG/KG	4.88E-06	4.88E-05	2.00E-05
53-70-3	Dibenz(a,h)anthracene	240	J	UG/KG	3.00E-01	1.41E-02	1.20E-01
132-64-9	Dibenzofuran	480	U	UG/KG			
84-66-2	Diethyl phthalate	480	U	UG/KG	4.80E-07	4.80E-07	1.02E-03
131-11-3	Dimethyl phthalate	480	U	UG/KG			
206-44-0	Fluoranthene	1600	J	UG/KG	1.95E-05	1.95E-05	3.72E-04
86-73-7	Fluorene	480	U	UG/KG	5.85E-06	5.85E-06	8.57E-04
118-74-1	Hexachlorobenzene	480	U	UG/KG	1.20E-01	6.15E-03	2.40E-01
87-68-3	Hexachlorobutadiene	480	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	480	U	UG/KG	3.43E-05	3.43E-05	1.20E-03
67-72-1	Hexachloroethane	480	U	UG/KG	2.40E-04	2.40E-04	9.60E-01
193-39-5	Indeno(1,2,3-c,d)pyrene	500	J	UG/KG	6.25E-02	2.94E-03	3.57E-02
78-59-1	Isophorone	480	U	UG/KG	1.17E-06	1.17E-06	6.00E-02
621-64-7	N-Nitroso-di-n-propylamine	480	U	UG/KG	6.00E-01	2.67E-02	9.60E+03
86-30-6	N-Nitrosodiphenylamine	280	J	UG/KG	2.33E-04	1.12E-05	2.80E-01
91-20-3	Naphthalene	480	U	UG/KG	5.85E-06	5.85E-05	5.71E-03

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
87-86-5	Pentachlorophenol	2400	U	UG/KG	1.00E-01	4.62E-03	8.00E+01
85-01-8	Phenanthrene	810	J	UG/KG	1.33E-05	1.33E-05	1.93E-04
108-95-2	Phenol	480	U	UG/KG	4.80E-07	4.00E-06	4.80E-03
129-00-0	Pyrene	1700	J	UG/KG	2.79E-05	2.79E-05	4.05E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	490	UJ	UG/KG			
99-65-0	1,3-Dinitrobenzene	490	UJ	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	980	UJ	UG/KG			
121-14-2	2,4-Dinitrotoluene	1400		UG/KG	1.67E-01	7.78E-03	1.75E+03
606-20-2	2,6-Dinitrotoluene	100	J	UG/KG	1.19E-02	5.56E-04	1.43E+02
	Dinitrotoluene Mixture	1500		UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	980	UJ	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	980	UJ	UG/KG			
99-08-1	3-Nitrotoluene	980	UJ	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	980	UJ	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	980	UJ	UG/KG			
2691-41-0	HMX	980	UJ	UG/KG			
98-95-3	Nitrobenzene	490	UJ	UG/KG	4.90E-04	4.90E-04	4.90E+00
55-63-0	Nitroglycerin	1200	U	UG/KG			
78-11-5	Pentaerythritol tetranitrate (PETN)	2500	U	UG/KG			
121-82-4	RDX	980	UJ	UG/KG			
479-45-8	Tetryl	1500	UJ	UG/KG			
Metals							
7429-90-5	Aluminum	10600	J	MG/KG			

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
7440-36-0	Antimony	0.34	J	MG/KG	4.15E-04	4.15E-03	6.80E-02
7440-38-2	Arsenic	17.3		MG/KG	5.77E+00	2.84E-01	6.18E-01
7440-39-3	Barium	392	J	MG/KG	2.80E-03	2.80E-02	3.27E-01
7440-41-7	Beryllium	0.71	U	MG/KG	7.10E-01	2.45E-02	1.08E-01
7440-42-8	Boron	5.1	J	MG/KG	2.83E-05	2.83E-04	
7440-43-9	Cadmium	1.2		MG/KG	6.00E-04	6.00E-03	3.24E-01
7440-70-2	Calcium	45300		MG/KG			
7440-47-3	Chromium	14.8		MG/KG	1.48E-03	3.61E-03	5.29E-01
7440-48-4	Cobalt	20.4	J	MG/KG	1.70E-04	1.70E-03	
7440-50-8	Copper	33.2		MG/KG	4.05E-04	4.05E-03	3.02E-03
7439-89-6	Iron	35700		MG/KG			
7439-92-1	Lead	29.4		MG/KG	7.35E-02	7.35E-02	
7439-95-4	Magnesium	11500		MG/KG			
7439-96-5	Manganese	6940		MG/KG	7.23E-02	7.23E-01	
7439-97-6	Mercury	0.12	J	MG/KG	1.97E-04	1.97E-03	8.00E-01
7440-02-0	Nickel	15.6		MG/KG	3.80E-04	3.80E-03	2.05E-01
2023695	Potassium	771		MG/KG			
7782-49-2	Selenium	3.8	J	MG/KG	3.80E-04	3.80E-03	1.58E+00
7440-22-4	Silver	1.9		MG/KG	1.90E-04	1.90E-03	1.27E+00
7440-23-5	Sodium	633		MG/KG			
7440-28-0	Thallium	1.9		MG/KG	1.19E-02	1.19E-02	7.92E-01
7440-62-2	Vanadium	36.8		MG/KG	2.63E-03	2.63E-02	3.76E-02
7440-66-6	Zinc	176		MG/KG	2.89E-04	2.89E-03	4.89E-02

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

TABLE 12-13
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
Dioxins							
1746-01-6	2,3,7,8-TCDD	0.000176	J	UG/KG			
Other Parameters							
7664-41-7	Nitrogen, Ammonia (as N)	63.8		MG/KG			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	35		MG/KG	3.50E-05	1.06E-04	3.50E+00
TOC	TOC	23800		MG/KG			

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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	850	U	UG/KG			1.12E-04	2.83E+00
95-50-1	1,2-Dichlorobenzene	850	U	UG/KG			2.56E-04	9.44E-01
541-73-1	1,3-Dichlorobenzene	850	U	UG/KG			1.64E-02	
106-46-7	1,4-Dichlorobenzene	850	U	UG/KG		1.05E-07	4.42E-04	8.50E+00
95-95-4	2,4,5-Trichlorophenol	4300	U	UG/KG			4.88E-05	4.30E-01
88-06-2	2,4,6-Trichlorophenol	850	U	UG/KG		3.79E-09		1.06E+02
120-83-2	2,4-Dichlorophenol	850	U	UG/KG			3.22E-04	1.70E+01
105-67-9	2,4-Dimethylphenol	850	U	UG/KG			4.82E-05	2.13E+00
51-28-5	2,4-Dinitrophenol	4300	U	UG/KG			2.44E-03	4.30E+02
91-58-7	2-Chloronaphthalene	850	U	UG/KG			3.12E-05	
95-57-8	2-Chlorophenol	850	U	UG/KG			3.52E-03	4.25E+00
91-57-6	2-Methylnaphthalene	3700		UG/KG			6.82E-05	1.85E-02
95-48-7	2-Methylphenol	850	U	UG/KG			1.93E-05	1.06E+00
88-74-4	2-Nitroaniline	4300	U	UG/KG			8.54E-02	
88-75-5	2-Nitrophenol	850	U	UG/KG			1.21E-04	
91-94-1	3,3'-Dichlorobenzidine	850	U	UG/KG		1.55E-07		2.83E+03
99-09-2	3-Nitroaniline	4300	U	UG/KG			8.54E-02	
534-52-1	4,6-Dinitro-2-methylphenol	4300	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	850	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	850	U	UG/KG			1.93E-05	
106-47-8	4-Chloroaniline	1700	U	UG/KG			4.82E-04	5.67E+01
7005-72-3	4-Chlorophenyl phenyl ether	850	U	UG/KG				
106-44-5	4-Methylphenol	850	U	UG/KG			1.93E-04	

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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	4300	U	UG/KG			8.54E-02	
100-02-7	4-Nitrophenol	4300	U	UG/KG			6.10E-04	
83-32-9	Acenaphthene	850	U	UG/KG			2.22E-05	2.83E-02
208-96-8	Acenaphthylene	850	U	UG/KG			1.57E-05	4.25E-03
120-12-7	Anthracene	140	J	UG/KG			3.59E-07	2.33E-04
56-55-3	Benzo(a)anthracene	210	J	UG/KG		7.28E-08		2.63E+00
50-32-8	Benzo(a)pyrene	260	J	UG/KG		9.01E-07		6.50E-01
205-99-2	Benzo(b)fluoranthene	340	J	UG/KG		1.18E-07		1.70E+00
191-24-2	Benzo(g,h,i)perylene	300	J	UG/KG			5.53E-06	1.50E-03
207-08-9	Benzo(k)fluoranthene	280	J	UG/KG		9.70E-09		1.40E-01
111-91-1	bis(2-Chloroethoxy)methane	850	U	UG/KG				
111-44-4	bis(2-Chloroethyl) ether	850	U	UG/KG		1.37E-06		4.25E+04
108-60-1	bis(2-Chloroisopropyl) ether	850	U	UG/KG		1.05E-07	2.00E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	180	J	UG/KG		1.02E-09	1.02E-05	
85-68-7	Butyl benzyl phthalate	850	U	UG/KG			4.82E-06	1.06E-03
86-74-8	Carbazole	170	J	UG/KG		1.38E-09		5.67E+00
218-01-9	Chrysene	290	J	UG/KG		1.00E-09		3.63E-02
84-74-2	Di-n-butyl phthalate	290	J	UG/KG			3.29E-06	9.67E-04
117-84-0	Di-n-octyl phthalate	850	U	UG/KG			4.82E-05	8.50E-05
53-70-3	Dibenz(a,h)anthracene	850	U	UG/KG		2.94E-06		1.06E+01
132-64-9	Dibenzofuran	1200		UG/KG			2.37E-04	
84-66-2	Diethyl phthalate	850	U	UG/KG			1.21E-06	
131-11-3	Dimethyl phthalate	850	U	UG/KG			9.65E-08	
206-44-0	Fluoranthene	170	J	UG/KG			5.65E-06	8.50E-04

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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	850	U	UG/KG			2.57E-05	2.83E-02
118-74-1	Hexachlorobenzene	850	U	UG/KG		5.51E-07	1.21E-03	8.50E+00
87-68-3	Hexachlorobutadiene	850	U	UG/KG		2.69E-08	4.82E-03	8.50E+00
77-47-4	Hexachlorocyclopentadiene	850	U	UG/KG			1.44E-04	4.25E-02
67-72-1	Hexachloroethane	850	U	UG/KG		4.82E-09	9.65E-04	4.25E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	180	J	UG/KG		6.24E-08		2.57E-01
78-59-1	Isophorone	850	U	UG/KG		3.27E-10	4.82E-06	2.83E+01
621-64-7	N-Nitroso-di-n-propylamine	850	U	UG/KG		2.41E-06		4.25E+05
86-30-6	N-Nitrosodiphenylamine	850	U	UG/KG		1.69E-09		1.42E+01
91-20-3	Naphthalene	1700		UG/KG			9.02E-03	4.25E-01
87-86-5	Pentachlorophenol	4300	U	UG/KG		3.88E-07	3.02E-04	4.30E+03
85-01-8	Phenanthrene	1400		UG/KG			2.58E-05	7.00E-03
108-95-2	Phenol	850	U	UG/KG			1.61E-06	1.70E-01
129-00-0	Pyrene	370	J	UG/KG			6.82E-06	1.85E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	640	U	UG/KG			2.42E-05	
99-65-0	1,3-Dinitrobenzene	640	U	UG/KG			7.27E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	1300	U	UG/KG		1.58E-08	2.95E-03	
121-14-2	2,4-Dinitrotoluene	96	J	UG/KG			5.45E-05	2.40E+03
606-20-2	2,6-Dinitrotoluene	540	J	UG/KG			6.13E-04	1.80E+04
	Dinitrotoluene Mixture	636	J	UG/KG		1.77E-07		1.59E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	1300	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	1300	U	UG/KG				
99-08-1	3-Nitrotoluene	1300	U	UG/KG			6.40E-04	

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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)
19406-51-0	4-Amino-2,6-Dinitrotoluene	1300	U	UG/KG				
99-99-0	4-Nitrotoluene (PNT)	1300	U	UG/KG			6.40E-04	
2691-41-0	HMX	1300	U	UG/KG			2.95E-05	
98-95-3	Nitrobenzene	640	U	UG/KG			5.59E-03	
121-82-4	RDX	1300	U	UG/KG		5.80E-08	4.92E-04	
479-45-8	Tetryl	1900	U	UG/KG			2.16E-04	
Metals								
7429-90-5	Aluminum	27900		MG/KG	2.48E+00		1.66E-02	
7440-36-0	Antimony	3.8		MG/KG	2.00E+00		4.65E-03	1.27E+01
7440-38-2	Arsenic	63.2		MG/KG	6.14E+00	2.32E-05	1.44E-01	6.32E+01
7440-39-3	Barium	433		MG/KG	2.21E+00		3.48E-03	5.41E+00
7440-41-7	Beryllium	1.2		MG/KG	7.50E-01	5.35E-10	3.25E-04	4.00E-01
7440-42-8	Boron	60.5		MG/KG			7.65E-04	
7440-43-9	Cadmium	5.5		MG/KG	3.44E+00	1.84E-09	6.79E-03	1.38E+01
7440-70-2	Calcium	26000		MG/KG	1.80E+01			
7440-47-3	Chromium	59.7		MG/KG	3.47E+00	1.33E-07		2.99E+01
7440-48-4	Cobalt	17.2		MG/KG	1.89E+00		1.40E-04	
7440-50-8	Copper	3330		MG/KG	1.98E+02		4.39E-02	
7439-89-6	Iron	103000		MG/KG	4.96E+00		1.68E-01	
7439-92-1	Lead	665		MG/KG	2.77E+01			
7439-95-4	Magnesium	11400		MG/KG	5.97E+00			
7439-96-5	Manganese	1180		MG/KG	1.13E+00		3.66E-02	
7439-97-6	Mercury	0.15	J	MG/KG	1.00E+00			
7440-02-0	Nickel	58.9		MG/KG	3.49E+00		1.44E-03	8.41E+00

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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)
2023695	Potassium	597		MG/KG	4.20E-01			
7782-49-2	Selenium	3		MG/KG	4.69E+00		2.94E-04	1.00E+01
7440-22-4	Silver	1.9	J	MG/KG	6.33E-01		1.86E-04	9.50E-01
7440-23-5	Sodium	152		MG/KG	1.05E-01			
7440-28-0	Thallium	0.72	J	MG/KG	2.32E+00		5.03E-06	
7440-62-2	Vanadium	70.1		MG/KG	2.50E+00		4.90E-03	2.34E-01
7440-66-6	Zinc	1800		MG/KG	3.15E+01		2.94E-03	3.00E+00
Other Parameters								
7664-41-7	Nitrogen, Ammonia (as N)	26.2		MG/KG	1.21E-01			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	1.8		MG/KG	1.20E+00			
TOC	TOC	44300		MG/KG	7.06E-01			

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TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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	850	U	UG/KG	4.25E-05	4.25E-04	1.70E-01
95-50-1	1,2-Dichlorobenzene	850	U	UG/KG	4.72E-06	4.72E-05	5.00E-02
541-73-1	1,3-Dichlorobenzene	850	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	850	U	UG/KG			4.25E-01
95-95-4	2,4,5-Trichlorophenol	4300	U	UG/KG	2.15E-05	2.15E-05	1.59E-02
88-06-2	2,4,6-Trichlorophenol	850	U	UG/KG	1.63E-03	7.73E-05	4.25E+00
120-83-2	2,4-Dichlorophenol	850	U	UG/KG	1.39E-04	1.39E-03	8.50E-01
105-67-9	2,4-Dimethylphenol	850	U	UG/KG	2.07E-05	2.07E-05	9.44E-02
51-28-5	2,4-Dinitrophenol	4300	U	UG/KG	1.05E-03	1.05E-02	2.15E+01
91-58-7	2-Chloronaphthalene	850	U	UG/KG			
95-57-8	2-Chlorophenol	850	U	UG/KG	8.50E-05	8.50E-05	2.13E-01
91-57-6	2-Methylnaphthalene	3700		UG/KG	6.07E-05	6.07E-05	8.81E-04
95-48-7	2-Methylphenol	850	U	UG/KG	8.50E-06	8.50E-06	5.67E-02
88-74-4	2-Nitroaniline	4300	U	UG/KG			
88-75-5	2-Nitrophenol	850	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	850	U	UG/KG	6.54E-02	3.04E-03	1.21E+02
99-09-2	3-Nitroaniline	4300	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	4300	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	850	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	850	U	UG/KG			
106-47-8	4-Chloroaniline	1700	U	UG/KG	2.07E-04	2.07E-03	2.43E+00
7005-72-3	4-Chlorophenyl phenyl ether	850	U	UG/KG			
106-44-5	4-Methylphenol	850	U	UG/KG			

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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	4300	U	UG/KG			
100-02-7	4-Nitrophenol	4300	U	UG/KG			
83-32-9	Acenaphthene	850	U	UG/KG	7.08E-06	7.08E-06	1.49E-03
208-96-8	Acenaphthylene	850	U	UG/KG	1.39E-05	1.39E-05	2.02E-04
120-12-7	Anthracene	140	J	UG/KG	2.30E-07	2.30E-07	1.17E-05
56-55-3	Benzo(a)anthracene	210	J	UG/KG	2.63E-02	1.24E-03	1.05E-01
50-32-8	Benzo(a)pyrene	260	J	UG/KG	3.25E-01	1.53E-02	3.25E-02
205-99-2	Benzo(b)fluoranthene	340	J	UG/KG	4.25E-02	2.00E-03	6.80E-02
191-24-2	Benzo(g,h,i)perylene	300	J	UG/KG	4.92E-06	4.92E-06	7.14E-05
207-08-9	Benzo(k)fluoranthene	280	J	UG/KG	3.59E-03	1.65E-04	5.71E-03
111-91-1	bis(2-Chloroethoxy)methane	850	U	UG/KG			
111-44-4	bis(2-Chloroethyl) ether	850	U	UG/KG	1.70E-01	1.13E-02	2.13E+03
108-60-1	bis(2-Chloroisopropyl) ether	850	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	180	J	UG/KG	4.39E-04	4.39E-05	5.00E-05
85-68-7	Butyl benzyl phthalate	850	U	UG/KG	2.07E-06	2.07E-06	9.14E-04
86-74-8	Carbazole	170	J	UG/KG	5.86E-04	2.74E-05	2.83E-01
218-01-9	Chrysene	290	J	UG/KG	3.72E-04	1.71E-05	1.81E-03
84-74-2	Di-n-butyl phthalate	290	J	UG/KG	1.45E-06	1.45E-06	1.26E-04
117-84-0	Di-n-octyl phthalate	850	U	UG/KG	2.07E-05	2.07E-04	8.50E-05
53-70-3	Dibenz(a,h)anthracene	850	U	UG/KG	1.06E+00	5.00E-02	4.25E-01
132-64-9	Dibenzofuran	1200		UG/KG			
84-66-2	Diethyl phthalate	850	U	UG/KG	8.50E-07	8.50E-07	1.81E-03
131-11-3	Dimethyl phthalate	850	U	UG/KG			
206-44-0	Fluoranthene	170	J	UG/KG	2.07E-06	2.07E-06	3.95E-05

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J = Estimated U = Nondetect

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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	850	U	UG/KG	1.04E-05	1.04E-05	1.52E-03
118-74-1	Hexachlorobenzene	850	U	UG/KG	2.13E-01	1.09E-02	4.25E-01
87-68-3	Hexachlorobutadiene	850	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	850	U	UG/KG	6.07E-05	6.07E-05	2.13E-03
67-72-1	Hexachloroethane	850	U	UG/KG	4.25E-04	4.25E-04	1.70E+00
193-39-5	Indeno(1,2,3-c,d)pyrene	180	J	UG/KG	2.25E-02	1.06E-03	1.29E-02
78-59-1	Isophorone	850	U	UG/KG	2.07E-06	2.07E-06	1.06E-01
621-64-7	N-Nitroso-di-n-propylamine	850	U	UG/KG	1.06E+00	4.72E-02	1.70E+04
86-30-6	N-Nitrosodiphenylamine	850	U	UG/KG	7.08E-04	3.40E-05	8.50E-01
91-20-3	Naphthalene	1700		UG/KG	2.07E-05	2.07E-04	2.02E-02
87-86-5	Pentachlorophenol	4300	U	UG/KG	1.79E-01	8.27E-03	1.43E+02
85-01-8	Phenanthrene	1400		UG/KG	2.30E-05	2.30E-05	3.33E-04
108-95-2	Phenol	850	U	UG/KG	8.50E-07	7.08E-06	8.50E-03
129-00-0	Pyrene	370	J	UG/KG	6.07E-06	6.07E-06	8.81E-05
Explosives							
99-35-4	1,3,5-Trinitrobenzene	640	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	640	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	1300	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	96	J	UG/KG	1.14E-02	5.33E-04	1.20E+02
606-20-2	2,6-Dinitrotoluene	540	J	UG/KG	6.43E-02	3.00E-03	7.71E+02
	Dinitrotoluene Mixture	636	J	UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	1300	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	1300	U	UG/KG			
99-08-1	3-Nitrotoluene	1300	U	UG/KG			

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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
19406-51-0	4-Amino-2,6-Dinitrotoluene	1300	U	UG/KG			
99-99-0	4-Nitrotoluene (PNT)	1300	U	UG/KG			
2691-41-0	HMX	1300	U	UG/KG			
98-95-3	Nitrobenzene	640	U	UG/KG	6.40E-04	6.40E-04	6.40E+00
121-82-4	RDX	1300	U	UG/KG			
479-45-8	Tetryl	1900	U	UG/KG			
Metals							
7429-90-5	Aluminum	27900		MG/KG			
7440-36-0	Antimony	3.8		MG/KG	4.63E-03	4.63E-02	7.60E-01
7440-38-2	Arsenic	63.2		MG/KG	2.11E+01	1.04E+00	2.26E+00
7440-39-3	Barium	433		MG/KG	3.09E-03	3.09E-02	3.61E-01
7440-41-7	Beryllium	1.2		MG/KG	1.20E+00	4.14E-02	1.82E-01
7440-42-8	Boron	60.5		MG/KG	3.36E-04	3.36E-03	
7440-43-9	Cadmium	5.5		MG/KG	2.75E-03	2.75E-02	1.49E+00
7440-70-2	Calcium	26000		MG/KG			
7440-47-3	Chromium	59.7		MG/KG	5.97E-03	1.46E-02	2.13E+00
7440-48-4	Cobalt	17.2		MG/KG	1.43E-04	1.43E-03	
7440-50-8	Copper	3330		MG/KG	4.06E-02	4.06E-01	3.03E-01
7439-89-6	Iron	103000		MG/KG			
7439-92-1	Lead	665		MG/KG	1.66E+00	1.66E+00	
7439-95-4	Magnesium	11400		MG/KG			
7439-96-5	Manganese	1180		MG/KG	1.23E-02	1.23E-01	
7439-97-6	Mercury	0.15	J	MG/KG	2.46E-04	2.46E-03	1.00E+00
7440-02-0	Nickel	58.9		MG/KG	1.44E-03	1.44E-02	7.75E-01

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

TABLE 12-14
HUMAN HEALTH SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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
2023695	Potassium	597		MG/KG			
7782-49-2	Selenium	3		MG/KG	3.00E-04	3.00E-03	1.25E+00
7440-22-4	Silver	1.9	J	MG/KG	1.90E-04	1.90E-03	1.27E+00
7440-23-5	Sodium	152		MG/KG			
7440-28-0	Thallium	0.72	J	MG/KG	4.50E-03	4.50E-03	3.00E-01
7440-62-2	Vanadium	70.1		MG/KG	5.01E-03	5.01E-02	7.15E-02
7440-66-6	Zinc	1800		MG/KG	2.95E-03	2.95E-02	5.00E-01
Other Parameters							
7664-41-7	Nitrogen, Ammonia (as N)	26.2		MG/KG			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	1.8		MG/KG	1.80E-06	5.45E-06	1.80E-01
TOC	TOC	44300		MG/KG			

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

TABLE 12-15
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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	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	
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	890	U	UG/KG			2.53E-04	2.97E+01
7005-72-3	4-Chlorophenyl phenyl ether	440	U	UG/KG				
106-44-5	4-Methylphenol	440	U	UG/KG			9.99E-05	

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

TABLE 12-15
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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	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				
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)	870	J	UG/KG		4.94E-09	4.94E-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	430	J	UG/KG			4.88E-06	1.43E-03
117-84-0	Di-n-octyl phthalate	160	J	UG/KG			9.08E-06	1.60E-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

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

TABLE 12-15
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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	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
85-01-8	Phenanthrene	440	U	UG/KG			8.11E-06	2.20E-03
108-95-2	Phenol	490	J	UG/KG			9.27E-07	9.80E-02
129-00-0	Pyrene	440	U	UG/KG			8.11E-06	2.20E-03
Explosives								
98-95-3	Nitrobenzene	440	U	UG/KG			3.84E-03	
121-14-2	2,4-Dinitrotoluene	440	U	UG/KG			2.50E-04	1.10E+04
606-20-2	2,6-Dinitrotoluene	440	U	UG/KG			4.99E-04	1.47E+04
Dioxins								
1746-01-6	2,3,7,8-TCDD	0.000552	U	UG/KG				

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

TABLE 12-15
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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	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			
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	890	U	UG/KG	1.09E-04	1.09E-03	1.27E+00
7005-72-3	4-Chlorophenyl phenyl ether	440	U	UG/KG			
106-44-5	4-Methylphenol	440	U	UG/KG			

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

TABLE 12-15
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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	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			
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)	870	J	UG/KG	2.12E-03	2.12E-04	2.42E-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	430	J	UG/KG	2.15E-06	2.15E-06	1.87E-04
117-84-0	Di-n-octyl phthalate	160	J	UG/KG	3.90E-06	3.90E-05	1.60E-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

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

TABLE 12-15
HUMAN HEALTH SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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	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
85-01-8	Phenanthrene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
108-95-2	Phenol	490	J	UG/KG	4.90E-07	4.08E-06	4.90E-03
129-00-0	Pyrene	440	U	UG/KG	7.21E-06	7.21E-06	1.05E-04
Explosives							
98-95-3	Nitrobenzene	440	U	UG/KG	4.40E-04	4.40E-04	4.40E+00
121-14-2	2,4-Dinitrotoluene	440	U	UG/KG	5.24E-02	2.44E-03	5.50E+02
606-20-2	2,6-Dinitrotoluene	440	U	UG/KG	5.24E-02	2.44E-03	6.29E+02
Dioxins							
1746-01-6	2,3,7,8-TCDD	0.000552	U	UG/KG			

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

TABLE 12-16
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 8S (AUS-0A8S)

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	0.6	J	UG/L	3.97E-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 12-16
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 8S (AUS-0A8S)

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	3	U	UG/L	7.02E-07	1.85E-03	6.00E-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	UJ	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	UJ	UG/L		3.29E-01	
90-12-0	1-Methylnaphthalene	1	U	UG/L		1.61E-01	
91-57-6	2-Methylnaphthalene	10	U	UG/L		5.48E-02	

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

TABLE 12-16
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 8S (AUS-0A8S)

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
95-48-7	2-Methylphenol	10	U	UG/L		5.48E-03	
88-74-4	2-Nitroaniline	50	UJ	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	UJ	UG/L			
101-55-3	4-Bromophenyl phenyl ether	10	UJ	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	UJ	UG/L			
106-44-5	4-Methylphenol	10	UJ	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	UJ	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	UJ	UG/L			
111-44-4	bis(2-Chloroethyl) ether	10	U	UG/L	1.02E-03		
108-60-1	bis(2-Chloroisopropyl) ether	10	UJ	UG/L	3.64E-05	4.11E-02	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	10	UJ	UG/L	2.08E-06	1.37E-02	

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

TABLE 12-16
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 8S (AUS-0A8S)

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
85-68-7	Butyl benzyl phthalate	10	U	UG/L		1.37E-03	
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	UJ	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	UJ	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	UJ	UG/L		4.57E-04	1.00E-01
129-00-0	Pyrene	10	U	UG/L		5.48E-02	

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

TABLE 12-16
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 8S (AUS-0A8S)

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
Explosives							
99-35-4	1,3,5-Trinitrobenzene	0.25	U	UG/L		2.28E-04	
99-65-0	1,3-Dinitrobenzene	0.25	UJ	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	UJ	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	1.4		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	1.2		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	
55-63-0	Nitroglycerin	1	U	UG/L	2.08E-07		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L			
121-82-4	RDX	0.5	UJ	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	769		UG/L		2.11E-02	
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	73.4	J	UG/L		2.87E-02	3.67E-02
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	96.4	J	UG/L		2.93E-02	4.82E-02
7440-43-9	Cadmium	5	U	UG/L		2.74E-01	1.00E+00

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

TABLE 12-16
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 8S (AUS-0A8S)

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
7440-70-2	Calcium	344000		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
7440-50-8	Copper	1.4	J	UG/L		1.03E-03	2.15E-03
7439-89-6	Iron	879		UG/L		8.03E-02	1.76E-01
7439-92-1	Lead	3	U	UG/L			4.00E-01
7439-95-4	Magnesium	165000		UG/L			
7439-96-5	Manganese	259		UG/L		2.96E-01	1.73E+00
7439-97-6	Mercury	0.2	U	UG/L			1.00E-01
7440-02-0	Nickel	2.1	J	UG/L		2.88E-03	2.10E-02
2023695	Potassium	1320	J	UG/L			
7782-49-2	Selenium	12.7		UG/L		6.96E-02	2.54E-01
7440-22-4	Silver	10	U	UG/L		5.48E-02	2.00E-01
7440-23-5	Sodium	190000		UG/L			
7440-28-0	Thallium	10	U	UG/L		3.91E+00	5.00E+00
7440-62-2	Vanadium	3.3	J	UG/L		1.29E-02	
7440-66-6	Zinc	20	U	UG/L		1.83E-03	4.00E-03
Other Parameters							
ALK	Alkalinity, Total (as CaCO3)	668		MG/L			
7664-41-7	Nitrogen, Ammonia (as N)	0.1		MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.05	UJ	MG/L		5.00E-02	5.00E-02
7601-90-3	Perchlorate	500	U	UG/L		2.74E+01	
TDS	TDS	6530		MG/L			5.44E+00
TSS	TSS	13		MG/L			

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 12-17
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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	UJ	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	UJ	UG/L		
75-35-4	1,1-Dichloroethene	1	U	UG/L		
107-06-2	1,2-Dichloroethane (EDC)	1	UJ	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	UJ	UG/L		
67-64-1	Acetone	5	U	UG/L		
71-43-2	Benzene	1	UJ	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	UJ	UG/L		
56-23-5	Carbon tetrachloride	1	U	UG/L		
108-90-7	Chlorobenzene	1	U	UG/L		
75-00-3	Chloroethane	1	UJ	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	UJ	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	UJ	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	UJ	UG/L		
108-88-3	Toluene	1	UJ	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	UJ	UG/L		
Semivolatile Organic Compounds						
120-82-1	1,2,4-Trichlorobenzene	10	U	UG/L		
95-50-1	1,2-Dichlorobenzene	10	U	UG/L		
541-73-1	1,3-Dichlorobenzene	10	U	UG/L		

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

TABLE 12-17
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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
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		
101-14-4	4,4'-Methylene bis(2-chloroaniline)	10	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	UJ	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)	3.1	J	UG/L		
85-68-7	Butyl benzyl phthalate	10	U	UG/L		
86-74-8	Carbazole	10	U	UG/L		
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		

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

TABLE 12-17
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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
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	UJ	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	UJ	UG/L		
88-72-2	2-Nitrotoluene (ONT)	0.5	U	UG/L		
99-08-1	3-Nitrotoluene	0.5	U	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	U	UG/L		
55-63-0	Nitroglycerin	1	U	UG/L		
78-11-5	Pentaerythritol tetranitrate (PETN)	2	U	UG/L		
121-82-4	RDX	0.5	U	UG/L		
479-45-8	Tetryl	0.75	UJ	UG/L		
Metals						
7429-90-5	Aluminum	1300		UG/L	6.50E+00	
7440-36-0	Antimony	6	U	UG/L	1.00E+00	
7440-38-2	Arsenic	10	U	UG/L	1.00E+00	

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

TABLE 12-17
HUMAN HEALTH SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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
7440-39-3	Barium	54.7	J	UG/L	2.41E+00	1.09E-02
7440-41-7	Beryllium	5	U	UG/L	1.00E+00	
7440-42-8	Boron	100	U	UG/L		1.00E-01
7440-43-9	Cadmium	5	U	UG/L	1.00E+00	
7440-70-2	Calcium	114000		UG/L	1.58E+01	
7440-47-3	Chromium	2.2	J	UG/L	2.20E-01	
7440-48-4	Cobalt	3.9	J	UG/L	7.80E-02	
7440-50-8	Copper	21.4		UG/L	2.14E+00	
7439-89-6	Iron	5290		UG/L	5.29E+01	5.29E+00
7439-92-1	Lead	5.6	U	UG/L	2.80E+00	
7439-95-4	Magnesium	68300		UG/L	2.70E+01	
7439-96-5	Manganese	461		UG/L	7.92E-01	4.61E-01
7439-97-6	Mercury	0.1	J	UG/L	5.00E-01	8.33E+00
7440-02-0	Nickel	10	U	UG/L	1.00E+00	1.00E-02
2023695	Potassium	1710		UG/L	1.06E+00	
7782-49-2	Selenium	4.4	J	UG/L	1.63E+00	4.40E-03
7440-22-4	Silver	10	U	UG/L	1.00E+00	2.00E+00
7440-23-5	Sodium	98500		UG/L	3.11E+01	
7440-28-0	Thallium	10	U	UG/L	1.00E+00	
7440-62-2	Vanadium	50	U	UG/L	1.00E+00	
7440-66-6	Zinc	22	U	UG/L	1.10E+00	2.20E-02
Other Parameters						
7601-90-3	Perchlorate	500	U	UG/L		

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

TABLE 12-18
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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		8	U	UG/KG	2.68E-04	
79-34-5	1,1,2,2-Tetrachloroethane		8	U	UG/KG	6.29E-02	
79-00-5	1,1,2-Trichloroethane		8	U	UG/KG	2.80E-04	
75-34-3	1,1-Dichloroethane		8	U	UG/KG	3.98E-04	
75-35-4	1,1-Dichloroethene		8	U	UG/KG	9.66E-04	
107-06-2	1,2-Dichloroethane (EDC)		8	U	UG/KG	3.77E-04	
540-59-0	1,2-Dichloroethene (total)		8	U	UG/KG	1.02E-02	
78-87-5	1,2-Dichloropropane		8	U	UG/KG	1.14E-05	
78-93-3	2-Butanone (MEK)		16	U	UG/KG	1.79E-04	
591-78-6	2-Hexanone		16	U	UG/KG	1.27E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		16	U	UG/KG	3.61E-05	
67-64-1	Acetone		16	U	UG/KG	6.40E-03	
71-43-2	Benzene		8	U	UG/KG	5.00E-04	
75-27-4	Bromodichloromethane		8	U	UG/KG	1.48E-02	
75-25-2	Bromoform		8	U	UG/KG	5.03E-04	
74-83-9	Bromomethane		8	U	UG/KG	3.40E-02	
75-15-0	Carbon disulfide		8	U	UG/KG	8.50E-02	
56-23-5	Carbon tetrachloride		8	U	UG/KG	8.00E-06	
108-90-7	Chlorobenzene		8	U	UG/KG	2.00E-04	
75-00-3	Chloroethane		8	U	UG/KG		
67-66-3	Chloroform		8	U	UG/KG	6.72E-03	
74-87-3	Chloromethane		8	U	UG/KG	7.69E-04	
156-59-2	cis-1,2-Dichloroethene		8	U	UG/KG	1.02E-02	
10061-01-5	cis-1,3-Dichloropropene		8	U	UG/KG	2.01E-02	
124-48-1	Dibromochloromethane		8	U	UG/KG	3.90E-03	
100-41-4	Ethylbenzene		8	U	UG/KG	1.60E-03	
75-09-2	Methylene chloride		12	U	UG/KG	2.96E-03	
110-54-3	N-Hexane		8	U	UG/KG		
100-42-5	Styrene		8	U	UG/KG	2.67E-05	
127-18-4	Tetrachloroethylene (PCE)		8	U	UG/KG	6.15E-04	
108-88-3	Toluene		8	U	UG/KG	2.67E-03	
1330-20-7	total Xylenes		8	U	UG/KG	1.33E-02	
156-60-5	trans-1,2-Dichloroethene		8	U	UG/KG	1.02E-02	
10061-02-6	trans-1,3-Dichloropropene		8	U	UG/KG	2.01E-02	
79-01-6	Trichloroethylene (TCE)		8	U	UG/KG	8.89E-04	
75-01-4	Vinyl chloride		8	U	UG/KG	1.24E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		480	U	UG/KG	2.40E-02	
95-50-1	1,2-Dichlorobenzene		480	U	UG/KG	1.62E-01	
541-73-1	1,3-Dichlorobenzene		480	U	UG/KG	1.27E-02	
106-46-7	1,4-Dichlorobenzene		480	U	UG/KG	2.40E-02	
95-95-4	2,4,5-Trichlorophenol		2400	U	UG/KG	6.00E-01	
88-06-2	2,4,6-Trichlorophenol		480	U	UG/KG	4.80E-02	

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

TABLE 12-18
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
120-83-2	2,4-Dichlorophenol		480	U	UG/KG	5.49E-03	
105-67-9	2,4-Dimethylphenol		480	U	UG/KG	4.80E+01	
51-28-5	2,4-Dinitrophenol		2400	U	UG/KG	1.20E-01	
91-58-7	2-Chloronaphthalene		480	U	UG/KG	3.94E+01	
95-57-8	2-Chlorophenol		480	U	UG/KG	1.98E+00	
90-12-0	1-Methylnaphthalene		41	U	UG/KG		
91-57-6	2-Methylnaphthalene		480	U	UG/KG	1.48E-01	
95-48-7	2-Methylphenol		480	U	UG/KG	1.19E-02	
88-74-4	2-Nitroaniline		2400	U	UG/KG	3.24E-02	
88-75-5	2-Nitrophenol		480	U	UG/KG	3.00E-01	
91-94-1	3,3'-Dichlorobenzidine		480	U	UG/KG	7.43E-01	
99-09-2	3-Nitroaniline		2400	U	UG/KG	7.59E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2400	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		480	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		480	U	UG/KG	6.04E-02	
106-47-8	4-Chloroaniline		970	U	UG/KG	8.82E-01	
7005-72-3	4-Chlorophenyl phenyl ether		480	U	UG/KG		
106-44-5	4-Methylphenol		480	U	UG/KG	2.94E-03	
100-01-6	4-Nitroaniline		2400	U	UG/KG	1.10E-01	
100-02-7	4-Nitrophenol		2400	U	UG/KG	3.43E-01	
83-32-9	Acenaphthene		480	U	UG/KG	7.03E-04	
208-96-8	Acenaphthylene		480	U	UG/KG	7.03E-04	
120-12-7	Anthracene		160	J	UG/KG	1.08E-04	YES
56-55-3	Benzo(a)anthracene		940	J	UG/KG	1.80E-01	YES
50-32-8	Benzo(a)pyrene		1100	J	UG/KG	2.50E-04	YES
205-99-2	Benzo(b)fluoranthene		1400	J	UG/KG	2.34E-02	YES
191-24-2	Benzo(g,h,i)perylene		490	J	UG/KG	4.12E-03	YES
207-08-9	Benzo(k)fluoranthene		1100	J	UG/KG	1.84E-02	YES
111-91-1	bis(2-Chloroethoxy)methane		480	U	UG/KG	1.58E+00	
111-44-4	bis(2-Chloroethyl) ether		480	U	UG/KG	2.03E-02	
108-60-1	bis(2-Chloroisopropyl) ether		480	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		570		UG/KG	6.16E-01	YES
85-68-7	Butyl benzyl phthalate		290	J	UG/KG	1.21E+00	YES
86-74-8	Carbazole		170	J	UG/KG		YES
218-01-9	Chrysene		1100	J	UG/KG	2.33E-01	YES
84-74-2	Di-n-butyl phthalate		2200		UG/KG	1.10E-02	YES
117-84-0	Di-n-octyl phthalate		200	J	UG/KG	2.82E-04	YES
53-70-3	Dibenz(a,h)anthracene		240	J	UG/KG	1.30E-02	YES
132-64-9	Dibenzofuran		480	U	UG/KG		
84-66-2	Diethyl phthalate		480	U	UG/KG	4.80E-03	
131-11-3	Dimethyl phthalate		480	U	UG/KG	2.40E-03	
206-44-0	Fluoranthene		1600	J	UG/KG	1.31E-02	YES
86-73-7	Fluorene		480	U	UG/KG	1.60E-02	
118-74-1	Hexachlorobenzene		480	U	UG/KG	4.80E-04	

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

TABLE 12-18
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
87-68-3	Hexachlorobutadiene		480	U	UG/KG	1.21E+01	
77-47-4	Hexachlorocyclopentadiene		480	U	UG/KG	4.80E-02	
67-72-1	Hexachloroethane		480	U	UG/KG	8.05E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		500	J	UG/KG	4.59E-03	YES
78-59-1	Isophorone		480	U	UG/KG	3.45E-03	
621-64-7	N-Nitroso-di-n-propylamine		480	U	UG/KG	8.83E-01	
86-30-6	N-Nitrosodiphenylamine		280	J	UG/KG	1.40E-02	
91-20-3	Naphthalene		480	U	UG/KG	1.93E-03	
87-86-5	Pentachlorophenol		2400	U	UG/KG	4.00E-01	
85-01-8	Phenanthrene		810	J	UG/KG	1.77E-02	YES
108-95-2	Phenol		480	U	UG/KG	1.20E-02	
129-00-0	Pyrene		1700	J	UG/KG	2.17E-02	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		490	UJ	UG/KG	1.30E+00	
99-65-0	1,3-Dinitrobenzene		490	UJ	UG/KG	7.48E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		980	UJ	UG/KG	3.27E-02	
121-14-2	2,4-Dinitrotoluene		1400		UG/KG	1.09E+00	
606-20-2	2,6-Dinitrotoluene		100	J	UG/KG	3.05E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		980	UJ	UG/KG	1.23E-02	
88-72-2	2-Nitrotoluene (ONT)		980	UJ	UG/KG		
99-08-1	3-Nitrotoluene		980	UJ	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		980	UJ	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		980	UJ	UG/KG		
2691-41-0	HMX		980	UJ	UG/KG	3.92E-02	
98-95-3	Nitrobenzene		490	UJ	UG/KG	1.23E-02	
55-63-0	Nitroglycerin		1200	U	UG/KG		
78-11-5	Pentaerythritol tetranitrate (PETN)		2500	U	UG/KG		
121-82-4	RDX		980	UJ	UG/KG	9.80E-03	
479-45-8	Tetryl		1500	UJ	UG/KG		
Metals							
7429-90-5	Aluminum	28800	10600	J	MG/KG		
7440-36-0	Antimony	0.83	0.34	J	MG/KG	6.80E-02	
7440-38-2	Arsenic	13.5	17.3		MG/KG	1.92E+00	
7440-39-3	Barium	195	392	J	MG/KG	7.84E-01	
7440-41-7	Beryllium	0.76	0.71	U	MG/KG	7.10E-02	
7440-42-8	Boron	5.3	5.1	J	MG/KG	1.02E+01	
7440-43-9	Cadmium	0.19	1.2		MG/KG	4.14E-02	
7440-70-2	Calcium	2497	45300		MG/KG		
7440-47-3	Chromium	25.2	14.8		MG/KG	2.96E+00	
7440-48-4	Cobalt	21.7	20.4	J	MG/KG	1.02E+00	
7440-50-8	Copper	11.3	33.2		MG/KG	1.07E+00	
7439-89-6	Iron	19306	35700		MG/KG	1.79E+02	
7439-92-1	Lead	23.4	29.4		MG/KG	6.79E-02	
7439-95-4	Magnesium	1552	11500		MG/KG		
7439-96-5	Manganese	3640	6940		MG/KG	6.94E+01	

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

TABLE 12-18
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 8S (AUS-0A8S)

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
7439-97-6	Mercury	0.06	0.12	J	MG/KG	1.71E-02	YES
7440-02-0	Nickel	18.9	15.6		MG/KG	5.20E-01	
2023695	Potassium	625	771		MG/KG		
7782-49-2	Selenium	2.34	3.8	J	MG/KG	3.80E+00	YES
7440-22-4	Silver	0.58	1.9		MG/KG	9.50E-01	
7440-23-5	Sodium	170	633		MG/KG		
7440-28-0	Thallium	0.41	1.9		MG/KG	1.90E+00	
7440-62-2	Vanadium	47.2	36.8		MG/KG	8.00E-01	
7440-66-6	Zinc	51.4	176		MG/KG	1.47E+00	
Dioxins							
1746-01-6	2,3,7,8-TCDD		0.000176	J	UG/KG	3.52E-08	YES
Other Parameters							
7664-41-7	Nitrogen, Ammonia (as N)		63.8		MG/KG		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite		35		MG/KG		
TOC	TOC	31393	23800		MG/KG		

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

TABLE 12-19
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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		850	U	UG/KG	9.24E-02	
95-50-1	1,2-Dichlorobenzene		850	U	UG/KG	2.50E+00	
541-73-1	1,3-Dichlorobenzene		850	U	UG/KG	5.00E-01	
106-46-7	1,4-Dichlorobenzene		850	U	UG/KG	2.43E+00	
95-95-4	2,4,5-Trichlorophenol		4300	U	UG/KG	2.97E+00	
88-06-2	2,4,6-Trichlorophenol		850	U	UG/KG	4.62E+01	
120-83-2	2,4-Dichlorophenol		850	U	UG/KG	2.33E+00	
105-67-9	2,4-Dimethylphenol		850	U	UG/KG	1.89E+01	
51-28-5	2,4-Dinitrophenol		4300	U	UG/KG	3.47E+02	
91-58-7	2-Chloronaphthalene		850	U	UG/KG	2.43E-01	
95-57-8	2-Chlorophenol		850	U	UG/KG	3.84E+00	
91-57-6	2-Methylnaphthalene		3700		UG/KG	5.29E+01	YES
95-48-7	2-Methylphenol		850	U	UG/KG	1.86E+02	
88-74-4	2-Nitroaniline		4300	U	UG/KG	8.90E-02	
88-75-5	2-Nitrophenol		850	U	UG/KG	2.67E-01	
91-94-1	3,3'-Dichlorobenzidine		850	U	UG/KG	4.25E-01	
99-09-2	3-Nitroaniline		4300	U	UG/KG	7.23E-02	
534-52-1	4,6-Dinitro-2-methylphenol		4300	U	UG/KG	5.13E+02	
101-55-3	4-Bromophenyl phenyl ether		850	U	UG/KG	6.54E-01	
59-50-7	4-Chloro-3-methylphenol		850	U	UG/KG	5.67E+03	
106-47-8	4-Chloroaniline		1700	U	UG/KG	1.04E-01	
7005-72-3	4-Chlorophenyl phenyl ether		850	U	UG/KG	6.18E-01	
106-44-5	4-Methylphenol		850	U	UG/KG	2.12E-01	
100-01-6	4-Nitroaniline		4300	U	UG/KG	1.19E-01	
100-02-7	4-Nitrophenol		4300	U	UG/KG	1.04E+02	
83-32-9	Acenaphthene		850	U	UG/KG	5.31E+01	
208-96-8	Acenaphthylene		850	U	UG/KG	1.93E+01	
120-12-7	Anthracene		140	J	UG/KG	2.46E+00	YES
56-55-3	Benzo(a)anthracene		210	J	UG/KG	1.94E+00	YES
50-32-8	Benzo(a)pyrene		260	J	UG/KG	1.73E+00	YES
205-99-2	Benzo(b)fluoranthene		340	J	UG/KG	1.26E+01	YES
191-24-2	Benzo(g,h,i)perylene		300	J	UG/KG	1.88E+01	YES
207-08-9	Benzo(k)fluoranthene		280	J	UG/KG	1.04E+01	YES
111-91-1	bis(2-Chloroethoxy)methane		850	U	UG/KG	6.54E-01	
111-44-4	bis(2-Chloroethyl) ether		850	U	UG/KG	2.98E-01	
108-60-1	bis(2-Chloroisopropyl) ether		850	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		180	J	UG/KG	2.40E-01	YES
85-68-7	Butyl benzyl phthalate		850	U	UG/KG	7.73E-02	
86-74-8	Carbazole		170	J	UG/KG	5.15E-02	YES
218-01-9	Chrysene		290	J	UG/KG	1.75E+00	YES
84-74-2	Di-n-butyl phthalate		290	J	UG/KG	2.64E-02	YES
117-84-0	Di-n-octyl phthalate		850	U	UG/KG	1.20E-03	
53-70-3	Dibenz(a,h)anthracene		850	U	UG/KG	2.58E+01	

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

TABLE 12-19
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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
132-64-9	Dibenzofuran		1200		UG/KG	6.00E-01	YES
84-66-2	Diethyl phthalate		850	U	UG/KG	1.35E+00	
131-11-3	Dimethyl phthalate		850	U	UG/KG	1.63E-03	
206-44-0	Fluoranthene		170	J	UG/KG	4.02E-01	YES
86-73-7	Fluorene		850	U	UG/KG	1.10E+01	
118-74-1	Hexachlorobenzene		850	U	UG/KG	8.50E+00	
87-68-3	Hexachlorobutadiene		850	U	UG/KG	1.78E+01	
77-47-4	Hexachlorocyclopentadiene		850	U	UG/KG	2.84E+02	
67-72-1	Hexachloroethane		850	U	UG/KG	1.25E+01	
193-39-5	Indeno(1,2,3-c,d)pyrene		180	J	UG/KG	1.06E+01	YES
78-59-1	Isophorone		850	U	UG/KG	7.41E-01	
621-64-7	N-Nitroso-di-n-propylamine		850	U	UG/KG		
86-30-6	N-Nitrosodiphenylamine		850	U	UG/KG	1.21E+00	
91-20-3	Naphthalene		1700		UG/KG	9.66E+00	
87-86-5	Pentachlorophenol		4300	U	UG/KG	5.81E+01	
85-01-8	Phenanthrene		1400		UG/KG	6.86E+00	YES
108-95-2	Phenol		850	U	UG/KG	1.77E+01	
129-00-0	Pyrene		370	J	UG/KG	1.90E+00	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		640	U	UG/KG	1.56E+01	
99-65-0	1,3-Dinitrobenzene		640	U	UG/KG	1.28E+02	
118-96-7	2,4,6-Trinitrotoluene (TNT)		1300	U	UG/KG	2.24E+00	
121-14-2	2,4-Dinitrotoluene		96	J	UG/KG	1.48E-01	
606-20-2	2,6-Dinitrotoluene		540	J	UG/KG	6.30E+00	
35572-78-2	2-Amino-4,6-Dinitrotoluene		1300	U	UG/KG		
88-72-2	2-Nitrotoluene (ONT)		1300	U	UG/KG	7.74E-02	
99-08-1	3-Nitrotoluene		1300	U	UG/KG	1.09E-01	
19406-51-0	4-Amino-2,6-Dinitrotoluene		1300	U	UG/KG		
99-99-0	4-Nitrotoluene (PNT)		1300	U	UG/KG	6.95E-02	
2691-41-0	HMX		1300	U	UG/KG	1.30E+02	
98-95-3	Nitrobenzene		640	U	UG/KG	1.09E+00	
121-82-4	RDX		1300	U	UG/KG	6.50E+00	
479-45-8	Tetryl		1900	U	UG/KG		
Metals							
7429-90-5	Aluminum	11241	27900		MG/KG	1.07E+00	
7440-36-0	Antimony	1.9	3.8		MG/KG	1.27E+00	
7440-38-2	Arsenic	10.3	63.2		MG/KG	6.46E+00	
7440-39-3	Barium	196	433		MG/KG		
7440-41-7	Beryllium	1.6	1.2		MG/KG		
7440-42-8	Boron		60.5		MG/KG		
7440-43-9	Cadmium	1.6	5.5		MG/KG	5.56E+00	
7440-70-2	Calcium	1448	26000		MG/KG		
7440-47-3	Chromium	17.2	59.7		MG/KG	1.38E+00	
7440-48-4	Cobalt	9.1	17.2		MG/KG	3.44E-01	
7440-50-8	Copper	16.8	3330		MG/KG	1.05E+02	

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

TABLE 12-19
ECOLOGICAL SCREENING OF SEDIMENT RESULTS FROM AREA 8S (AUS-0A8S)

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
7439-89-6	Iron	20750	103000		MG/KG	5.42E-01	
7439-92-1	Lead	24	665		MG/KG	1.86E+01	
7439-95-4	Magnesium	1909	11400		MG/KG		
7439-96-5	Manganese	1043	1180		MG/KG	1.87E+00	
7439-97-6	Mercury	0.15	0.15	J	MG/KG	8.33E-01	YES
7440-02-0	Nickel	16.9	58.9		MG/KG	2.59E+00	
2023695	Potassium	1421	597		MG/KG		
7782-49-2	Selenium	0.64	3		MG/KG		YES
7440-22-4	Silver	3	1.9	J	MG/KG	1.90E+00	
7440-23-5	Sodium	1450	152		MG/KG		
7440-28-0	Thallium	0.31	0.72	J	MG/KG		
7440-62-2	Vanadium	28	70.1		MG/KG		
7440-66-6	Zinc	57.1	1800		MG/KG	1.49E+01	
Other Parameters							
7664-41-7	Nitrogen, Ammonia (as N)	217	26.2		MG/KG		
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	1.5	1.8		MG/KG		
TOC	TOC	62778	44300		MG/KG		

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

TABLE 12-20
ECOLOGICAL SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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		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	
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		890	U	UG/KG	8.09E-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)		870	J	UG/KG	9.40E-01	YES
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		430	J	UG/KG	2.15E-03	YES

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

TABLE 12-20
ECOLOGICAL SCREENING OF DRUM RESULTS FROM AREA 8S (AUS-0A8S)

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		160	J	UG/KG	2.26E-04	YES
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	
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		490	J	UG/KG	1.23E-02	
129-00-0	Pyrene		440	U	UG/KG	5.61E-03	
Explosives							
121-14-2	2,4-Dinitrotoluene		440	U	UG/KG	3.44E-01	
606-20-2	2,6-Dinitrotoluene		440	U	UG/KG	1.34E+01	
98-95-3	Nitrobenzene		440	U	UG/KG	1.10E-02	
Dioxins							
1746-01-6	2,3,7,8-TCDD		0.000552	U	UG/KG	1.10E-07	

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

TABLE 12-21
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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	UJ	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	UJ	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	UJ	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	UJ	UG/L	2.94E-02	
67-64-1	Acetone		5	U	UG/L	9.86E-03	
71-43-2	Benzene		1	UJ	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	UJ	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	UJ	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	UJ	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	UJ	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	UJ	UG/L	1.19E-02	
108-88-3	Toluene		1	UJ	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	UJ	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 12-21
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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	
101-14-4	4,4'-Methylene bis(2-chloroaniline)		10	U	UG/L		
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	UJ	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)		3.1	J	UG/L	1.03E+00	YES
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	

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

TABLE 12-21
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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
206-44-0	Fluoranthene		10	UJ	UG/L	1.23E+00	
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	UJ	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	U	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	U	UG/L	9.26E-04	
55-63-0	Nitroglycerin		1	U	UG/L	5.00E-03	
78-11-5	Pentaerythritol tetranitrate (PETN)		2	U	UG/L	2.35E-05	
121-82-4	RDX		0.5	U	UG/L	2.63E-03	
479-45-8	Tetryl		0.75	UJ	UG/L		
Metals							
7429-90-5	Aluminum	200	1300		UG/L	1.49E+01	
7440-36-0	Antimony	6	6	U	UG/L	2.00E-01	
7440-38-2	Arsenic	10	10	U	UG/L	5.26E-02	
7440-39-3	Barium	22.7	54.7	J	UG/L	1.09E-02	
7440-41-7	Beryllium	5	5	U	UG/L	9.43E+00	
7440-42-8	Boron		100	U	UG/L	1.00E-01	
7440-43-9	Cadmium	5	5	U	UG/L	4.55E+00	
7440-70-2	Calcium	7197	114000		UG/L	9.83E-01	
7440-47-3	Chromium	10	2.2	J	UG/L	1.06E-02	

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

TABLE 12-21
ECOLOGICAL SCREENING OF SURFACE WATER RESULTS FROM AREA 8S (AUS-0A8S)

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
7440-48-4	Cobalt	50	3.9	J	UG/L	1.70E+00	
7440-50-8	Copper	10	21.4		UG/L	1.81E+00	
7439-89-6	Iron	100	5290		UG/L	5.29E+00	
7439-92-1	Lead	2	5.6	U	UG/L	2.79E-01	
7439-95-4	Magnesium	2534	68300		UG/L	8.33E-01	
7439-96-5	Manganese	582	461		UG/L	4.61E-01	
7439-97-6	Mercury	0.2	0.1	J	UG/L	7.69E-02	YES
7440-02-0	Nickel	10	10	U	UG/L	1.00E-02	
2023695	Potassium	1613	1710		UG/L	3.23E-02	
7782-49-2	Selenium	2.7	4.4	J	UG/L	4.40E-03	YES
7440-22-4	Silver	10	10	U	UG/L	2.00E+00	
7440-23-5	Sodium	3169	98500		UG/L	1.45E-01	
7440-28-0	Thallium	10	10	U	UG/L	2.50E+00	
7440-62-2	Vanadium	50	50	U	UG/L	2.63E+00	
7440-66-6	Zinc	20	22	U	UG/L	2.20E-02	
Other Parameters							
7601-90-3	Perchlorate		500	U	UG/L		

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

TABLE 12-22

DIOXIN/FURAN TOXICITY EQUIVALENTS FOR SOIL AND DRUM CONTENT SAMPLES FROM AREA 8 SOUTH (AUS-0A8S)

ADDITIONAL AND UNCHARACTERIZED SITES OU

FIELD ID	TEF	AUS-0A8S-005-DRUM			AUS-0A8S-001-SD-0X			AUS-0A8S-002-SD-0X			AUS-0A8S-005-SD-0X			AUS-0A8S-006-SD-0X		
		Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*
DIOXINS / FURANS (ng/kg)																
2,3,7,8-TCDD	1.000	<	U		<	U		<	U		<	U		<	U	
1,2,3,7,8-PeCDD	1.000	<	U		<	U		<	U		<	U		0.241	XJ	*0.2410*
1,2,3,4,7,8-HxCDD	0.100	<	U		<	U		<	U		<	U		0.454	J	*0.0454*
1,2,3,6,7,8-HxCDD	0.100	<	U		<	U		1.32	J	*0.1320*	0.8	XJ	*0.0800*	0.952	J	*0.0952*
1,2,3,7,8,9-HxCDD	0.100	<	U		<	U		0.821	XJ	*0.0821*	<	U		0.66	J	*0.0660*
1,2,3,4,6,7,8-HpCDD	0.010	17		*0.1700*	8.04		*0.0804*	10.5		*0.1050*	11.2		*0.1120*	18.1		*0.1810*
OCDD	0.0001	970		*0.0970*	801		*0.0801*	928		*0.0928*	849		*0.0849*	873		*0.0873*
2,3,7,8--TCDF	0.100	<	U		<	U		<	U		<	U		0.418	XJ	*0.0418*
1,2,3,7,8-PeCDF	0.050	<	U		<	U		<	U		<	U		<	U	
2,3,4,7,8-PeCDF	0.500	<	U		<	U		<	U		<	U		<	U	
1,2,3,4,7,8-HxCDF	0.100	<	U		<	U		<	U		<	U		<	U	
1,2,3,6,7,8-HxCDF	0.100	<	U		<	U		<	U		<	U		<	U	
2,3,4,6,7,8-HxCDF	0.100	<	U		<	U		<	U		<	U		<	U	
1,2,3,7,8,9-HxCDF	0.100	<	U		<	U		<	U		<	U		<	U	
1,2,3,4,6,7,8-HpCDF	0.010	3.36		*0.0336*	<	U		0.873	J	*0.0087*	0.825	J	*0.0083*	1.33	XJ	*0.0133*
1,2,3,4,7,8,9-HpCDF	0.010	<	U		<	U		<	U		<	U		<	U	
OCDF	0.0001	18		*0.0018*	<	U		<	U		<	U		1.8	J	*0.0002*
Total TCDDs		<	U		<	U		<	U		<	U		<	U	
Total PeCDDs		<	U		<	U		0.784	J		<	U		1.22	J	
Total HxCDDs		2	J		<	U		7.91			4.63	J		5.77	J	
Total HpCDDs		41.6			18.7			24.4			25.4			40.4		
Total TCDFs		<	U		<	U		<	U		<	U		0.449	J	
Total PeCDFs		<	U		<	U		0.732	J		<	U		1.03	J	
Total HxCDFs		<	U		<	U		0.546	J		0.332	J		1.24	J	
Total HpCDFs		6.19			<	U		0.873	J		1.47	J		1.54	J	
TOTAL TEQ				*0.3024*			*0.1605*			*0.4206*			*0.2852*			*0.7712*

Diluted sample results were used, if available.
E = Value exceeds linear range
EDL = Estimated Detection Limit
J = Estimated
ND = Not Detected
Qual = Qualifier
TEF = Toxic Equivalency Factor
TEQ = Toxicity Equivalent
U = Nondetect
UJ = Estimated Nondetect
X = Estimated Maximum Possible
Note: QAPP reporting limits were listed as the EDL for detected compounds

TABLE 12-22

DIOXIN/FURAN TOXICITY EQUIVALENTS
FOR SOIL AND DRUM CONTENT SAMPLES FROM AREA 8 SOUTH (AUS-0A8S)

ADDITIONAL AND UNCHARACTERIZED SITES OU

FIELD ID	TEF	AUS-0A8S-008-SS-02			AUS-0A8S-018-SS-0X			AUS-0A8S-W03-SS-0X			AUS-0A8S-019-SS-0X			AUS-0A8S-W04-SS-0X		
		Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*	Result	Qual	*TEQ*
DIOXINS / FURANS (ng/kg)																
2,3,7,8-TCDD	**1.000**	<	U		<	U		<	U		0.176	J	*0.1760*	<	U	
1,2,3,7,8-PeCDD	**1.000**	<	U		<	U		<	U		<	U		<	U	
1,2,3,4,7,8-HxCDD	**0.100**	<	U		<	U		<	U		<	U		<	U	
1,2,3,6,7,8-HxCDD	**0.100**	<	U		<	U		0.224	XJ	*0.0224*	0.186	XJ	*0.0186*	<	U	
1,2,3,7,8,9-HxCDD	**0.100**	<	U		<	U		<	U		0.172	XJ	*0.0172*	<	U	
1,2,3,4,6,7,8-HpCDD	**0.010**	6.28		*0.0628*	8.59		*0.0859*	3.82		*0.0382*	5.08		*0.0508*	0.249	XJ	*0.0025*
OCDD	**0.0001**	1170		*0.1170*	996		*0.0996*	361		*0.0361*	397		*0.0397*	7.57		*0.0008*
2,3,7,8--TCDF	**0.100**	<	U		<	U		<	U		<	U		<	U	
1,2,3,7,8-PeCDF	**0.050**	<	U		<	U		<	U		<	U		<	U	
2,3,4,7,8-PeCDF	**0.500**	<	U		<	U		<	U		<	U		<	U	
1,2,3,4,7,8-HxCDF	**0.100**	<	U		<	U		<	U		<	U		<	U	
1,2,3,6,7,8-HxCDF	**0.100**	<	U		<	U		<	U		<	U		<	U	
2,3,4,6,7,8-HxCDF	**0.100**	<	U		<	U		<	U		<	U		<	U	
1,2,3,7,8,9-HxCDF	**0.100**	<	U		<	U		<	U		<	U		<	U	
1,2,3,4,6,7,8-HpCDF	**0.010**	<	U		<	U		0.23	J	*0.0023*	0.392	J	*0.0039*	0.11	J	*0.0011*
1,2,3,4,7,8,9-HpCDF	**0.010**	<	U		<	U		<	U		<	U		<	U	
OCDF	**0.0001**	<	U		<	U		0.407	J	*0.00004*	1.25	J	*0.0001*	<	U	
Total TCDDs		<	U		<	U		<	U		0.176	J		1.72		
Total PeCDDs		<	U		<	U		<	U		<	U		0.279	J	
Total HxCDDs		<	U		<	U		1.25	J		0.695	J		<	U	
Total HpCDDs		14.1			20.6			8.14			11.1			0.138		
Total TCDFs		<	U		<	U		<	U		<	U		<	U	
Total PeCDFs		<	U		<	U		<	U		<	U		<	U	
Total HxCDFs		<	U		<	U		0.13	J		0.269	J		<	U	
Total HpCDFs		<	U		<	U		0.23	J		1	J		<	U	
TOTAL TEQ				***0.1798***			***0.1855***			***0.0990407***			***0.306345***			***0.004347***

Diluted sample results were used, if available.
E = Value exceeds linear range
EDL = Estimated Detection Limit
J = Estimated
ND = Not Detected
Qual = Qualifier

TEF = Toxic Equivalency Factor
TEQ = Toxicity Equivalent
U = Nondetect
UJ = Estimated Nondetect
X = Estimated Maximum Possible Concentration

TABLE 12-23, AUS-0A8S
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	No	A	NA	NA	No	A
1,1,2,2-Tetrachloroethane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,1,2-Trichloroethane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,1-Dichloroethane	No	C	No	A	NA	NA	No	A
1,1-Dichloroethene	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethane (EDC)	No	C	Uncertainty	B	NA	NA	Uncertainty	B
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	No	A
1,2-Dichloropropane	No	C	Uncertainty	B	NA	NA	Uncertainty	B
2-Butanone (MEK)	No	C	No	A	NA	NA	No	A
2-Hexanone	No	C	No	C	NA	NA	No	C
4-Methyl-2-pentanone (MIBK)	No	C	No	A	NA	NA	No	A
Acetone	No	C	No	A	NA	NA	No	A
Benzene	No	A	Uncertainty	B	NA	NA	Uncertainty	B
Bromodichloromethane	No	C	Uncertainty	B	NA	NA	No	A
Bromoform	No	C	No	A	NA	NA	No	A
Bromomethane	No	C	No	A	NA	NA	No	A
Carbon disulfide	No	C	No	A	NA	NA	No	A
Carbon tetrachloride	No	C	Uncertainty	B	NA	NA	Uncertainty	B
Chlorobenzene	No	C	No	A	NA	NA	No	A
Chloroethane	No	C	No	A	NA	NA	No	A
Chloroform	No	C	Uncertainty	B	NA	NA	No	A
Chloromethane	No	C	No	F	NA	NA	No	A
cis-1,2-Dichloroethene	No	C	No	A	NA	NA	No	A
cis-1,3-Dichloropropene	No	C	Uncertainty	B	NA	NA	No	A
Dibromochloromethane	No	C	Uncertainty	B	NA	NA	No	A
Ethylbenzene	No	A	No	A	NA	NA	No	A
Methylene chloride	No	A	No	A	NA	NA	Uncertainty	B
N-Hexane	No	C	No	A	NA	NA	No	A
Styrene	No	C	No	A	NA	NA	No	A
Tetrachloroethylene (PCE)	No	C	No	A	NA	NA	Uncertainty	B
Toluene	No	A	No	A	NA	NA	No	A
total Xylenes	No	A	No	A	NA	NA	No	A
trans-1,2-Dichloroethene	No	C	No	A	NA	NA	No	A
trans-1,3-Dichloropropene	No	C	Uncertainty	B	NA	NA	No	A
Trichloroethylene (TCE)	No	C	No	A	NA	NA	Uncertainty	B
Vinyl chloride	No	C	Uncertainty	B	NA	NA	Uncertainty	B
Semivolatile Organic Compounds								
1,2,4-Trichlorobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
1,2-Dichlorobenzene	No	C	No	A	No	A	No	A
1,3-Dichlorobenzene	No	C	Uncertainty	B	No	A	No	A
1,4-Dichlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4,5-Trichlorophenol	No	C	No	A	No	A	No	A

TABLE 12-23, AUS-0A8S
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	Uncertainty	B	Uncertainty	B	Uncertainty	B
2,4-Dichlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dimethylphenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2,4-Dinitrophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
2-Chloronaphthalene	No	C	No	A	No	A	No	A
2-Chlorophenol	No	C	No	A	Uncertainty	B	Uncertainty	B
1-Methylnaphthalene	NA	NA	No	A	NA	NA	No	A
2-Methylnaphthalene	No	A	No	A	No	F	No	A
2-Methylphenol	No	C	No	A	Uncertainty	B	No	A
2-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
2-Nitrophenol	No	C	No	A	No	A	No	A
3,3'-Dichlorobenzidine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
3-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4,6-Dinitro-2-methylphenol	No	C	No	C	No	C	No	C
4-Bromophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Chloro-3-methylphenol	No	C	No	A	No	A	No	A
4-Chloroaniline	No	C	No	A	Uncertainty	B	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C	No	C	No	C	No	C
4-Methylphenol	No	C	No	A	No	A	No	A
4-Nitroaniline	No	C	Uncertainty	B	No	A	No	A
4-Nitrophenol	No	C	No	A	No	A	No	A
Acenaphthene	No	C	No	A	No	A	No	A
Acenaphthylene	No	A	No	A	No	A	No	A
Anthracene	No	A	No	A	No	F	No	F
Benzo(a)anthracene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Uncertainty	B	No	F	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	No	A	No	A	No	F	No	F
Benzo(k)fluoranthene	No	C	Uncertainty	B	No	F	No	F
bis(2-Chloroethoxy)methane	No	C	No	C	No	C	No	C
bis(2-Chloroethyl) ether	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	C	Uncertainty	B	No	A	No	A
bis(2-Ethylhexyl) phthalate	Uncertainty	G	Uncertainty	B	No	F	No	F
Butyl benzyl phthalate	No	C	No	A	No	A	No	F
Carbazole	No	C	Uncertainty	B	Yes	E	Yes	E
Chrysene	Uncertainty	B	Uncertainty	B	No	F	No	F
Di-n-butyl phthalate	No	C	No	A	No	F	No	F
Di-n-octyl phthalate	No	C	No	A	No	A	No	F
Dibenz(a,h)anthracene	No	C	Uncertainty	B	Uncertainty	B	Yes	E
Dibenzofuran	No	C	No	A	No	F	No	A
Diethyl phthalate	No	C	No	A	No	A	No	A
Dimethyl phthalate	No	C	No	A	No	A	No	A
Fluoranthene	No	A	No	A	No	F	No	F

TABLE 12-23, AUS-0A8S
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	No	A	No	A	No	A
Hexachlorobenzene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorobutadiene	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Hexachlorocyclopentadiene	No	C	No	A	No	A	No	A
Hexachloroethane	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	Uncertainty	B	Uncertainty	B	No	F	Yes	J
Isophorone	No	C	No	A	Uncertainty	B	Uncertainty	B
N-Nitroso-di-n-propylamine	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
N-Nitrosodiphenylamine	No	C	No	A	Uncertainty	B	Yes	E
Naphthalene	No	C	Uncertainty	B	No	F	No	A
Pentachlorophenol	No	C	Uncertainty	B	Uncertainty	B	Uncertainty	B
Phenanthrene	No	A	No	A	No	F	No	F
Phenol	No	A	No	A	No	A	No	A
Pyrene	No	A	No	A	No	F	No	F
Metals and Inorganics								
Aluminum	Uncertainty	G	No	F	No	F	No	F
Antimony	No	C	Uncertainty	B	Yes	E	Yes	D
Arsenic	No	C	Uncertainty	B	Yes	E	Yes	E
Barium	No	F	No	F	Yes	E	Yes	E
Beryllium	No	C	Uncertainty	B	Yes	D	No	A
Boron	No	A	No	F	No	F	No	F
Cadmium	No	C	Uncertainty	B	Yes	E	Yes	E
Calcium	No	H	No	H	No	H	No	H
Chromium	Uncertainty	G	No	A	Yes	E	Yes	D
Cobalt	Uncertainty	G	No	A	No	F	No	F
Copper	Uncertainty	G	No	F	No	F	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	No	F	No	F
Lead	No	C	No	A	Yes	E	No	F
Magnesium	No	H	No	H	No	H	No	H
Manganese	No	F	Yes	E	No	F	No	F
Mercury	Yes	D	No	A	Yes	D	No	F
Nickel	No	A	No	F	Yes	E	Yes	D
Potassium	No	H	No	H	No	H	No	H
Selenium	No	F	No	F	Yes	E	Yes	E
Silver	Uncertainty	B	No	A	Yes	D	Yes	E
Sodium	No	H	No	H	No	H	No	H
Thallium	No	C	Uncertainty	B	No	F	No	F
Vanadium	No	C	No	F	No	F	No	F
Zinc	No	A	No	A	Yes	E	No	F
Explosives								
1,3,5-Trinitrobenzene	No	C	No	A	No	A	No	A
1,3-Dinitrobenzene	No	C	No	A	No	A	No	A

TABLE 12-23, AUS-0A8S
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	No	A	No	A	No	A
2,4-Dinitrotoluene	No	C	No	A	Yes	E	Yes	E
2,6-Dinitrotoluene	No	C	No	A	Yes	E	Yes	E
2-Amino-4,6-Dinitrotoluene	No	C	Uncertainty	G	No	C	No	C
2-Nitrotoluene (ONT)	No	C	No	C	No	C	No	C
3-Nitrotoluene	No	C	No	A	No	A	No	A
4-Amino-2,6-Dinitrotoluene	No	C	Uncertainty	G	No	C	No	C
4-Nitrotoluene (PNT)	No	C	No	A	No	A	No	A
HMX	No	C	No	A	No	A	No	A
Nitrobenzene	No	C	No	A	Uncertainty	B	Uncertainty	B
Nitroglycerin	No	C	No	A	NA	NA	No	A
Pentaerythritol tetranitrate (PETN)	No	C	No	C	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA	NA	NA
RDX	No	C	No	A	No	A	No	A
Tetryl	No	C	No	A	No	A	No	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	No	A	No	F	Yes	E
Phosphorus, Total (as P)	NA	NA	NA	NA	NA	NA	NA	NA
Dioxins								
2,3,7,8-TCDD	NA	NA	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 exceeeded 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 12-23A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

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

TABLE 12-23A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
1,4-Dichlorobenzene	Uncertainty	B
2,4,5-Trichlorophenol	No	A
2,4,6-Trichlorophenol	Uncertainty	B
2,4-Dichlorophenol	Uncertainty	B
2,4-Dimethylphenol	Uncertainty	B
2,4-Dinitrophenol	Uncertainty	B
2-Chloronaphthalene	No	A
2-Chlorophenol	Uncertainty	B
1-Methylnaphthalene	NA	NA
2-Methylnaphthalene	No	A
2-Methylphenol	No	A
2-Nitroaniline	No	A
2-Nitrophenol	No	A
3,3'-Dichlorobenzidine	Uncertainty	B
3-Nitroaniline	No	A
4,6-Dinitro-2-methylphenol	No	C
4-Bromophenyl phenyl ether	No	C
4-Chloro-3-methylphenol	No	A
4-Chloroaniline	Uncertainty	B
4-Chlorophenyl phenyl ether	No	C
4-Methylphenol	No	A
4-Nitroaniline	No	A
4-Nitrophenol	No	A
Acenaphthene	No	A
Acenaphthylene	No	A
Anthracene	No	A
Benzo(a)anthracene	Uncertainty	B
Benzo(a)pyrene	Uncertainty	B
Benzo(b)fluoranthene	Uncertainty	B
Benzo(g,h,i)perylene	No	A
Benzo(k)fluoranthene	No	A
bis(2-Chloroethoxy)methane	No	C
bis(2-Chloroethyl) ether	Uncertainty	B
bis(2-Chloroisopropyl) ether	No	A
bis(2-Ethylhexyl) phthalate	No	F
Butyl benzyl phthalate	No	A
Carbazole	Uncertainty	B
Chrysene	No	A
Di-n-butyl phthalate	No	F
Di-n-octyl phthalate	No	F
Dibenz(a,h)anthracene	Uncertainty	B

TABLE 12-23A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Dibenzofuran	No	A
Diethyl phthalate	No	A
Dimethyl phthalate	No	A
Fluoranthene	No	A
Fluorene	No	A
Hexachlorobenzene	Uncertainty	B
Hexachlorobutadiene	Uncertainty	B
Hexachlorocyclopentadiene	No	A
Hexachloroethane	Uncertainty	B
Indeno(1,2,3-c,d)pyrene	No	A
Isophorone	Uncertainty	B
N-Nitroso-di-n-propylamine	Uncertainty	B
N-Nitrosodiphenylamine	Uncertainty	B
Naphthalene	No	A
Pentachlorophenol	Uncertainty	B
Phenanthrene	No	A
Phenol	No	F
Pyrene	No	A
Metals and Inorganics		
Aluminum	NA	NA
Antimony	NA	NA
Arsenic	NA	NA
Barium	NA	NA
Beryllium	NA	NA
Boron	NA	NA
Cadmium	NA	NA
Calcium	NA	NA
Chromium	NA	NA
Cobalt	NA	NA
Copper	NA	NA
Cyanide, Total	NA	NA
Iron	NA	NA
Lead	NA	NA
Magnesium	NA	NA
Manganese	NA	NA
Mercury	NA	NA
Nickel	NA	NA
Potassium	NA	NA
Selenium	NA	NA
Silver	NA	NA
Sodium	NA	NA

TABLE 12-23A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF HUMAN HEALTH COPC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Thallium	NA	NA
Vanadium	NA	NA
Zinc	NA	NA
Explosives		
1,3,5-Trinitrobenzene	NA	NA
1,3-Dinitrobenzene	NA	NA
2,4,6-Trinitrotoluene (TNT)	NA	NA
2,4-Dinitrotoluene	Uncertainty	B
2,6-Dinitrotoluene	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA
2-Nitrotoluene (ONT)	NA	NA
3-Nitrotoluene	NA	NA
4-Amino-2,6-Dinitrotoluene	NA	NA
4-Nitrotoluene (PNT)	NA	NA
HMX	NA	NA
Nitrobenzene	Uncertainty	B
Nitroglycerin	NA	NA
Pentacrythritol tetranitrate (PETN)	NA	NA
Perchloric Acid	NA	NA
RDX	NA	NA
Tetryl	NA	NA
Dioxins		
2,3,7,8-TCDD	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 exceeeded 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 12-24, AUS-0A8S
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 12-24, AUS-0A8S
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	No	C
2-Methylnaphthalene	No	A	Yes	E	No	A
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	Yes	E	Yes	E
Benzo(a)anthracene	Uncertainty	B	Yes	E	Yes	E
Benzo(a)pyrene	Uncertainty	B	Yes	E	Yes	E
Benzo(b)fluoranthene	Uncertainty	B	Yes	E	Yes	E
Benzo(g,h,i)perylene	Uncertainty	B	Yes	E	Yes	E
Benzo(k)fluoranthene	Uncertainty	B	Yes	E	Yes	E
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	Yes	E	Yes	E	Yes	E
Butyl benzyl phthalate	No	A	No	A	Yes	E
Carbazole	No	A	Yes	E	Yes	E
Chrysene	No	A	Yes	E	Yes	E
Di-n-butyl phthalate	Uncertainty	B	Yes	E	Yes	E
Di-n-octyl phthalate	No	A	No	A	Yes	E
Dibenz(a,h)anthracene	Uncertainty	B	Uncertainty	B	Yes	E
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	Yes	E

TABLE 12-24, AUS-0A8S
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	Yes	E
Isophorone	No	A	No	A	No	A
N-Nitroso-di-n-propylamine	No	C	No	C	No	A
N-Nitrosodiphenylamine	No	A	Uncertainty	B	No	F
Naphthalene	No	A	Yes	E	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	Yes	E
Metals and Inorganics						
Aluminum	Yes	E	Yes	E	Uncertainty	I
Antimony	No	A	Yes	E	No	F
Arsenic	No	A	Yes	E	Yes	E
Barium	No	F	Uncertainty	G	No	F
Beryllium	Uncertainty	B	Uncertainty	G	No	A
Boron	No	A	Uncertainty	G	Yes	D
Cadmium	Uncertainty	B	Yes	E	No	F
Calcium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Chromium	No	F	Yes	E	Yes	D
Cobalt	Yes	D	No	F	Yes	D
Copper	Yes	E	Yes	E	Yes	E
Cyanide, Total	NA	NA	NA	NA	NA	NA
Iron	Yes	E	No	F	Yes	E
Lead	No	A	Yes	E	No	F
Magnesium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Manganese	No	F	Yes	E	Yes	E
Mercury	Yes	D	Yes	D	Yes	E
Nickel	No	A	Yes	E	No	F
Potassium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Selenium	Yes	E	Yes	E	Yes	E
Silver	Uncertainty	B	Yes	D	No	F
Sodium	No	F,H	Uncertainty	G,H	Uncertainty	G,H
Thallium	Uncertainty	B	Uncertainty	G	Yes	E
Vanadium	Uncertainty	B	Uncertainty	G	No	F
Zinc	No	A	Yes	E	Yes	E
Explosives						
1,3,5-Trinitrobenzene	No	A	Uncertainty	B	Uncertainty	B
1,3-Dinitrobenzene	No	A	Uncertainty	B	No	A

TABLE 12-24, AUS-0A8S
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	F	Yes	E
2,6-Dinitrotoluene	No	A	Yes	E	Yes	E
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	Uncertainty	B	No	A
Nitroglycerin	No	A	NA	NA	No	C
Pentaerythritol tetranitrate (PETN)	No	A	NA	NA	No	C
Perchloric Acid	NA	NA	NA	NA	NA	NA
RDX	No	A	Uncertainty	B	No	A
Tetryl	No	C	No	C	No	C
Dioxins						
2,3,7,8-TCDD	NA	NA	NA	NA	Yes	E

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 exceeeded 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 12-24A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

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

TABLE 12-24A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
1,4-Dichlorobenzene	No	A
2,4,5-Trichlorophenol	No	A
2,4,6-Trichlorophenol	No	A
2,4-Dichlorophenol	No	A
2,4-Dimethylphenol	Uncertainty	B
2,4-Dinitrophenol	No	A
2-Chloronaphthalene	Uncertainty	B
2-Chlorophenol	Uncertainty	B
1-Methylnaphthalene	NA	NA
2-Methylnaphthalene	No	A
2-Methylphenol	No	A
2-Nitroaniline	No	A
2-Nitrophenol	No	A
3,3'-Dichlorobenzidine	No	A
3-Nitroaniline	No	A
4,6-Dinitro-2-methylphenol	No	C
4-Bromophenyl phenyl ether	No	C
4-Chloro-3-methylphenol	No	A
4-Chloroaniline	No	A
4-Chlorophenyl phenyl ether	No	C
4-Methylphenol	No	A
4-Nitroaniline	No	A
4-Nitrophenol	No	A
Acenaphthene	No	A
Acenaphthylene	No	A
Anthracene	No	A
Benzo(a)anthracene	No	A
Benzo(a)pyrene	No	A
Benzo(b)fluoranthene	No	A
Benzo(g,h,i)perylene	No	A
Benzo(k)fluoranthene	No	A
bis(2-Chloroethoxy)methane	Uncertainty	B
bis(2-Chloroethyl) ether	No	A
bis(2-Chloroisopropyl) ether	No	C
bis(2-Ethylhexyl) phthalate	Yes	E
Butyl benzyl phthalate	Uncertainty	B
Carbazole	No	C
Chrysene	No	A
Di-n-butyl phthalate	Yes	E
Di-n-octyl phthalate	Yes	E
Dibenz(a,h)anthracene	No	A

TABLE 12-24A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Dibenzofuran	No	C
Diethyl phthalate	No	A
Dimethyl phthalate	No	A
Fluoranthene	No	A
Fluorene	No	A
Hexachlorobenzene	No	A
Hexachlorobutadiene	Uncertainty	B
Hexachlorocyclopentadiene	No	A
Hexachloroethane	No	A
Indeno(1,2,3-c,d)pyrene	No	A
Isophorone	No	A
N-Nitroso-di-n-propylamine	No	A
N-Nitrosodiphenylamine	No	A
Naphthalene	No	A
Pentachlorophenol	No	A
Phenanthrene	No	A
Phenol	No	F
Pyrene	No	A
Metals and Inorganics		
Aluminum	NA	NA
Antimony	NA	NA
Arsenic	NA	NA
Barium	NA	NA
Beryllium	NA	NA
Boron	NA	NA
Cadmium	NA	NA
Calcium	NA	NA
Chromium	NA	NA
Cobalt	NA	NA
Copper	NA	NA
Cyanide, Total	NA	NA
Iron	NA	NA
Lead	NA	NA
Magnesium	NA	NA
Manganese	NA	NA
Mercury	NA	NA
Nickel	NA	NA
Potassium	NA	NA
Selenium	NA	NA
Silver	NA	NA
Sodium	NA	NA

TABLE 12-24A, AUS-0A8S
(DRUM SAMPLES)
SUMMARY OF ECOLOGICAL COPEC EVALUATION

AUS OU PA/SI
CRAB ORCHARD NATIONAL WILDLIFE REFUGE

Chemical	Drum	
	COPC (yes/no)	Rationale
Thallium	NA	NA
Vanadium	NA	NA
Zinc	NA	NA
Explosives		
1,3,5-Trinitrobenzene	NA	NA
1,3-Dinitrobenzene	NA	NA
2,4,6-Trinitrotoluene (TNT)	NA	NA
2,4-Dinitrotoluene	No	A
2,6-Dinitrotoluene	Uncertainty	B
2-Amino-4,6-Dinitrotoluene	NA	NA
2-Nitrotoluene (ONT)	NA	NA
3-Nitrotoluene	NA	NA
4-Amino-2,6-Dinitrotoluene	NA	NA
4-Nitrotoluene (PNT)	NA	NA
HMX	NA	NA
Nitrobenzene	No	A
Nitroglycerin	NA	NA
Pentaerythritol tetranitrate (PETN)	NA	NA
Perchloric Acid	NA	NA
RDX	NA	NA
Tetryl	NA	NA
Dioxins		
2,3,7,8-TCDD	No	A

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 exceeeded 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 12-25
AUS-0A8S - IOP GROUP III LOAD LINE
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum	Soil	Sediment	Ground Water	Surface Water
SVOCs					
2-Methylnaphthalene			E		
Anthracene		E	E		
Benzo(a)anthracene		H,E	H,E		
Benzo(a)pyrene		H,E	E		
Benzo(b)fluoranthene		H,E	H,E		
Benzo(g,h,i)perylene		E	E		
Benzo(k)fluoranthene		E	E		
bis(2-Ethylhexyl)phthalate (DEHP)	E	E	E		E
Butyl benzyl phthalate		E			
Carbazole		H,E	H,E		
Chrysene		E	E		
Di-n-butyl phthalate	E	E	E		
Di-n-octyl phthalate	E	E			
Dibenz(a,h)anthracene		H,E			
Dibenzofuran			E		
Fluoranthene		E	E		
Indeno(1,2,3-c,d)pyrene		H,E	E		
N-Nitrosodiphenylamine		H			
Naphthalene			E		
Phenanthrene		E	E		
Pyrene		E	E		
Metals					
Aluminum	NA		E		E
Antimony	NA		H,E		
Arsenic	NA	H,E	H,E		
Barium	NA	H	H		
Cadmium	NA	H	H,E		
Chromium	NA		H,E		
Copper	NA	E	E		E
Iron	NA	E			H,E
Lead	NA		H,E		
Manganese	NA	E	E	H	
Mercury	NA	E			
Nickel	NA		H,E		
Selenium	NA	H,E	H,E		E
Silver	NA	H			
Thallium	NA	E			
Zinc	NA	E	H,E		
Explosives					
2,4-Dinitrotoluene		H,E	H		
2,6-Dinitrotoluene		H,E	H,E		

TABLE 12-25
AUS-0A8S - IOP GROUP III LOAD LINE
CHEMICALS DETECTED ABOVE SCREENING CRITERIA AND ABOVE REFUGE BACKGROUND
(WHERE APPLICABLE)

ADDITIONAL AND UNCHARACTERIZED SITES OU SI

Chemical	Drum	Soil	Sediment	Ground Water	Surface Water
Other Parameters					
Nitrogen, Nitrate-nitrite	NA	**H**			NA
Dioxins					
2,3,7,8-TCDD		**E**	NA	NA	NA

Key:
NA = not analyzed
H = human health screening criteria exceeded
E = ecological screening criteria exceeded

SOURCE: USGS DIGITAL RASTER GRAPHIC

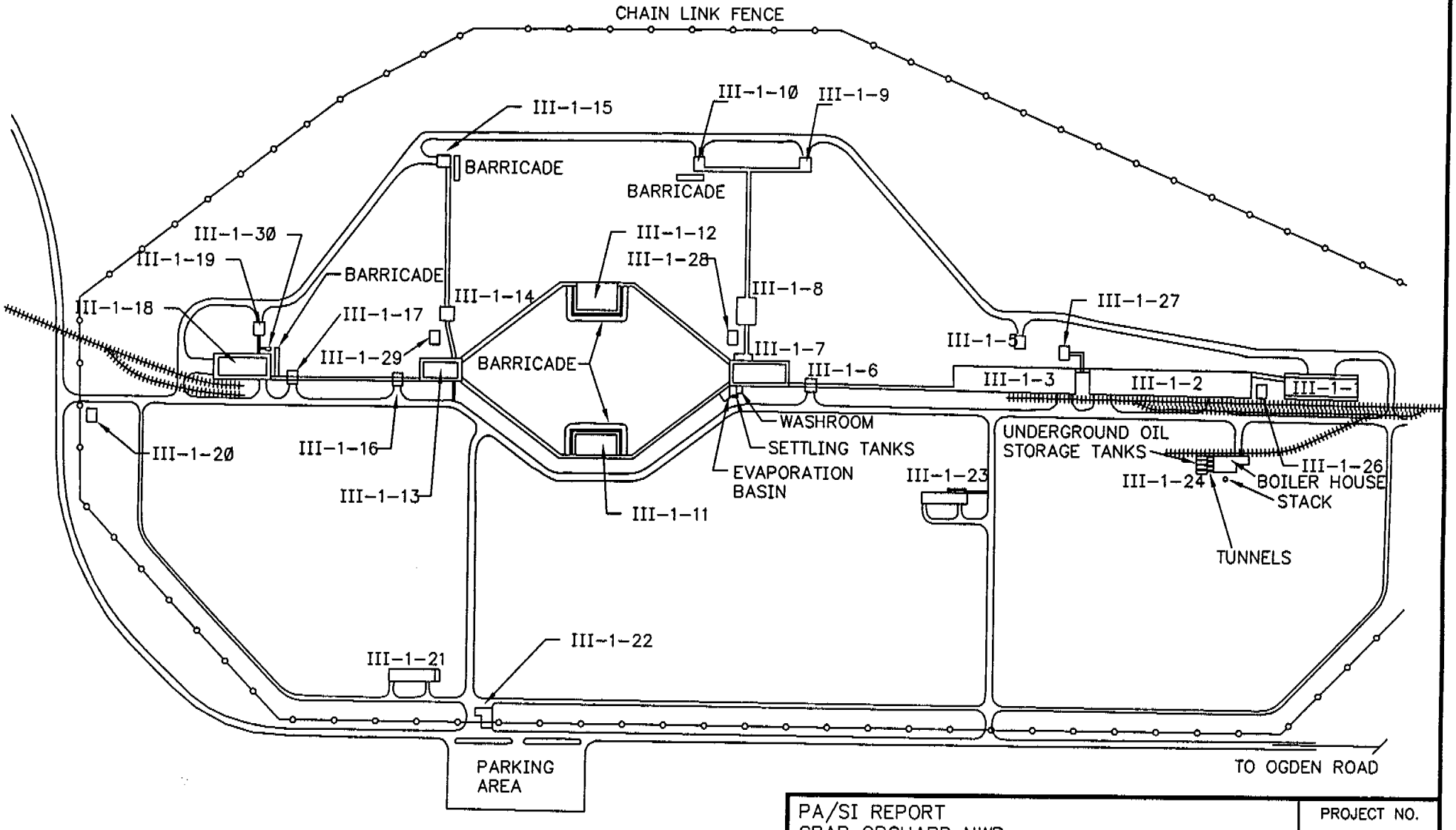
N

0 2000

SCALE FEET

PA/SI REPORT–AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: djd 8/25/99 DSGN. BY: mch CHKD. BY: cmw	Area 8 South Site Location Map — FIG. NO. 12–1

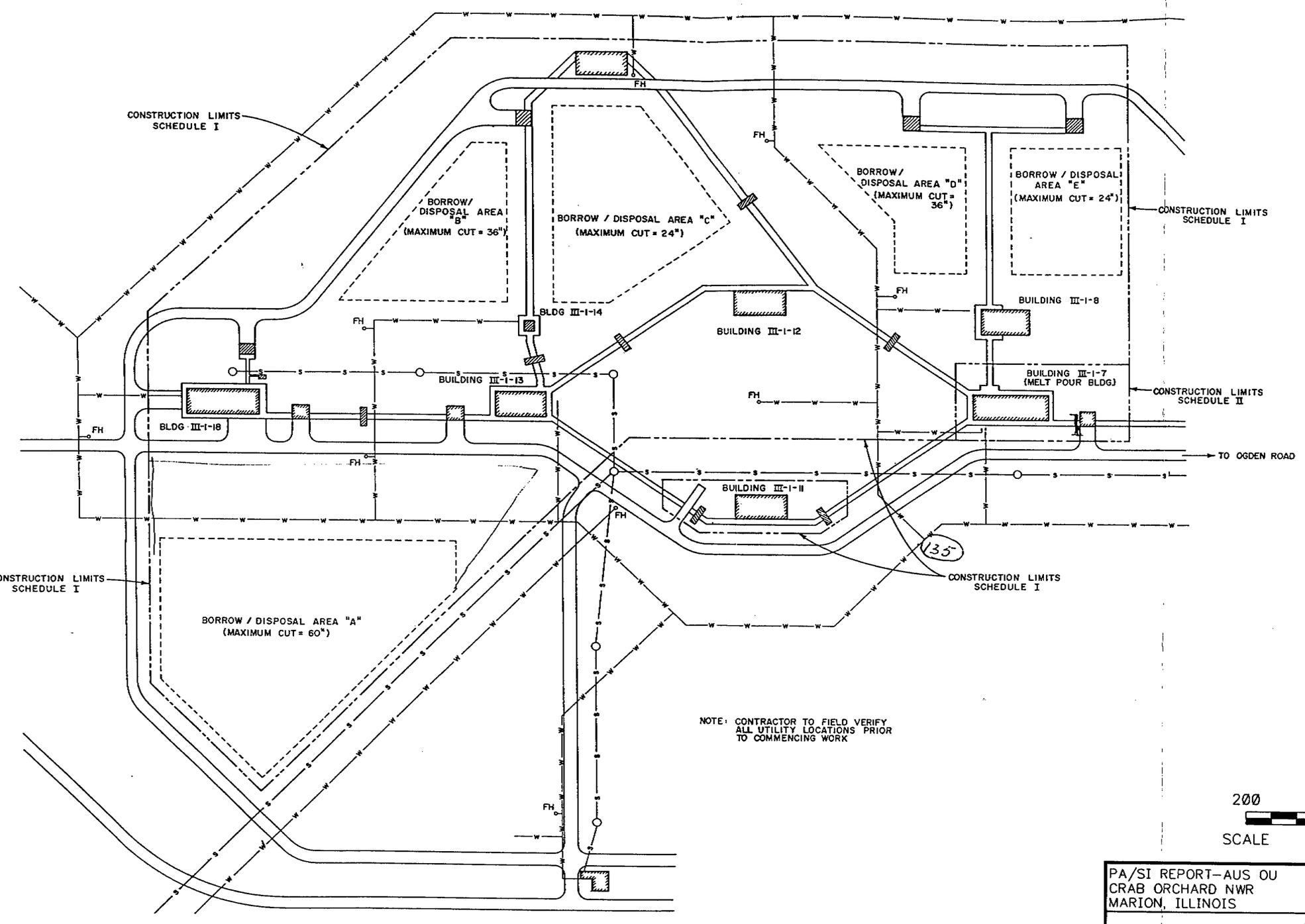
File: E:\45EOM9602N\FIG_12-1.DWG Last edited: 06/28/01 @ 5:07 p.m. @ MCC-ST.LOUIS



SOURCE: U.S. ACE. 1944, WAR DEPARTMENT
FACILITIES INVENTORY OF THE ILLINOIS
ORDNANCE PLANT
PART I SECT. 5 PAGE 9
(PLAN NO. 6544-101.15

NOT TO SCALE

PA/SI REPORT CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: djd 8/15/99 DSGN. BY: mh CHKD. BY: cmw	Original Area 8 Configuration — FIG. NO. 12-2



NOTE: CONTRACTOR TO FIELD VERIFY ALL UTILITY LOCATIONS PRIOR TO COMMENCING WORK

200 0 200
SCALE FEET

PA/SI REPORT–AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: did 7/6/00 DSGN. BY: mch CHKD. BY: mch	Area 8 South Demolition Contract Drawing
	FIG. NO. 12–3

Note: Drawing obtained from USFWS Contract No. 14-16-0003-82-073 Invitation No. FWS3-82-1FB-49 Drawing No. 3R-ILL-415-430.

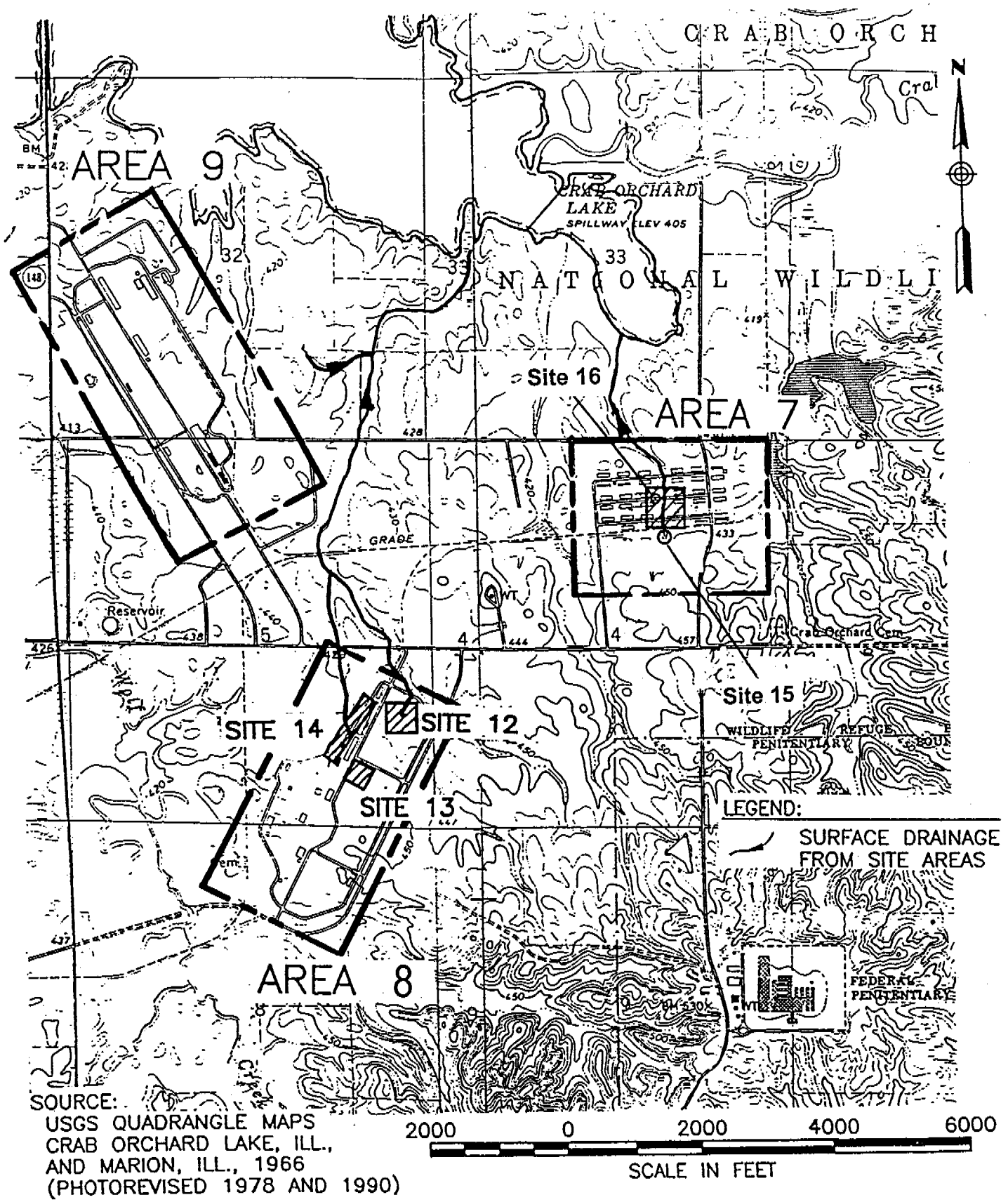
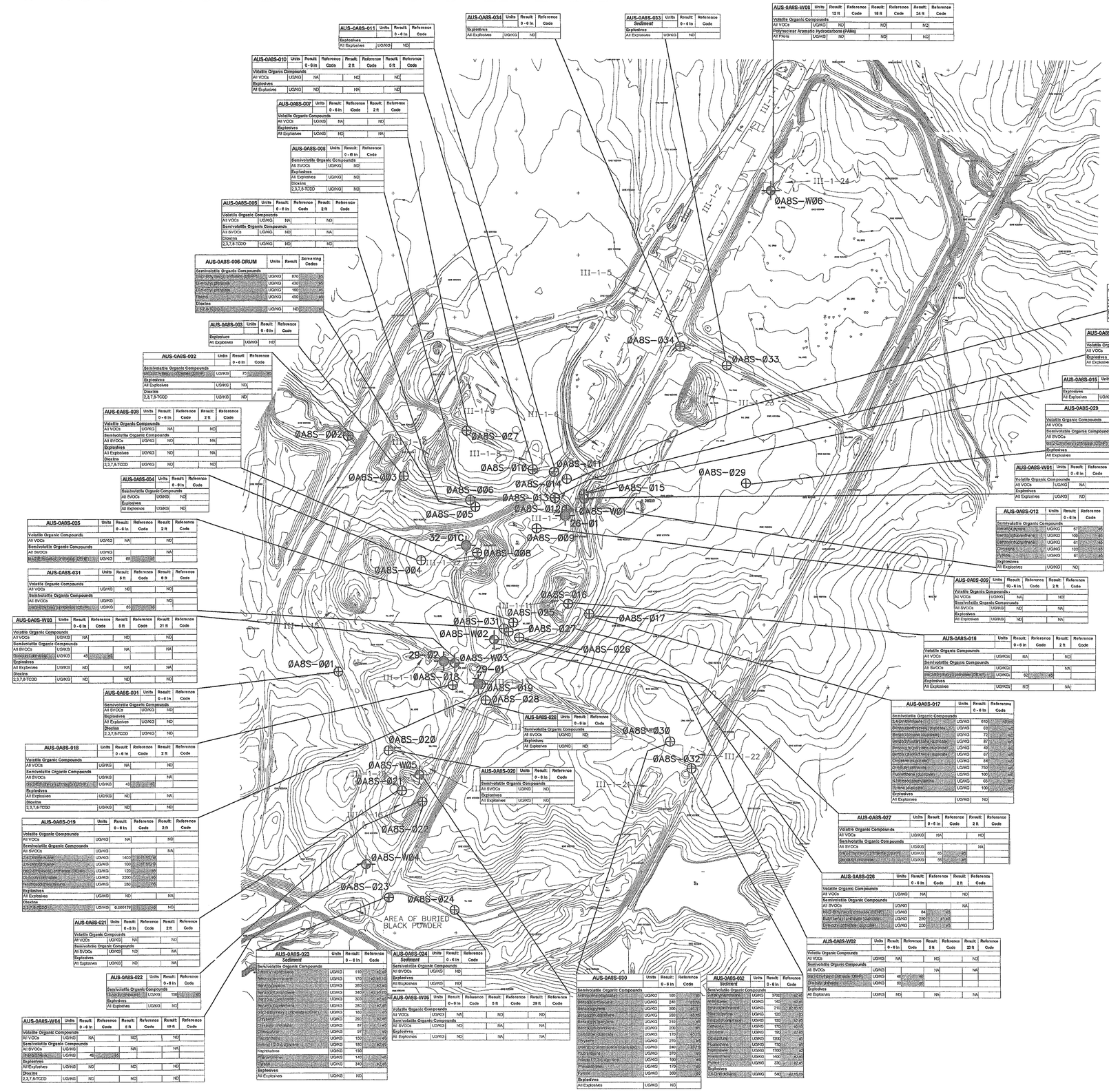


Figure 12-4

MISCA OU Sites in Areas 7 and 8

AREA 8 SOUTH–FORMER IOP LOAD LINE III



AUS-0A8S-011

	Units	Result: 0 - 6 In	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-034

	Units	Result: 0 - 6 In	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-033

	Units	Result: 0 - 6 In	Reference Code
Sediment			
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-W06

	Units	Result: 12 ft	Reference Code	Result: 16 ft	Reference Code	Result: 24 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	ND		ND		ND	
Polynuclear Aromatic Hydrocarbons (PAHs)							
All PAHs	UG/KG	ND		ND		ND	

AUS-0A8S-010

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference Code	Result: 5 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Explosives							
All Explosives	UG/KG	ND		NA		ND	

AUS-0A8S-007

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A8S-008

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	
Dioxins			
2,3,7,8-TCDD	UG/KG	ND	

AUS-0A8S-005

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG	ND		NA	
Dioxins					
2,3,7,8-TCDD	UG/KG	ND		ND	

AUS-0A8S-006-DRUM

	Units	Result	Screening Codes
Semivolatile Organic Compounds			
BNZ(A)ANTHRACENE (1,2-BENZANTHRACENE)	UG/KG	870	s5
CHRYSENE (BENZO(A)PHENANTHRENE)	UG/KG	430	s5
DI-N-OCTYL PHTHALATE	UG/KG	160	s5
PHENOL	UG/KG	450	s5
Dioxins			
2,3,7,8-TCDD	UG/KG	ND	s5

AUS-0A8S-003

	Units	Result: 0 - 6 In	Reference Code
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-002

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
BNZ(A)ANTHRACENE (1,2-BENZANTHRACENE)	UG/KG	73	s5
Explosives			
All Explosives	UG/KG	ND	
Dioxins			
2,3,7,8-TCDD	UG/KG	ND	

AUS-0A8S-009

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	
Dioxins					
2,3,7,8-TCDD	UG/KG	ND		ND	

AUS-0A8S-004

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-025

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	69	s5		

AUS-0A8S-031

	Units	Result: 5 ft	Reference Code	Result: 8 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	ND		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			ND	
BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	UG/KG	65	s5		

AUS-0A8S-W03

	Units	Result: 0 - 6 In	Reference Code	Result: 5 ft	Reference Code	Result: 21 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Semivolatile Organic Compounds							
All SVOCs	UG/KG			NA		NA	
DI-N-OCTYL PHTHALATE	UG/KG	45	s5				
Explosives							
All Explosives	UG/KG	ND		NA		NA	
Dioxins							
2,3,7,8-TCDD	UG/KG	ND		ND		ND	

AUS-0A8S-001

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	
Dioxins			
2,3,7,8-TCDD	UG/KG	ND	

AUS-0A8S-018

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	43	s5		
Explosives					
All Explosives	UG/KG	ND		NA	
Dioxins					
2,3,7,8-TCDD	UG/KG	ND		ND	

AUS-0A8S-019

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Semivolatile Organic Compounds					
All SVOCs	UG/KG			NA	
2,4-DINITROTOLUENE	UG/KG	1400	s1,s7,h6		
2,6-DINITROTOLUENE	UG/KG	500	s1,h6,h9		
BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	UG/KG	120	s5		
DI-N-OCTYL PHTHALATE	UG/KG	2200	s5		
Nitrobenzene/Isophorone	UG/KG	280	s6		
Explosives					
All Explosives	UG/KG	ND		NA	
Dioxins					
2,3,7,8-TCDD	UG/KG	0.000174	s5	ND	

AUS-0A8S-021

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	

AUS-0A8S-022

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	UG/KG	150	s5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-W04

	Units	Result: 0 - 6 In	Reference Code	Result: 5 ft	Reference Code	Result: 19 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Semivolatile Organic Compounds							
All SVOCs	UG/KG			NA		NA	
BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	UG/KG	45	s5				
Explosives							
All Explosives	UG/KG	ND		ND		ND	
Dioxins							
2,3,7,8-TCDD	UG/KG	ND		ND		ND	

AUS-0A8S-023 Sediment

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
2-METHYLNAPHTHALENE	UG/KG	110	s2,s6
ANTHRACENE	UG/KG	170	s1,s5,s6
BENZO(A)PYRENE	UG/KG	280	s2,s6
BENZO(B)FLUORANTHENE	UG/KG	340	s2,s5,s6
BENZO(G,H,I)PERYLENE	UG/KG	320	s2,s6
BENZO(K)FLUORANTHENE	UG/KG	280	s2,s6
BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	UG/KG	180	s5
CHRYSENE	UG/KG	260	s2,s6
DI-N-OCTYL PHTHALATE	UG/KG	97	s5
FLUORANTHENE	UG/KG	97	s6
NAPHTHALENE	UG/KG	150	s6
PHENANTHRENE	UG/KG	180	s2,s6
PHENOL	UG/KG	130	
PYRENE	UG/KG	140	s2,s6
TOTAL PAHS	UG/KG	940	s2,s6
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-024 Sediment

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
All SVOCs	UG/KG	ND	
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-W05

	Units	Result: 0 - 6 In	Reference Code	Result: 5 ft	Reference Code	Result: 20 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Semivolatile Organic Compounds							
All SVOCs	UG/KG	ND		NA		NA	
Explosives							
All Explosives	UG/KG	ND		NA		NA	

AUS-0A8S-030

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
2-METHYLNAPHTHALENE	UG/KG	100	s2,s6
ANTHRACENE	UG/KG	240	s1,s5,s6
BENZO(A)PYRENE	UG/KG	300	s2,s6
BENZO(B)FLUORANTHENE	UG/KG	260	s2,s6
BENZO(G,H,I)PERYLENE	UG/KG	210	s2,s6
BENZO(K)FLUORANTHENE	UG/KG	200	s2,s6
CHRYSENE	UG/KG	170	s2,s6
DI-N-OCTYL PHTHALATE	UG/KG	270	s5
FLUORANTHENE	UG/KG	240	s6
NAPHTHALENE	UG/KG	370	s6
PHENANTHRENE	UG/KG	190	s2,s6
PHENOL	UG/KG	170	s5
PYRENE	UG/KG	300	s2,s6
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-032 Sediment

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
2-METHYLNAPHTHALENE	UG/KG	3700	s2,s6
ANTHRACENE	UG/KG	1400	s2,s6
CHRYSENE (BENZO(A)PHENANTHRENE)	UG/KG	2100	s2,s6
BENZO(A)PYRENE	UG/KG	1300	s2,s6
BENZO(B)FLUORANTHENE	UG/KG	1300	s2,s6
BENZO(G,H,I)PERYLENE	UG/KG	1100	s2,s6
BENZO(K)FLUORANTHENE	UG/KG	1300	s2,s6
CARBAZOLE	UG/KG	1700	s2,s6
CHRYSENE	UG/KG	1900	s2,s6
DIBENZOFURAN	UG/KG	1200	s6
FLUORANTHENE	UG/KG	1700	s6
FLUORENE	UG/KG	1700	s6
NAPHTHALENE	UG/KG	1400	s2,s6
PHENANTHRENE	UG/KG	370	s2,s6
PYRENE	UG/KG	1700	s2,s6
Explosives			
2,6-DINITROTOLUENE	UG/KG	540	s1,h6,h9

AUS-0A8S-014

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A8S-013

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference Code
Volatile Organic Compounds					
All VOCs	UG/KG	NA		ND	
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A8S-015

	Units	Result: 0 - 6 In	Reference Code	Result: 3 ft	Reference Code
Explosives					
All Explosives	UG/KG	ND		ND	

AUS-0A8S-029

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	56	s5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A8S-W01

	Units	Result: 0 - 6 In	Reference Code	Result: 5 ft	Reference Code	Result: 18 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Explosives							
All Explosives	UG/KG	ND		NA		NA	

AUS-0A8S-012

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
BENZO(A)PYRENE	UG/KG	57	s5
BENZO(B)FLUORANTHENE	UG/KG	100	s5
BENZO(K)FLUORANTHENE	UG/KG	61	s5
CHRYSENE	UG/KG	100	s5
PYRENE	UG/KG	61	s5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-009

	Units	Result: 00 - 6 In	Reference Code	Result: 2 ft	Reference 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	

AUS-0A8S-016

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	62	s5		
Explosives					
All Explosives	UG/KG	ND		NA	

AUS-0A8S-017

	Units	Result: 0 - 6 In	Reference Code
Semivolatile Organic Compounds			
2,4-DINITROTOLUENE	UG/KG	610	s1,h6
BENZO(A)ANTHRACENE (1,2-BENZANTHRACENE)	UG/KG	63	s5
BENZO(A)PYRENE	UG/KG	72	s5
BENZO(B)FLUORANTHENE	UG/KG	87	s5
BENZO(G,H,I)PERYLENE	UG/KG	49	s5
BENZO(K)FLUORANTHENE	UG/KG	67	s5
CHRYSENE	UG/KG	84	s5
DI-N-OCTYL PHTHALATE	UG/KG	750	s5
FLUORANTHENE	UG/KG	160	s6
N-NITROSODIPHENYLAMINE	UG/KG	60	s6
PYRENE	UG/KG	100	s5
Explosives			
All Explosives	UG/KG	ND	

AUS-0A8S-027

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	65	s5		
DI-N-OCTYL PHTHALATE	UG/KG	50	s5		

AUS-0A8S-026

	Units	Result: 0 - 6 In	Reference Code	Result: 2 ft	Reference 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	84	s5		
BUTYLBENZYL PHTHALATE (BBP)	UG/KG	230	s1,s5		
DI-N-OCTYL PHTHALATE	UG/KG	200	s5		

AUS-0A8S-W02

	Units	Result: 0 - 6 In	Reference Code	Result: 8 ft	Reference Code	Result: 22 ft	Reference Code
Volatile Organic Compounds							
All VOCs	UG/KG	NA		ND		ND	
Semivolatile Organic Compounds							
All SVOCs	UG/KG			NA		NA	
BIS(2-ETHYLHEXYL) PHTHALATE (DEHP)	UG/KG	46	s5				
DI-N-OCTYL PHTHALATE	UG/KG	63	s5				
Explosives							
All Explosives	UG/KG	ND		NA		NA	

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATION

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

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT.
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.

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SCALE FEET

Revision No.	Description	Date	By	App.

REVISIONS

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

AUS–0A8S Sample Locations and Detections of Organic Compounds in Soils/Sediments/Drums

Date:	Project Number:	Figure Number:
June 29, 2000	2320000026.00	12–5
Drawn by: DJD	Design by: MM	Checked by: CMW

URS

File: E:\2320000026.00\PA-SI REPORT-AUS OU\AUS-0A8S.DWG Last edited: AUG. 03, 01 @ 1:05 p.m. URS Corp.

AREA 8 SOUTH–FORMER IOP LOAD LINE III

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 SAMPLE LOCATION

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
ISPA 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
ISPA TACO Industrial/Commercial Soil Ingestion	h7
ISPA TACO Construction Worker Soil Ingestion	h8
ISPA TACO Class I Soil Component of Groundwater	h9
ISPA General Use Surface Water Quality Human Health	h10

AUS-0A8S-W06	Units	Result: 12 ft	Reference Code	Result: 18 ft	Reference Code	Result: 24 ft	Reference Code
Metals							
Aluminum	MG/KG	9280		6590		6360	
Antimony	MG/KG	ND		ND		0.27	
Arsenic	MG/KG	3.5	h1,h5,h7	8.7	h1,h5,h7	2.5	h1,h5
Barium	MG/KG	47.9		270		38.6	
Boron	MG/KG	ND		1.6	e1	ND	
Cadmium	MG/KG	ND		0.33	b1	ND	
Calcium	MG/KG	1910		7780	b1	38200	b1
Chromium	MG/KG	8.9	e1,h5	19.8	e1,h5	10.3	e1,h5
Cobalt (duplicate)	MG/KG	5.3		NA		11.2	
Copper	MG/KG	8.4		9		11.2	
Iron	MG/KG	10500	e1	12300	e1	10400	e1
Lead	MG/KG	10.8		10.4		7.5	
Magnesium	MG/KG	1170		1780	b1	11900	b1
Manganese	MG/KG	95.5		1900	e1	171	e1
Nickel	MG/KG	7.8	h5	12.9	h5	19.3	h5
Potassium	MG/KG	234		414		771	b1
Selenium	MG/KG	ND		0.81	h5	ND	h5
Silver	MG/KG	ND		0.46		ND	
Thallium	MG/KG	0.39		ND		ND	
Vanadium	MG/KG	24.3		15.3		12	
Zinc	MG/KG	16.9		30.3		43	

AUS-0A8S-011	Units	Result: 0 - 6 in	Reference Code
Other Parameters			
Nitrogen, Ammonia (as N)	MG/KG	11.5	
Nitrogen, Nitrate-Nitrite	MG/KG	0.53	

AUS-0A8S-007	Units	Result: 0 - 6 in	Reference Code
Other Parameters			
Nitrogen, Ammonia (as N)	MG/KG	18	
Nitrogen, Nitrate-Nitrite	MG/KG	35	h9

AUS-0A8S-003	Units	Result: 0 - 6 in	Reference Code
Other Parameters			
Nitrogen, Ammonia (as N)	MG/KG	63.8	
Nitrogen, Nitrate-Nitrite	MG/KG	2.8	

AUS-0A8S-002	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5190	
Arsenic	MG/KG	4.2	h1,h5,h7
Barium	MG/KG	106	h5
Calcium	MG/KG	0900	b1
Chromium	MG/KG	9	e1,h5
Copper	MG/KG	5.7	
Iron	MG/KG	10900	e1
Lead	MG/KG	13.2	
Magnesium	MG/KG	3800	b1
Manganese	MG/KG	329	e1
Nickel	MG/KG	7.3	h5
Potassium	MG/KG	291	
Selenium	MG/KG	0.83	e5,h5
Vanadium	MG/KG	20.6	
Zinc	MG/KG	26	
Other Parameters			
TOC	MG/KG	23900	

AUS-0A8S-013	Units	Result: 0 - 6 in	Reference Code
Other Parameters			
Nitrogen, Ammonia (as N)	MG/KG	7.4	

AUS-0A8S-004	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6350	
Arsenic	MG/KG	4.5	h1,h5,h7
Barium	MG/KG	65.4	
Calcium	MG/KG	1080	
Chromium	MG/KG	8.1	e1,h5
Copper	MG/KG	4.8	
Iron	MG/KG	11800	e1
Lead	MG/KG	13	
Magnesium	MG/KG	1240	
Manganese	MG/KG	428	e1
Nickel	MG/KG	5.3	
Potassium	MG/KG	364	
Selenium	MG/KG	1	e5,h5
Vanadium	MG/KG	20.1	
Zinc	MG/KG	23.5	

AUS-0A8S-029	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5090	
Arsenic	MG/KG	7.4	h1,h5,h7
Barium	MG/KG	70.8	
Calcium	MG/KG	571	
Chromium	MG/KG	7.5	e1,h5
Copper	MG/KG	5	
Iron	MG/KG	10300	e1
Lead	MG/KG	12.4	
Magnesium	MG/KG	1520	
Manganese	MG/KG	166	e1
Nickel	MG/KG	3.8	
Potassium	MG/KG	519	
Selenium	MG/KG	1.3	e1,e5,h5
Sodium	MG/KG	639	b1
Vanadium	MG/KG	26.3	
Zinc	MG/KG	18	

AUS-0A8S-028	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4770	
Arsenic	MG/KG	4	h1,h5,h7
Barium	MG/KG	57.5	
Calcium	MG/KG	1080	
Chromium	MG/KG	6.4	e1,h5
Copper	MG/KG	3.5	
Iron	MG/KG	7600	e1
Lead	MG/KG	9.2	
Magnesium	MG/KG	1290	
Manganese	MG/KG	612	e1
Nickel	MG/KG	4.1	
Potassium	MG/KG	508	
Selenium	MG/KG	0.6	e5,h5
Vanadium	MG/KG	14.3	
Zinc	MG/KG	17.5	

AUS-0A8S-017	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	9950	
Arsenic	MG/KG	4.1	h1,h5,h7
Barium	MG/KG	1220	h5
Cadmium	MG/KG	0.3	b1
Calcium	MG/KG	6560	b1
Chromium	MG/KG	11.1	e1,h5
Copper	MG/KG	8.9	
Iron	MG/KG	14000	e1
Lead	MG/KG	19.2	
Magnesium	MG/KG	4570	b1
Manganese	MG/KG	207	e1
Nickel	MG/KG	10.8	h5
Potassium	MG/KG	653	b1
Vanadium	MG/KG	16.4	
Zinc	MG/KG	50.5	
Other Parameters			
TOC	MG/KG	14700	

AUS-0A8S-027	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4690	
Arsenic	MG/KG	5.3	h1,h3,h7
Barium	MG/KG	62.1	
Cadmium	MG/KG	0.05	
Calcium	MG/KG	2330	b1
Chromium	MG/KG	7.3	e1,h5
Copper	MG/KG	4.7	
Iron	MG/KG	10500	e1
Lead	MG/KG	11	
Magnesium	MG/KG	2230	b1
Manganese	MG/KG	647	e1
Nickel	MG/KG	4.8	
Potassium	MG/KG	370	
Selenium	MG/KG	0.44	e5,h5
Sodium	MG/KG	1.3	b1,e1
Vanadium	MG/KG	18	
Zinc	MG/KG	21.7	

AUS-0A8S-030	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7920	
Antimony	MG/KG	0.26	
Arsenic	MG/KG	18.3	h1,e1,h1,h3,h7
Barium	MG/KG	114	h5
Cadmium	MG/KG	0.39	b1
Calcium	MG/KG	3350	b1
Chromium	MG/KG	14.8	e1,h5
Cobalt	MG/KG	9.8	
Copper	MG/KG	16.9	b1
Iron	MG/KG	30700	e1,h5
Lead	MG/KG	22.6	
Magnesium	MG/KG	2060	b1
Manganese	MG/KG	1160	e1
Mercury	MG/KG	0.07	b1,e5
Nickel	MG/KG	14.7	h5
Potassium	MG/KG	620	
Selenium	MG/KG	1.6	e1,e5,h5
Silver (duplicate)	MG/KG	0.27	
Vanadium	MG/KG	23.8	
Zinc	MG/KG	60.2	b1

AUS-0A8S-032 Sediment	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4650	
Antimony	MG/KG	0.99	h5
Arsenic	MG/KG	15	h1,e2,h1,h3,h7
Barium	MG/KG	54.9	
Beryllium	MG/KG	1.2	h7
Boron	MG/KG	66.5	
Calcium	MG/KG	4300	b2
Chromium	MG/KG	14.5	h5
Cobalt	MG/KG	4.9	
Copper	MG/KG	12.9	
Iron	MG/KG	21600	b2
Lead	MG/KG	19	
Magnesium	MG/KG	456	
Manganese	MG/KG	94	
Mercury	MG/KG	0.035	e5
Nickel	MG/KG	10.7	h5,h7
Potassium	MG/KG	662	
Selenium	MG/KG	3	e2,e4,e5,h5,h9
Sodium	MG/KG	108	
Thallium	MG/KG	0.72	h5
Vanadium	MG/KG	78.1	h5
Zinc	MG/KG	49.6	

AUS-0A8S-001	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4500	
Arsenic	MG/KG	6.8	h1,h5,h7
Barium	MG/KG	68.8	
Cadmium	MG/KG	0.34	b1
Calcium	MG/KG	3080	b1
Chromium	MG/KG	13.7	e1,h5
Cobalt	MG/KG	8.1	
Iron	MG/KG	16400	e1
Lead	MG/KG	11.6	
Magnesium	MG/KG	2370	b1
Manganese	MG/KG	1160	e1
Mercury	MG/KG	0.12	e5,e5
Nickel	MG/KG	8.2	h5
Potassium	MG/KG	383	
Selenium	MG/KG	1.6	e1,e5,h5
Silver	MG/KG	0.34	
Vanadium	MG/KG	25	
Zinc	MG/KG	179.0	h9,b1

AUS-0A8S-018	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5480	
Arsenic	MG/KG	6.9	h1,h5,h7
Barium	MG/KG	68.5	
Calcium	MG/KG	2780	b1
Chromium	MG/KG	7	e1,h5
Copper	MG/KG	4.2	
Iron	MG/KG	9820	e1
Lead	MG/KG	14	
Magnesium	MG/KG	2150	b1
Manganese	MG/KG	621	e1
Nickel	MG/KG	4.9	
Potassium	MG/KG	515	
Selenium	MG/KG	1	e5,h5
Silver	MG/KG	0.22	
Vanadium	MG/KG	21.6	
Zinc	MG/KG	19.6	

AUS-0A8S-020	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6460	
Arsenic	MG/KG	4.6	h1,h5,h7
Barium	MG/KG	74.3	
Calcium	MG/KG	1180	
Chromium	MG/KG	9.4	e1,h5
Copper	MG/KG	5.6	
Iron	MG/KG	12700	e1
Lead	MG/KG	10.5	
Magnesium	MG/KG	1480	
Manganese	MG/KG	295	e1
Nickel	MG/KG	11.4	h5
Potassium	MG/KG	377	
Vanadium	MG/KG	17.21	
Zinc	MG/KG	34.2	

AUS-0A8S-021	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	9760	
Arsenic	MG/KG	7.3	h1,h5,h7
Barium	MG/KG	58.6	h5
Cadmium	MG/KG	0.17	
Calcium	MG/KG	1490	
Chromium	MG/KG	13	e1,h5
Cobalt	MG/KG	5	
Copper	MG/KG	10.2	
Iron	MG/KG	15800	e1
Lead	MG/KG	14.2	
Magnesium	MG/KG	2160	b1
Manganese	MG/KG	695	e1
Nickel	MG/KG	11.1	h5
Potassium	MG/KG	485	b1
Selenium	MG/KG	0.97	e5,h5
Vanadium	MG/KG	25.6	
Zinc	MG/KG	39.8	

AUS-0A8S-031	Units	Result: 5 ft	Reference Code	Result: 8 ft	Reference Code
Metals					
Aluminum	MG/KG	8540		7400	
Arsenic	MG/KG	5	h1,h5	3.6	h1,h5,h7
Barium	MG/KG	105	h5	305	h5
Calcium	MG/KG	787		1050	
Chromium	MG/KG	7.9	e1,h5	13.6	e1,h5
Cobalt	MG/KG	2.7		NA	
Copper	MG/KG	5.9		7.1	
Iron	MG/KG	10200	e1	11300	e1
Lead	MG/KG	7.8		5.4	
Magnesium	MG/KG	1540		1990	b1
Manganese	MG/KG	170	e1	54.2	
Nickel	MG/KG	5		6.7	
Potassium	MG/KG	555		227	
Vanadium	MG/KG	12.4		21.5	
Zinc	MG/KG	19.8		19.3	

AUS-0A8S-W02	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	10800	
Arsenic	MG/KG	5.6	h1,h5,h7
Barium	MG/KG	43.6	
Cadmium	MG/KG	0.31	b1
Calcium	MG/KG	45000	b1
Chromium	MG/KG	11.3	e1,h5
Copper	MG/KG	7	
Iron	MG/KG	14200	e1
Lead	MG/KG	7.7	
Magnesium	MG/KG	2300	b1
Manganese	MG/KG	110	e1
Nickel	MG/KG	6.5	
Potassium	MG/KG	462	
Vanadium	MG/KG	15.4	
Zinc	MG/KG	30.4	

AUS-0A8S-W03	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7530	
Arsenic	MG/KG	8.2	e1,h1,h5,h7
Barium	MG/KG	392	e1,h5,h7
Cadmium	MG/KG	0.45	b1,h5
Calcium	MG/KG	12200	b1
Chromium	MG/KG	11.4	e1,h5
Cobalt	MG/KG	20.4	e1
Copper	MG/KG	6.6	
Iron	MG/KG	14700	e1
Lead	MG/KG	22.7	
Magnesium	MG/KG	7600	b1
Manganese	MG/KG	6540	e1,h5
Nickel	MG/KG	12.5	h5
Potassium	MG/KG	438	
Selenium	MG/KG	3.8	b1,e1,e5,h5,h9
Silver	MG/KG	1.9	b1,h9
Vanadium	MG/KG	27.7	
Zinc	MG/KG	170	b1,h9

AUS-0A8S-022	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	9800	
Arsenic	MG/KG	3.6	h1,h5,h7
Barium	MG/KG	83.3	h5
Cadmium	MG/KG	0.2	b1
Calcium	MG/KG	2600	b1
Chromium	MG/KG	11.8	e1,h5
Copper	MG/KG	8	
Iron	MG/KG	14300	e1
Lead	MG/KG	14	
Magnesium	MG/KG	2410	b1
Manganese	MG/KG	220	e1
Nickel	MG/KG	9.9	h5
Potassium	MG/KG	610	
Selenium	MG/KG	0.79	e5,h5
Vanadium	MG/KG	19.4	
Zinc	MG/KG	41.6	

AUS-0A8S-W04	Units	Result: 0 - 6 in	Reference Code
Aluminum	MG/KG	6540	
Antimony (duplicate)	MG/KG	0.34	h5
Arsenic	MG/KG	4.8	h1,h5,h7
Barium	MG/KG	67.4	
Boron	MG/KG	4.3	e1
Calcium	MG/KG	2300	
Chromium	MG/KG	13.2	e1,h5
Cobalt	MG/KG	7.1	
Copper	MG/KG	8	
Iron	MG/KG	12000	e1
Lead	MG/KG	600	b2,e2,h10
Magnesium	MG/KG	1160	
Manganese	MG/KG	488	e1
Nickel	MG/KG	12.7	h5
Potassium	MG/KG	371	
Vanadium	MG/KG	31.4	
Zinc	MG/KG	31.8	

AUS-0A8S-023 Sediment	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	27900	e2,e5
Antimony	MG/KG	3.3	e2,e4,h10
Arsenic	MG/KG	69.2	e1,e2,e5,h1,h5,h7
Barium	MG/KG	1430	e2,e4,h10
Boron	MG/KG	30.2	
Cadmium	MG/KG	5.53	e2,e4,h5,h10
Calcium	MG/KG	28000	b2
Chromium	MG/KG	98.7	e2,e4,h5,h10
Cobalt	MG/KG	17.6	b2
Copper	MG/KG	330	e2,e4,h10
Iron	MG/KG	103000	b2
Lead	MG/KG	440	e2,e4,h10
Magnesium	MG/KG	11600	b2
Manganese	MG/KG	1180	e2,e5
Mercury	MG/KG	0.13	e5
Nickel	MG/KG	64.9	e2,e4,h10
Potassium	MG/KG	597	
Silver	MG/KG	2.8	e2,e4,h10
Vanadium	MG/KG	118	e2,h10
Zinc	MG/KG	1500	e2,e4,h10

AUS-0A8S-024 Sediment	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	8050	
Antimony	MG/KG	0.39	h5
Arsenic	MG/KG	7	h1,h5,h7
Barium	MG/KG	135	h5
Boron	MG/KG	3.3	
Calcium	MG/KG	1950	b2
Chromium	MG/KG	14.2	h5
Cobalt	MG/KG	8.6	
Copper	MG/KG	13.1	
Iron	MG/KG	20000	b2
Lead	MG/KG	14.3	
Magnesium	MG/KG	2300	b2
Manganese	MG/KG	426	
Nickel	MG/KG	14.9	h5
Potassium	MG/KG	569	
Vanadium	MG/KG	21.6	
Zinc	MG/KG	48.1	

AUS-0A8S-W05	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	8410	
Arsenic	MG/KG	7.7	h1,h5,h7
Barium	MG/KG	91.1	h5
Calcium	MG/KG	1140	
Chromium	MG/KG	13.2	e1,h5
Cobalt	MG/KG	7.9	
Copper	MG/KG	10.1	
Iron	MG/KG	16200	e1
Lead	MG/KG	11.3	h5
Magnesium	MG/KG	1910	b1
Manganese	MG/KG	394	e1
Nickel	MG/KG	11.3	h5
Potassium	MG/KG	465	
Selenium	MG/KG	0.77	e5,h5
Vanadium	MG/KG	24.2	
Zinc	MG/KG	34	

AUS-0A8S-019	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7860	
Antimony	MG/KG	0.34	h5
Arsenic	MG/KG	6.6	h1,h5,h7
Barium	MG/KG	140	h5
Boron	MG/KG	2	e1
Cadmium	MG/KG	0.34	b1
Calcium	MG/KG	20300	b1
Chromium	MG/KG	12.3	e1,h5
Cobalt	MG/KG	19.6	
Copper	MG/KG	33.3	e1,h10
Iron	MG/KG	15900	e1
Lead	MG/KG	21.4	
Magnesium	MG/KG	4910	b1
Manganese	MG/KG	419	e1
Nickel	MG/KG	10.8	h5
Potassium	MG/KG	466	
Selenium	MG/KG	0.3	e5
Vanadium	MG/KG	17.7	
Zinc	MG/KG	68.1	b1

AUS-0A8S-026	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5150	
Arsenic	MG/KG	4.6	h1,h5,h7
Barium	MG/KG	64.8	
Calcium	MG/KG	7300	b1
Chromium	MG/KG	7.8	e1,h5
Copper	MG/KG	4.9	
Iron	MG/KG	10400	e1
Lead	MG/KG	12.7	
Magnesium	MG/KG	2720	b1
Manganese	MG/KG	574	e1
Nickel	MG/KG	5.4	
Potassium	MG/KG	410	
Selenium	MG/KG	0.33	e5,h5
Vanadium	MG/KG	19.6	
Zinc	MG/KG	22.6	

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT.
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.

Revision No.	Description	Date	By	App.

REVISIONS

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

AUS–0A8S Sample Locations
and Detections of Inorganic Compounds
in Soils/Sediments

Date:	Project Number:	Figure Number:
June 29, 2000	2320000026.00	12–6
Drawn by: DJD	Design by: MM	Checked by: CMW

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AREA 8 SOUTH–FORMER IOP LOAD LINE III

LEGEND

- MONITORING WELL LOCATION
- HAND AUGER LOCATION
- USEPA 1998 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
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

NOTES:

1. BASE TOPOGRAPHIC MAP PREPARED BY WALKER & ASSOCIATES, FROM FLYOVER IN JANUARY 2000. CONTOUR INTERVAL IS ONE FOOT.

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-0A8S-W05-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Chloromethane	UG/L	0.6	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	412	
Calcium	UG/L	78600	
Iron	UG/L	506	
Magnesium	UG/L	39100	
Manganese	UG/L	209	h7,h8,h9,h10
Selenium	UG/L	5.1	
Sodium	UG/L	67400	

AUS-0A8S-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	640	
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
TDS	MG/L	6400	e3,e4
TSS	MG/L	53	

AUS-0A8S-W02-GW-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			
Calcium	UG/L	344000	
Magnesium	UG/L	165000	
Potassium	UG/L	1330	
Selenium	UG/L	4	
Sodium	UG/L	87900	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W03-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
2-Amino-4,6-Dinitrotoluene	UG/L	1.1	
4-Amino-2,6-Dinitrotoluene	UG/L	0.81	
Metals			
Aluminum	UG/L	207	
Calcium	UG/L	110000	
Iron	UG/L	205	
Magnesium	UG/L	130000	
Manganese	UG/L	327	h7,h8,h9,h10
Potassium	UG/L	1320	
Selenium	UG/L	12.7	
Sodium	UG/L	149000	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W04-GW-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	160	
Barium	UG/L	73.4	
Boron	UG/L	28.4	
Calcium	UG/L	84200	
Iron	UG/L	205	
Magnesium	UG/L	46400	
Manganese	UG/L	9.9	
Sodium	UG/L	25900	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-023-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			
Barium	UG/L	31.8	h3
Calcium	UG/L	12600	h3
Cobalt	UG/L	27.4	e3,e4,e5
Iron	UG/L	1100	e3,e4,e5,h3,h10
Magnesium	UG/L	5350	h3
Manganese	UG/L	160	
Mercury	UG/L	0.1	h10
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-024-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	1000	e3,e4
Barium	UG/L	51.5	h3
Calcium	UG/L	11900	h3
Chromium	UG/L	2.2	
Cobalt	UG/L	3.8	e5
Copper	UG/L	4.4	
Iron	UG/L	2260	e3,e4,e5,h3,h10
Magnesium	UG/L	6410	h3
Manganese	UG/L	481	
Selenium	UG/L	4.4	h3
Sodium	UG/L	4010	h3
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W06-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	UG/L	3.1	e3,e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	437	e3,e5
Barium	UG/L	94.7	h3
Calcium	UG/L	114000	h3
Iron	UG/L	312	h3
Magnesium	UG/L	66300	h3
Manganese	UG/L	83.8	h3
Potassium	UG/L	1710	h3
Sodium	UG/L	55500	h3
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-002-SW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	UG/L	3.1	e3,e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	437	e3,e5
Barium	UG/L	94.7	h3
Calcium	UG/L	114000	h3
Iron	UG/L	312	h3
Magnesium	UG/L	66300	h3
Manganese	UG/L	83.8	h3
Potassium	UG/L	1710	h3
Sodium	UG/L	55500	h3
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W02-GW-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			
Calcium	UG/L	344000	
Magnesium	UG/L	165000	
Potassium	UG/L	1330	
Selenium	UG/L	4	
Sodium	UG/L	87900	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W03-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
2-Amino-4,6-Dinitrotoluene	UG/L	1.1	
4-Amino-2,6-Dinitrotoluene	UG/L	0.81	
Metals			
Aluminum	UG/L	207	
Calcium	UG/L	110000	
Iron	UG/L	205	
Magnesium	UG/L	130000	
Manganese	UG/L	327	h7,h8,h9,h10
Potassium	UG/L	1320	
Selenium	UG/L	12.7	
Sodium	UG/L	149000	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W04-GW-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	160	
Barium	UG/L	73.4	
Boron	UG/L	28.4	
Calcium	UG/L	84200	
Iron	UG/L	205	
Magnesium	UG/L	46400	
Manganese	UG/L	9.9	
Sodium	UG/L	25900	
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-023-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			
Barium	UG/L	31.8	h3
Calcium	UG/L	12600	h3
Cobalt	UG/L	27.4	e3,e4,e5
Iron	UG/L	1100	e3,e4,e5,h3,h10
Magnesium	UG/L	5350	h3
Manganese	UG/L	160	
Mercury	UG/L	0.1	h10
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-024-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	1000	e3,e4
Barium	UG/L	51.5	h3
Calcium	UG/L	11900	h3
Chromium	UG/L	2.2	
Cobalt	UG/L	3.8	e5
Copper	UG/L	4.4	
Iron	UG/L	2260	e3,e4,e5,h3,h10
Magnesium	UG/L	6410	h3
Manganese	UG/L	481	
Selenium	UG/L	4.4	h3
Sodium	UG/L	4010	h3
Other Parameters			
Perchlorate	UG/L	ND	

AUS-0A8S-W05-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
Chloromethane	UG/L	0.6	
Semivolatile Organic Compounds			
All SVOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	412	
Calcium	UG/L	78600	
Iron	UG/L	506	
Magnesium	UG/L	39100	
Manganese	UG/L	209	h7,h8,h9,h10
Selenium	UG/L	5.1	
Sodium	UG/L	67400	

AUS-0A8S-W01-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Explosives			
All Explosives	UG/L	ND	
Other Parameters			
Alkalinity, Total (as CaCO3)	MG/L	640	
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	ND	
Perchlorate	UG/L	ND	
TDS	MG/L	6400	e3,e4
TSS	MG/L	53	

AUS-0A8S-W06-GW-00	Units	Result	Screening Codes
Volatile Organic Compounds			
All VOCs	UG/L	ND	
Semivolatile Organic Compounds			
bis(2-Ethylhexyl)phthalate	UG/L	3.1	e3,e5
Explosives			
All Explosives	UG/L	ND	
Metals			
Aluminum	UG/L	437	e3,e5
Barium	UG/L	94.7	h3
Calcium	UG/L	114000	h3
Iron	UG/L	312	h3
Magnesium	UG/L	66300	h3
Manganese	UG/L	83.8	h3
Potassium	UG/L	1710	h3
Sodium	UG/L	55500	h3
Other Parameters			
Perchlorate	UG/L	ND	

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Revision No.	Description	Date	By	App.

REVISIONS

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

AUS–ØA8S Sample Locations and Detections in Surface Water and Groundwater

Date:	Project Number:	Figure Number:
June 29, 2000	2320000026.00	12–7
Drawn by: DJD	Design by: MM	Checked by: CMW

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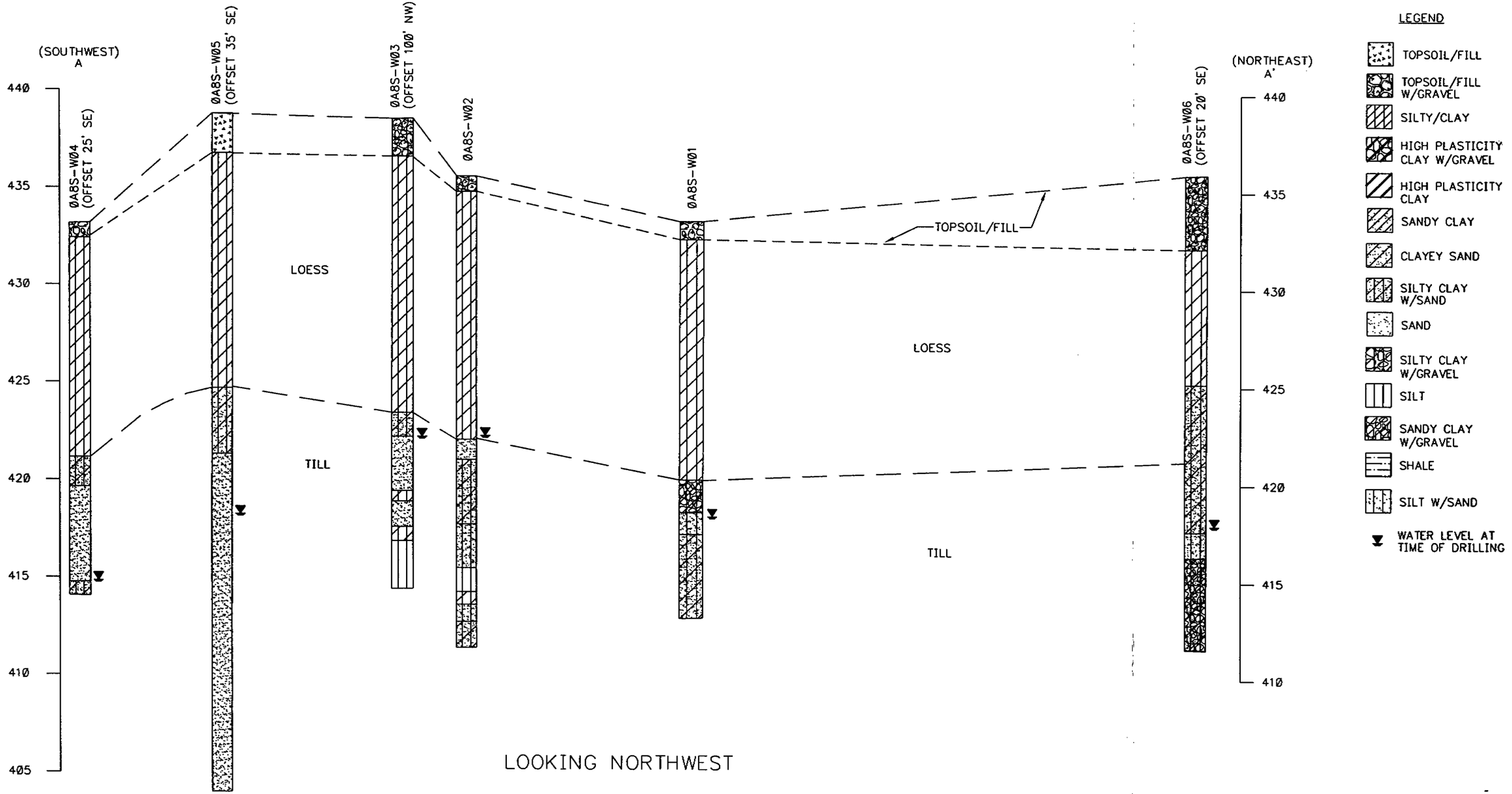

LOOKING NORTHWEST

HORIZONTAL SCALE: 1" = 300'
VERTICAL SCALE: 1" = 5'

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PA/SI REPORT-AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: djd 10/17/00 DSGN. BY: dre CHKD. BY: mmf	Geologic Cross-Section A-A' for Area 8 South — FIG. NO. 12-8

LEGEND

⌖ MONITORING WELL LOCATION

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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: cmw	Area 8 South Groundwater Elevation Map-May 2000	FIG. NO. 12-9

File: E:\2320000026.00\PA-SI REPORT-AUS OU\FIG 12-9.DWG Last edited: Dec. 16, 01 @ 11:30 a.m. URS Corp.

Area 9 is located just north of Ogden Road, approximately one-half mile east of Highway 148 (Figure 13-1). Area 9 was the Illinois Ordnance Plant (IOP) Group I Load Line and was later used by industrial tenants.

AUS Original Site Designations

Seven of the original sites designated in 1997-1999 by the United States Fish & Wildlife Service (USFWS) as part of the Additional and Uncharacterized Sites Operable Unit (AUS OU) were located in Area 9: AUS-0034 through AUS-0040.

13.1 HISTORIC SEARCH INFORMATION

13.1.1 Site Description

Area 9, shown in Figure 13-2, originally consisted of the 38 buildings that make up the IOP Load Line I.[1,2] Load Line I was designed, built and used by the Sherwin Williams Defense Corporation, under contract with the War Department (SWDC/War Department), for the loading of artillery shells. There have been two major post-World War II tenants in Area 9: Sangamo Electric Company (Sangamo), later Sangamo Westin, Inc., now Schlumberger Industries, Inc. (1946 to 1963) and Olin Corporation and its successors (1967 to the present).

In 1996 and 1997, a large area in and near Area 9 was remediated as a part of the PCB OU, which primarily addressed contamination resulting from Sangamo's operations.[3] The design excavation boundaries for this remedial operation are shown on Figure 13-3, but the excavation boundaries expanded during remediation.[4] During the remediation, chlorinated volatile organic compounds (CVOCs) were found in the soil and groundwater in the general area of the PCB remediation. The CVOC contamination will be remediated as part of the PCB OU; that work is currently in the pre-design phase.

The historic information in this report includes Sangamo and Olin's activities, as well as the many other smaller and shorter-term tenants. All known tenant information is summarized in Table 13-1.

Olin entered into a lease for Area 9 in 1967, and used this area for manufacturing mortar flares and medium caliber ammunition[5,6] until 1996 when Olin's ordnance division was spun off to Primex Technologies, Inc. (Primex). General Dynamics Corporation acquired Primex in January

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[1] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant Carbondale, IL, Part I, Section 5, Page 1, (Plan no. 6544-101.62).

[2] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant Carbondale, IL, Part I, Section 5, Page 8, (Plan no. 6544-101.14).

[3] Fluor Daniel GTI, August 1997, Acceptance Report for Closure of PCB Areas Operable Unit Landfill, Crab Orchard National Wildlife Refuge, Marion, IL.

[4] The design excavation boundary was provided to URS as an electronic file from FWS. The actual remediation boundary is greater, but the extent is not known.

[5] DOI 001199. Olin's response to First Set of Information Requests, Page 4.

[6] Interview with Mr. Norm Thomas as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations and Ownership History, Crab Orchard National Wildlife Refuge, Page B-1.

2001. Primex became a wholly owned subsidiary of General Dynamics and changed its name to General Dynamics Ordnance and Tactical Systems, Inc. (GDO&TS).[7,8] Primex assumed the Olin lease at the end of 1996. GDO&TS assumed the lease in January 2001 and is currently the sole tenant in Area 9.

13.1.2 Operational History and Waste Characteristics

13.1.2.1 IOP Load Line I Operations – General Information

SWDC/War Department constructed and occupied all of the original buildings in Area 9, from 1942 through 1945, for the production of shells and anti-tank mines. Figure 13-2 identifies all of the Load Line I buildings used by SWDC/War Department during World War II, while the IOP was in operation. The following discussion of IOP operations was obtained from the 1944 War Department Facilities Inventory except where otherwise noted.

Load Line I was originally constructed to load 105mm artillery shells.[9] This process generally began on the southernmost end of Load Line I where raw materials were brought in and stored (Buildings I-1-1 and I-1-2). The shells were cleaned and painted in Building I-1-3 then loaded with either melted amatol or melted trinitrotoluene (TNT) and cooled in Building I-1-6. After the shells were filled, they were drilled out so that the booster and a fuse could be placed inside. Finally these shells were loaded on trucks and shipped off site. Rail lines were used at the beginning of the load line for bringing in materials.

In 1943, Load Line I was re-tooled to produce metallic anti-tank mines.[10] Both M1A1 anti-tank mine fuses and M115 boosters were used in the production of the anti-tank mines.[11] The M1A1 detonators for the anti-tank mine fuses were made up of lead azide, antimony sulfide, carborundrum, potassium chlorate and tetryl.[12]

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[7] General Dynamics Ordnance and Tactical Systems, Letter to Crab Orchard National Wildlife Refuge regarding Building and Igloo Lease Contract No. 14-16-0003-96-579, changing Primex's name to General Dynamics Ordnance and Tactical Systems, Inc., dated January 29, 2001.

[8] Amendment No. 13 to Building and Igloo Lease Contract No. 14-16-0003-96-579, Primex Technologies, Inc., effective January 29, 2001; and, Crab Orchard National Wildlife Refuge, Letter to General Dynamics Ordnance and Tactical Systems, Inc. enclosing Amendment No. 13 regarding the Primex name change, dated March 13, 2001.

[9] NAR 000016. IOP, Illinois Ordnance Plant, Historical Record, August 18th, 1941 to December 31st, 1942, Page 11.

[10] DPRA Document No. 00028115. US Army Corps of Engineers, 1993, Defense Environmental Restoration Program for Formerly Used Defense Sites, Ordnance and Explosive Waste, Archives Search Report, Findings for the former Illinois Ordnance Plant, Carbondale, Illinois, Project Number E05IL000203, Page 14 of Document No. F-14.

[11] DPRA Document No. 00028115. US Army Corps of Engineers, 1993, Defense Environmental Restoration Program for Formerly Used Defense Sites, Ordnance and Explosive Waste, Archives Search Report, Findings for the former Illinois Ordnance Plant, Carbondale, Illinois, Project Number E05IL000203, Page 14 of Document No. F-14.

[12] DPRA Document No. 00028115. US Army Corps of Engineers, 1993, Defense Environmental Restoration Program for Formerly Used Defense Sites, Ordnance and Explosive Waste, Archives Search Report, Findings for the former Illinois Ordnance Plant, Carbondale, Illinois, Project Number E05IL000203, Page 14 of Document No. F-14.

Load Line I was shut down and placed on standby in June 1945,[13] and all operations were ended on V-J Day (September 2, 1945).[14]

IOP Decontamination

After the IOP operations ended at CONWR, the IOP was to be decontaminated in accordance with standard Army procedures (for a discussion, see section 3.1.2.3.). Post-World War II military records are inadequate to determine if this area was decontaminated and, if so, whether the standard procedures were followed.

Leftover shells were shipped off site as was confirmed by Mr. Virgil Hollis (a former SWDC).[15] Mr. Hollis also added that any of the remaining anti-tank landmines were detonated in pits.

13.1.2.2 Sangamo Operations – General Information

Lease documents indicate Sangamo occupied several buildings in this area (discussed on a building-by-building basis in Section 13.1.2.18), from 1946 to 1962.[16,17,18,19,20,21] Sangamo manufactured various kinds of AC and DC capacitors (made with either copper or steel covers) including mica capacitors (sometimes made with lead foil), electrolytic capacitors, oil-filled paper capacitors, molded paper capacitors, and power factor capacitors.[22,23] They also manufactured other equipment in Area 9 such as transducers for sonar apparatus, small dry transformers (containing copper wire), and delay line equalizers.[24,25] Sangamo used lead (tin-lead) a component of solder to coat small parts, particularly electrical connections (by dipping them into molten solder).[26,27]

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[13] NAR 000681. IOP, Illinois Ordnance Plant, Carbondale, Illinois, Historical Record, 1 April 1945 to 30 June 1945, Page 12.

[14] NAR 000691. IOP, Illinois Ordnance Plant, Carbondale, Illinois, Historical Record, 1 October 1945 to 1 July 1946, (page number illegible).

[15] ACO 000128. Virgil Hollis, personal interview, as found in Appendix H, Page H-7, of an unknown report.

[16] DOI 007663 – DOI 007674. Lease, Sangamo Electric Company, dated September 27, 1946.

[17] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.

[18] DOI 007669 – DOI 007672. Lease Renewal Agreement, Sangamo Electric Company, dated February 19, 1951, Pages 1-2.

[19] DOI 007683 – DOI 007692. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.

[20] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.

[21] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.

[22] DPRA Document No. 00020115. Schlumberger Environmental Services, Inc. (Sangamo Electric Company) response to the request for information pursuant to Section 104 (e) of CERCLA, dated August 31, 1989.

[23] DOI 007588. Deposition of Robert Eugene Cochran, June 8, 1987, Pages 13 and 21.

[24] DPRA Document No. 00020115. Schlumberger Environmental Services, Inc. (Sangamo Electric Company) response to the request for information pursuant to Section 104 (e) of CERCLA, dated August 31, 1989.

[25] DOI 007588. Deposition of Robert Eugene Cochran, June 8, 1987, Pages 21, 26, and 27.

[26] DPRA Document No. 00020115. Schlumberger Environmental Services, Inc. (Sangamo Electric Company) response to the request for information pursuant to Section 104 (e) of CERCLA, dated August 31, 1989.

Degreasers and other chemicals were used by Sangamo in their manufacturing processes, including various types of acids, acetone, ethylene glycol, epoxy resins, silver (in a paste-like compound), ammonia, trichloroethylene, perchloroethylene, and liquid Aroclor 1254 and 1242.[28,29] They also used substances such as polyester or alkyd putties, microcrystalline wax, and a chemical referred to as "butyl carbitol acetate" (used to thin the silver paste compound).[30] In 1955, Sangamo planned to institute a copper and silver plating operation in Area 9 requiring the use of chromic, nitric, sulfuric, and hydrochloric acid, and copper and silver cyanide.[31,32,33] Sangamo planned to discharge wastes from this plating operation to either the sanitary sewer system or directly to Crab Orchard Lake via a northeast drainage channel.[34,35,36] To satisfy concerns of the Illinois Sanitary Water Board (SWB) regarding cyanide waste from this operation, Sangamo proposed to treat the cyanide in their plating rinse water by hypochlorite treatment prior to discharge;[37,38] however, it is unknown if the plating operation ever began. If it was, no information was found regarding where Sangamo discharged plating wastes.

13.1.2.3 Olin Operations – General Information

As noted above, Olin Corporation leased 48 acres and numerous buildings in Area 9 beginning in 1967[39,40,41] and continuing until the Primex Technologies spin-off in 1996. GDO&TS is

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[27] DPRA Document No. 00022545. Schlumberger Environmental Services, Inc., Letter to USEPA containing supplement information pursuant to Section 104 (e) request, dated August 20, 1990, Page 2.
[28] DPRA Document No. 00020115. Schlumberger Environmental Services, Inc. (Sangamo Electric Company) response to the request for information pursuant to Section 104 (e) of CERCLA, dated August 31, 1989.
[29] DPRA Document No. 00022545. Schlumberger Environmental Services, Inc., Letter to USEPA containing supplement information pursuant to Section 104 (e) request, dated August 20, 1990, Page 2.
[30] DPRA Document No. 00022545. Schlumberger Environmental Services, Inc., Letter to USEPA containing supplement information pursuant to Section 104 (e) request, dated August 20, 1990, Page 2.
[31] DPRA Document No. 00018707. Illinois Sanitary Water Board, Memorandum to M. R. Golley regarding Sangamo's plan to begin plating operations at the Refuge, dated June 17, 1955.
[32] DPRA Document No. 00018720. Sangamo Electric Company, Letter to the Illinois Sanitary Water Board regarding Sangamo's plan for a plating operation at the Refuge, detailing chemical components of the operation, dated June 20, 1955.
[33] DPRA Document No. 00018724. Illinois Sanitary Water Board, Letter to Sangano Electric Company regarding Sangamo's proposed plating operation, dated June 27, 1955.
[34] DPRA Document No. 00018720. Sangamo Electric Company, Letter to the Illinois Sanitary Water Board regarding Sangamo's plan for a plating operation at the Refuge, detailing chemical components of the operation, dated June 20, 1955.
[35] DPRA Document No. 00018730. Illinois Sanitary Water Board, Memorandum to the Division of Sanitary Engineering regarding a site visit to Sangamo's operation in Area 9, dated June 28, 1955.
[36] DPRA Document No. 00019836. Illinois Sanitary Water Board, Letter to Sangamo Electric Company regarding Sangamo's proposed plating operation, dated August 22, 1955.
[37] DPRA Document No. 00019842. Sangamo Electric Company, Letter to the Illinois Sanitary Water Board regarding treating the cyanide plating rinse water with a hypochlorite treatment, dated August 18, 1955.
[38] DPRA Document No. 00019836. Illinois Sanitary Water Board, Letter to Sangamo Electric Company regarding Sangamo's proposed plating operation, dated August 22, 1955.
[39] DOI 001508 – DOI 001509. Lease # 14-16-0003-12613, dated January 1, 1967, Pages 1-2.
[40] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-82-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980, Page 1 and Page 1 of 1A.
[41] DPRA Document No. 00007527. Amendment No. 11 to Lease Contract No. 14-16-0003-12613, Primex Technologies, Inc., dated January 1, 1997.

currently the only tenant in Area 9.[42] Olin and its successors used this area for several different activities including its pyrotechnic operations, which included manufacturing 60mm and 81mm mortar magnesium flares for the military during the Vietnam War, as well as medium caliber ammunition production.[43,44,45] The pyrotechnic operations were relocated from Olin's East Alton plant to Area 9 in 1967.[46]

Olin began their operation in Area 9 with the production of illumination flares,[47,48,49] which were made with a combination of ammonium perchlorate, magnesium and an oxidizer bound together with some type of plastic binder.[50,51,52] After the end of the Vietnam War, Olin's production in Area 9 turned to ammunition products. Medium caliber (20 millimeter (mm)) ammunition production was relocated from Kingsbury, Indiana to Area 9 in 1973[53,54] and ammunition products have been made there ever since.[55]

Table 13-3 lists the different ammunition products manufactured by Olin and its successors. Included in this ammunition line was the assembly operation of ammunition containing depleted uranium (DU) penetrators.[56] Olin has been licensed for the use of depleted uranium (in pre-formed, plastic wrapped cones which are inserted into projectiles), since the early 1970s. Since 1978, these licenses have been issued by the Illinois Department of Nuclear Safety (IDNS)[57] which performs regular inspections and requires monitoring and training of Olin/Primex/GDO&TS personnel. When and if Olin/Primex/GDO&TS terminates its license in the future, it will be required to conduct a survey and any clean-up that may be necessary under IDNS oversight.

A 1985 Olin map indicated explosive quantities and types located in Area 2B buildings as well as the classification of these explosives. Table 13-3A summarizes this information.

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[42] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[43] DPRA Document No. 00009356. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1966, Page 50.
[44] DPRA Document No. 00009355. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1967, Page 50.
[45] Interview with Mr. Norm Thomas as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations and Ownership History, Crab Orchard National Wildlife Refuge, Page B-1.
[46] DOI 001199. Olin's response to First Set of Information Requests, Page 4.
[47] Deposition of John Miller, April 9, 1998, Page 62.
[48] Deposition of George T. Wisely, June 28, 1999, Pages 49-50.
[49] Deposition of Charles Funk, April 9, 1998, Pages 53-54.
[50] Department of the Army, September 1984, Military Explosives Technical Manual, (NTIS # TM 9-1300-214), Page 10-2.
[51] Deposition of John Miller, April 9, 1998, Page 63.
[52] Deposition of George T. Wisely, June 28, 1999, Page 51
[53] DOI 001199. Olin's response to First Set of Information Requests, Page 4.
[54] Deposition of Charles Funk, April 9, 1998, Page 9.
[55] Deposition of Charles Funk, April 9, 1998, Pages 41-42.
[56] DPRA Document No. 00014843. Olin Corporation, Addendum to Radioactive Material License and Application, dated November 15, 1988, Page 004174.
[57] DPRA Document No. 00014809. Olin Corporation, Radioactive Material License and Application, dated November 15, 1988, Page 004150.

13.1.2.4 Building Specific Information

This section describes IOP, Sangamo, and Olin operations. Information about other tenant uses is described in Tables 13-1 and 13-2.

Industrial tenants at the Refuge were allowed to move existing buildings, construct new buildings and raze old buildings in the areas that they occupied, and often the USFWS would not have records of this activity. Those buildings which were newly constructed were sometimes given the same building number as other buildings that had been razed. In the discussion below, IOP building numbers that a tenant used again for a different building are designated as "IOP," and the new building is designated with the name of the tenant.. For example, there is an IOP Building I-1-19, and an Olin Building I-1-19.

The current configuration for Area 9 is shown on Figure 13-2a. Table 13-2 lists the buildings in Area 9 and their functions over the years.

Mr. Kermit Troutman, a former SWDC employee, provided a description of bomb loading procedures at Load Line III.[58] Most of his information is applicable to Load Line I because of the configuration similarities of both load lines. That general information is not repeated in this section; it is discussed in Section 12. Only information specific to Load Line I buildings is discussed below.

Building I-1-1 – Inert Storage Building

At the beginning of Load Line I (generally from south to north) there was the IOP Inert Storage Building (I-1-1).[59] Rail lines ran along the west side of this building.[60] They entered the site from the south and ran to the north as far as the IOP Cleaning and Painting Building (I-1-3). Raw materials were brought into the Inert Storage Building.

Sangamo leased this building from 1946 to 1962.

In 1983, Olin inspected both Buildings I-1-1 and I-1-2 prior to leasing them. Olin noted a fibrepack marked "TALC" containing white material upstairs and a 55-gallon drum of unknown materials downstairs in one of these buildings. The drum contained at least one container of unidentified liquid. They also noted a red fibrepack of an unknown "chemical" located downstairs in one of these buildings.[61]

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[58] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Pages B-1 – B-5.

[59] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[60] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[61] DPRA Document No. 00027291. Olin, Interoffice memo entitled "I-1-1 and I-1-2 Inspection Report," Page 1.

In Building I-1-1, Olin noted two paint exhaust units on the south which had paint residues (later analyses indicated the residue was non-hazardous). SIU handled the removal of the paint exhaust system in this building.[62,63]

Olin began occupying Building I-1-1 in 1983 along with the Annex #3 (the space between I-1-1 and I-1-2).[64] In 1985, Olin approved the following materials for storage in Building I-1-1:[65]

- MK-24 cases with igniters
- T-2342 in 55-gallon drums (no information was found to determine what this substance was)
- Phenolic tubing and bars (asbestos)
- MXU-4A/A cartridges
- Iron powder
- Stearic acid
- Soda ash
- Aluminum stearate
- Red and white dyes
- Epon 828
- Epirez 505 and 510
- Curing agent
- LUU-10/B insulation tube assembly
- Toluenediamine

Olin's 20MM Phalanx operations took place in Area 9,[66] and they used Building I-1-1 for receiving and storage of completed rounds.[67] In 1987, Olin temporarily stored and tested depleted uranium contaminated sand in Building I-1-1.[68] In 1985, Olin housed 20mm and 30mm inert parts in Building I-1-1.[69]

Primex assumed Olin's lease for this building (and the annex between I-1-1 and I-1-2) in 1997 (lease noted for cold storage).[70] GDO&TS is the current tenant in Building I-1-1.[71]

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[62] DPRA Document No. 00027291. Olin, Interoffice memo entitled "I-1-1 and I-1-2 Inspection Report," Page 1.
[63] DPRA Document No. 00027285. Olin, Interoffice memo entitled "I-1-1 and I-1-2."
[64] DPRA Document No. 00007590. Amendment No. 3 to Building Lease Contract No. 14-16-0003-81-525, dated August 1, 1983.
[65] DPRA Document Nos. 00012333, 00012336, and 00012338. Olin, cover memo entitled "Chemicals/Assemblies Evaluation for I-1-1 Storage ," and attachments.
[66] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988.
[67] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.
[68] DPRA Document No. 00014628. Olin, Inter Office Memo entitled "Initial shipment D.U. Contaminated Sand (only) to Nuclear Metals, Inc." dated January 5, 1987.
[69] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.
[70] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

Building I-1-2 – Receiving and Storage Building

SWDC/War Department operated Building I-1-2 as the IOP Receiving and Storage Building.[72] Sangamo leased this building from 1946 to 1962.

In 1983, Olin inspected both Buildings I-1-1 and I-1-2 prior to leasing these buildings. Olin noted a fibrepack marked "TALC" containing white material upstairs and a 55-gallon drum of unknown materials downstairs one of these two buildings. The drum contained at least one container of unidentified liquid. They also noted a red fibrepack of an unknown "chemical" located downstairs in one of these buildings.[73] Outside Building I-1-2, Olin noted a "noticeable" oil spill on the ground and in water west of this building.[74]

Olin began occupying Building I-1-2 in 1983,[75] stopped in 1989,[76] and resumed occupancy in 1991.[77] Olin used this building for receiving and storage of completed rounds[78] for their 20MM Phalanx operations. In 1985, Olin housed 20mm and 30mm inert parts in Building I-1-1.[79]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[80] GDO&TS is the current tenant in Building I-1-2.[81]

Building I-1-3 – Cleaning and Painting Building

North of the Receiving and Storage Building (connected via ramp) was the IOP Cleaning and Painting Building (I-1-3).[82] The Cleaning and Painting Building contained one pressure-feed tank, two paint spray booths and two drying ovens.[83,84] This building was divided into two

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[71] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[72] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[73] DPRA Document No. 00027291. Olin, Interoffice memo entitled "I-1-1 and I-1-2 Inspection Report," Page 1.
[74] DPRA Document No. 00027291. Olin, Interoffice memo entitled "I-1-1 and I-1-2 Inspection Report," Page 1.
[75] DPRA Document No. 00007590. Amendment No. 3 to Building Lease Contract No. 14-16-0003-81-525, dated August 1, 1983.
[76] DPRA Document No. 00018833. Amendment No. 5 to Building Lease Contract No. 14-16-0003-81-525, Olin Corporation, dated March 1, 1989.
[77] DPRA Document No. 00007601. Amendment No. 7 to Building Lease Contract No. 14-16-0003-81-525, Olin Corporation, dated October 1, 1991.
[78] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.
[79] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.
[80] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[81] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[82] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[83] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 6.

areas—the inspection and cleaning unit in the southern half and the inspection and painting unit in the northern half.[85]

Paint Spray Booths and Drains

There were two paint spray booths located just north of the inspection and cleaning unit tables, and the drying ovens were just north of the paint spray booths.[86] The paint spray booth had a drain and overflow for the tank, on its northernmost side. This drain appears to have been located above the sewer line.[87] There were also paint circulating lines that came in and exited the building on the east side.[88] These paint-circulating lines went to Building I-1-5 (IOP Paint Service Building).[89]

There were two support buildings associated with the Cleaning and Painting Building: the Paint Service Building (II-1-5) and the Paint Shield Cleaning Building (II-1-4).[90] Paint storage and inspection, packing and shipping was done from the paint service building.

Sangamo leased this building from 1946 to 1962.

Lease documents indicate Olin began occupying Building I-1-3 in 1975 for storage[91,92] Later, Olin used I-1-3 for receiving and storage[93] associated with their 20MM Phalanx operations. A 1987 Olin receiving report listed receipt of projectile subcaliber penetrators with a location description of I-1-3.[94]

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[84] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 5.
[85] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 5.
[86] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 5.
[87] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 5.
[88] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 5.
[89] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 5.
[90] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[91] DPRA Document No. 00025248/CRO 000469. Special Use Permit, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #4. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #4 is I-1-3.
[92] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-81-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980.
[93] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.
[94] DPRA Document No. 00014715/PRI-006368. Olin Defense Systems Ordnance, Receiving Report for "projectile subcaliber penetrat" with a location description of I-1-3, dated April 15, 1987.

In 1985, Olin was using Building I-1-3 to store Geon Resin[95] (likely a polyvinyl chloride resin)[96]. Olin noted this substance was an OSHA regulated materials and considered it a carcinogenic.[97] In 1986, Olin was storing "no-name" penetrators in Building I-1-3.[98]

In 1988, Olin identified empty drums present on a pad, in the dock area and in the bushes at Building I-1-3.[99] It is assumed that these drums contained PCB-contaminated materials, since Olin recommended placing all the PPE (personal protective equipment) in a drum marked for PCBs.[100] According to Glen Heil, a former Primex employee,[101] this building was being used in 1999 for dry storage of raw materials containing low-level explosives. Also in 1988, Olin noted poor housekeeping conditions in this building.[102]

During the site reconnaissance, there were two dry sump-like features noted to the east of Building I-1-3. One is filled with soil and construction debris such as bricks and concrete. The other is empty and it appears that piping from the building would empty into this sump. Existing monitoring well 33-MWCC-14 appears to be located about midway between these two sumps. These sump-like features were not a part of the original IOP construction as seen in the original construction diagrams,[103] and are noted on Figure 13-5.

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[104] GDO&TS is the current tenant in Building I-1-3.[105]

Building I-1-3A

In 1951, Sangamo moved Building FAM-3-4 from Area 3 into Area 9 adjoining it to Building I-1-3. They leased FAM-3-4 until 1962.[106,107,108,109,110] Note, Building FAM-3-4 was later designated I-1-3A,[111] also known as Building #5.[112]

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[95] DPRA Document No. 00012360. Olin, Inter Office Memo entitled "Chemical Spill-Geon Resin," dated June 4, 1985.
[96] DPRA 00016397. Olin Mathieson Chemical Corporation, Associated Products Division, Approved Vendors of Chemical Raw Materials, Dated April 6, 1967, Page 5.
[97] DPRA Document No. 00012360. Olin, Inter Office Memo entitled "Chemical Spill-Geon Resin," dated June 4, 1985.
[98] DPRA Document No. 00014468. Olin, Inter Office Memo entitled "November 19 Radiation Committee Meeting," dated December 12, 1986r 19k Radiation Committee Meeting," dated December 12, 1986.
[99] PRI-016557. Olin inter office memo entitled "I-1-3 Empty drums," dated December 14, 1988.
[100] PRI-016557. Olin inter office memo entitled "I-1-3 Empty drums," dated December 14, 1988.
[101] Heil was a current employee at the time of the site reconnaissance of Area 9 and was interviewed then.
[102] DPRA document No. 00016642. Olin, 1988 Safety Audit Action Items, dated March 7, 1988.
[103] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[104] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[105] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[106] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.
[107] DOI 007669 – DOI 007672. Lease Renewal Agreement, Sangamo Electric Company, dated February 19, 1951, Pages 1-2.
[108] DOI 007683 – DOI 007692. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.

Olin began leasing Building I-1-3A in 1975 for storage.[113,114] Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[115] GDO&TS is the current tenant in Building I-1-3A.[116]

Building I-1-4 – Paint Shield Cleaning Building

The IOP Paint Shield Cleaning Building (I-1-4) was located to the east of the IOP Cleaning and Painting Building.[117] Painting equipment may have been cleaned in this buildings, using solvents.

Sangamo leased Building I-1-4 from 1946 to 1962.[118,119,120,121,122,123] By 1951,[124] this building was moved slightly east to likely make room for the relocation of Building FAM-3-4 (Building I-1-3A) which was adjoined to Building I-1-3.

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[109] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.

[110] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.

[111] DOI 001582. Building Lease Contract No. 14-16-0003-81-525 by and between U. S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980, Page 1 of Page 1A.

[112] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #5. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #5 is FAM-3-4 which is also I-1-3A.

[113] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #5. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #5 is FAM-3-4 which is also I-1-3A.

[114] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-81-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980.

[115] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[116] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[117] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[118] DOI 007663 – DOI 007674. Lease, Sangamo Electric Company, dated September 27, 1946.

[119] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.

[120] DOI 007669 – DOI 007672. Lease Renewal Agreement, Sangamo Electric Company, dated February 19, 1951, Pages 1-2.

[121] DOI 007683 – DOI 007692. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.

[122] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.

[123] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1,

Lease documents indicate Olin occupied Building I-1-4 from 1975[125,] to 1989.[126,127] In 1984,[128] Olin noted serious problems with the storage of chemicals/materials in this building and the other buildings grouped behind (to the east) Building I-1-3. Specifically, they noted spills, unknown chemicals present, and equipment not tagged as "decontaminated" with neither OSHA nor DOD storage requirements being met. According to Olin, some of the chemicals noted were:

- Methylene chloride
- Isopropanol anhydrous
- Trichloroethylene
- 529 Solvent
- B-625 (type of solvent)
- Acetone
- Drums of unknown contents

In 1985, Olin likely used this building for flammable chemicals storage.[129]

Building I-1-5 – Paint Service Building

As discussed above, the IOP Paint Service Building (I-1-5) was connected to the IOP Cleaning and Painting Building (I-1-3), via paint circulation lines. Paint storage and inspection, packing and shipping were done from the Paint Service Building.

Sangamo leased this building from 1946 to 1962.

Lease documents indicate Olin occupied Building I-1-5 from 1975[130] to 1989.[131,132] In 1984,[133] Olin noted serious problems with the storage of chemicals/materials in this building and the other

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1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.

[124] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland (same photograph used by Entech, Inc.).

[125] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #13. This document is used to compare to other lease documents that indicate Building #14 is I-1-4.

[126] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-81-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980.

[127] DPRA Document No. 00018833. Amendment No. 5 to Building Lease Contract No. 14-16-0003-81-525, Olin Corporation, dated March 1, 1989.

[128] DPRA Document No. 00009535. Olin, Inter Office Memo entitled "Buildings and Contents Behind I-1-3/Request to Move," dated August 20, 1984.

[129] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[130] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #10. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #105 which is also I-1-5.

[131] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-81-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980.

[132] DPRA Document No. 00018833. Amendment No. 5 to Building Lease Contract No. 14-16-0003-81-525, Olin Corporation, dated March 1, 1989.

buildings grouped behind (to the east) Building I-1-3. Specifically, they noted spills, unknown chemicals present, and equipment not tagged as "decontaminated" with neither OSHA nor DOD storage requirements being met. According to Olin, some of the chemicals noted were:

- Magnesium Powder
- Strontium Nitrate
- Phosphoric Acid
- Magnesium Aluminum Powder
- Engine Oil
- Barium Nitrate
- Barium Peroxide
- Polyethylene
- Zinc Stearate
- Strontium Peroxide

In 1985, Olin likely used this building for flammable chemicals storage.[134]

Building I-1-6 – Melt Loading Building

The IOP Melt Loading Building (I-1-6) was located near the center of Load Line I.[135] Melting and pouring operations were done in this building. The Melt Loading Building was mostly used for filling the shells and mines with amatol and TNT. A discussion of the melting and pouring operations in Building I-1-6 is as follows.

Heating and Mixing

TNT and ammonium nitrate were delivered to the southern end of Building I-1-6, after they had been screened in Building I-1-8 (IOP Screening Building).[136] These two buildings were connected via rampways.[137] At the southern end of the Melt Loading Building, the TNT and ammonium nitrate were heated (two ammonium nitrate pre-heaters on the third floor and three TNT melting units on the second floor) and mixed in kettles (two amatol mixing kettles in the melt mixing room on the second floor) to form amatol.[138]

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[133] DPRA Document No. 00009535. Olin, Inter Office Memo entitled "Buildings and Contents Behind I-1-3/Request to Move," dated August 20, 1984.
[134] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[135] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[136] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[137] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[138] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 6.

Cleaning Rooms

There was a draw-off room on the first floor, beneath the mixing room. Just south of the draw-off room was an attached one-story structure that contained the equipment cleaning room with a cleaning basin.[139] While the exact use of this room is unknown, it may have been used to clean explosives from equipment. If so, the cleaning water may have gone to the settling tanks and evaporation basin shown on Figure 13-2, or cleaning fluids may have gone to some other unidentified location.

Just north of the draw-off room, the building was only one story again. From south to north in this one-story area, there were two pouring rooms (where bombs were filled), a cooling room and a cooling unit next to a TNT melt unit – both of which were located on the northernmost end of the building.[140] These rooms are discussed below.

Pour Rooms and Cleaning Operations

The pouring rooms in the Melt Loading Building (I-1-6), were where the shells were loaded with the amatol and/or TNT. According to Mr. Kermit Troutman,[141] in the beginning, it was likely that this was a fairly messy operation because the shut-off valves on the rubber hoses were difficult to manipulate.[142] The hoses were later equipped with metal collars and new shut-off valves, thus minimizing the spillage of explosive materials.[143] If spillage occurred in this area, it would immediately be mopped up with water and both the both the spilled explosive and the wash water were disposed of in a sump that was located just outside the Melt Loading Building.[144] The sump that Mr. Troutman was referring to, was probably the settling tanks[145] found on Figure 13-2, which is discussed in more detail below. According to Mr. Troutman, this sump had a filtering screen, and he speculated that any waste in this sump would have been burned at the burning grounds located east of the load lines in a fairly remote area of IOP.[146] The entire area would be thoroughly cleaned with water whenever a kettle was emptied and the wash water would go to the sump.[147]

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[139] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.
[140] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 32.
[141] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.
[142] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-1 through B-5.
[143] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-1 through B-5.
[144] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.
[145] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[146] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.
[147] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.

Cooling Room

After the shells were filled in the pouring rooms of the Melt Loading Building (I-1-6), it is assumed that they were taken to the cooling room in the center of this building to cool.

Settling Tanks and Evaporation Basin

There were settling tanks (the sump) located along the west side of the Melt Loading Building.[148] The sump was approximately 13-ft long by 5-ft wide. Information regarding the depth of this sump was not found. Additionally there was an evaporation basin located just north of the settling tanks and it appears that the evaporation basin and the settling tanks were connected (possibly via drain lines). The evaporation basin was approximately 50-ft long by 15-ft wide.[149] No information was found to confirm if the basin was lined or if all of the water in this basin would evaporate, or if some of it would seep into the ground.

If there was spillage during pouring operations the spill would be washed up with water, and both the spilled explosive and the wash water were disposed of in a sump.[150] This sump (likely settling tanks located next to Melt Loading Building[151]) had a filtering screen and he speculated that any explosive waste that would collect in this sump would have been burned at the burning grounds located east of the load lines in a fairly remote area of IOP.[152] The entire pouring area would be thoroughly cleaned with water whenever a mixing kettle was emptied, and this wash water would also go to the sump.[153]

There were a number of housekeeping problems cited at the load lines – the most common being carelessness with handling TNT. TNT and amatol were handled as follows:

- Solid scrap TNT, which was recovered in a clean dry state, was reused by returning it to the mixers or the melt units. This included scrap TNT obtained from cooling tubs, pails, tools, splash-guards, risers, and specially installed vacuum systems.
- The sump would overflow into nearby ditches, during periods of maximum production at the load lines.[154]

During the IOP era, it is likely that the buildings were regularly cleaned by washing them with generous amounts of water and allowing the wash waters to flow into the sump or out onto the

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[148] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[149] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[150] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.
[151] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[152] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.
[153] Interview with Mr. Kermit C. Troutman as found in TechLaw, Inc., 1997, Draft Investigation Report, The Sherwin-Williams Company, Illinois Ordnance Plant, Page B-3.
[154] ACO 4997. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Page 22.

grounds and into the ditches, since this was the procedure used for cleaning by later industrial tenants.[155] Spillage of explosive materials in this building was cleaned up with water and disposed of in the sump also as discussed above. Spillage of explosive materials in this building was cleaned up with water and disposed of in the sump, as discussed above.

According to Refuge personnel, Building I-1-6 was sold in 1959 and removed from Area 9.[156] This agrees with aerial photographs which indicate Building I-1-6 was removed sometime between 1951 and 1960.[157]

Building I-1-8 – Screening Building

Building I-1-8 was an IOP Screening Building for TNT and ammonium nitrate during the IOP era. Ammonium nitrate and TNT were both used in melting and pouring operations in Building I-1-6. Ammonium nitrate and TNT were brought in and staged prior to use on the load line at the IOP Ammonium Nitrate Service Building (I-1-10) and the IOP TNT Service Building (I-1-9),[158] respectively. These buildings were connected via rampways to each other and to the Screening Building (I-1-8).[159] Half of the screening building was used for screening ammonium nitrate and the other half was used for screening TNT.[160] The first floor of the building contained the screening rooms and the second floor contained the ammonium nitrate and TNT charging rooms.[161] There were three screening machines located in this building.[162]

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[155] Interview with Mr. Art Boles as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations/Ownership History, Crab Orchard National Wildlife Refuge, Appendix B, Page B-14.

[156] Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.

[157] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[158] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[159] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[160] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 33.

[161] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 33.

[162] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 6.

According to Refuge personnel, Building I-1-8 was sold in 1959 and removed from Area 9[163] This agrees with aerial photographs which indicate Building I-1-8 was removed sometime between 1951 and 1960.[164]

Building I-1-9 – TNT Service Building

Building I-1-9 was the IOP TNT Service Building during the IOP.[165] TNT was delivered to this building and staged here prior to use in the Melt Loading Building (I-1-6). This building was connected via ramps to both the IOP Ammonium Nitrate Service Building (I-1-10) and the IOP Screening Building (I-1-8).[166]

According to Refuge personnel, Building I-1-9 was sold in 1959 and removed from Area 9.[167] This would agree with aerial photographs which indicate Building I-1-9 was removed sometime between 1951 and 1960.[168]

Building I-1-10 – Ammonium Nitrate Service Building

Building I-1-10 was the IOP Ammonium Nitrate Service Building during the IOP.[169] Ammonium nitrate was delivered to this building and staged here prior to use in the IOP Melt Loading Building (I-1-6). This building was connected via ramps to both the IOP TNT Service Building (I-1-9) and the IOP Screening Building (I-1-8).[170] This building may have later been used for staging TNT, after the use of ammonium nitrate ceased.

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[163] Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.

[164] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[165] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[166] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[167] Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.

[168] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[169] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[170] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

According to Refuge personnel, Building I-1-10 was sold and removed from the refuge in 1959.[171] This would agree with aerial photographs which indicate Building I-1-10 was removed sometime between 1951 and 1960.[172]

IOP Building I-1-11 – Booster Service Magazine (Building I-1-49)

The IOP Booster Service Magazine (Building I-1-11) was used to store boosters prior to insertion into the shells. It was located just south of the IOP Drilling and Boostering Building (I-1-12), and it was connected to this building via a ramp.[173]

According to lease documents, Olin began using this building in 1969.[174] According to Refuge personnel, Olin had pyrotechnic mixing operations in this building.[175]

Primex assumed Olin's lease for this building in 1997 (building use is not noted specifically in the lease).[176] GDO&TS is the current tenant in Building I-1-11.[177]

Building I-1-12 – Drilling and Boostering Building

Building I-1-12 is the IOP Drilling and Boostering Building.[178] This building contained office space and 12 concrete bays, seven of which were shell drilling bays that were located mostly in the center of the building.[179] Boosters were most likely inserted into the shells in this building. This building contained four rotary machines; sixteen thread cleaning machines, and eight

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[171] Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.

[172] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[173] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[174] DPRA Document No. 00007513. Amendment No. 2 to Lease Contract No. 14-16-0003-12613, Olin Mathieson Chemical Corporation, Technical Systems Operation, dated January 1, 1969.

[175] Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.

[176] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[177] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[178] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[179] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 26.

tensioning machines.[180] A typical equipment layout diagram was found in the 1944 War Department Facilities Inventory.[181]

According to lease documents, Olin began using this building in 1969.[182] In 1970, Olin noted poor housekeeping in this building, specifically excessive powder and brass scrap on the loading dock.[183] In 1975, Olin used the dock of Building I-1-12 as an explosive scrap pickup point for materials such as pyro-propellant, explosives, ammunition, and primers.[184] By 1977, this building housed some portion of the 25MM trace operation.[185]

Ending in November 1984, Olin used Building I-1-12 for loading trace mix into projectiles.[186] This building was used for the 20-mm Trace Operations,[187] Olin's 20MM Phalanx operations took place in Area 9,[188] and they used Building I-1-12 for processing/assembly related to these operations.[189,190] Olin's phalanx projectile assembly was moved from Building I-1-20 to Building I-1-12 in 1988, and a penetrator storage area was built at the end of I-1-12.[191]In 1988, Olin was using solvents and inks in this building.[192]

Dehumidification was necessary in this building to prevent caking or the trace mix as it goes into the projectile.[193] This building contained a drench coil unit, which at this time would discharge condensate water from the dehumidification process into the sewer system.[194] In September 1984, this building also contained a Hoffman Wet Collector (High Explosives Igniter (HEI) Slurry Filtration System) to collect HEI Mix and water from milling operations.[195] The material collected was passed through a filter and discharged to a holding tank in Building I-1-49.[196]

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[180] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 6.
[181] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 1, Page 24.
[182] DPRA Document No. 00007513. Amendment No. 2 to Lease Contract No. 14-16-0003-12613, Olin Mathieson Chemical Corporation, Technical Systems Operation, dated January 1, 1969.
[183] DPRA Document No. 00004388. Olin, Inter Office Memo entitled "Scrap Loading Docks," dated October 7, 1970, Page 2.
[184] PRI-002629. Olin, 1975 Safety Performance, Technical Systems Operation, Marion, Illinois, Table entitled "Scrap Packaging & Storage I-1-12."
[185] DPRA Document No. PRI-006677. Olin, Inter Office Memo entitled "I Area Third Quarter Hazard Audit," dated October 11, 1977.
[186] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[187] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[188] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988.
[189] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.
[190] DPRA Document No. 00014727. Olin, Radiation Safety Training Program, Safety Procedure 116, dated December 1987, Page 5.
[191] DPRA Document No. 00014461. Olin, Inter Office Memo entitled "February, 1988 Radiation Safety Meeting, dated February 10, 1988, Page 2.
[192] DPRA document No. 00016642. Olin, 1988 Safety Audit Action Items, dated March 7, 1988.
[193] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[194] PRI-016550. Olin Corporation, Olin-Marion Wastewater Discharges/Sources: Group B, Status Report, dated June 1, 1987.
[195] PRI-016714. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[196] PRI-016714. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

After the water was filtered, it was discharged to the ground surface outside the building,[197] until 1987 when the system was converted into a closed loop system.[198]

At one time, Building I-1-12 had a boiler.[199] Olin discharged the water from the boiler blowdown process and also from cooling water out of this building.[200] No information was found regarding where these water were discharged.

Primex assumed Olin's lease for this building in 1997 (lease noted for manufacturing).[201] GDO&TS is the current tenant in Building I-1-12.[202]

Building I-1-13 – Vacuum Pump House

This IOP Vacuum Pump House (I-1-13) was associated with the IOP Drilling and Boostering Building (I-1-12).[203]

Building I-1-13 was removed sometime between 1951 and 1960.[204]

Buildings I-1-14 through I-1-18 – Vacuum Pump Houses

These IOP Vacuum Pump Houses were associated with the IOP Drilling and Boostering Building (I-1-12).[205]

Buildings I-1-14 through I-1-18 were removed sometime between 1951 and 1960.[206]

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[197] PRI-016714. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[198] PRI-016550. Olin Corporation, Olin-Marion Wastewater Discharges/Sources: Group B, Status Report, dated June 1, 1987.
[199] DPRA Document No. 00020663. Olin, Inter Office Memo entitled "EPA Boiler Operating Permits," dated August 14, 1975.
[200] DPRA Document No. 00026279. Olin Inter Office Memo entitled "TSO Water Discharges," dated March 18, 1981.
[201] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[202] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[203] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[204] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[205] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[206] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

Olin Building I-1-15

No information was found regarding the exact location of Olin Building I-1-15. Primex began leasing this building in 1998,[207] and GDO&TS is the current tenant.[208]

IOP Building I-1-19 – Fuse Service Building

IOP Building I-1-19 was the IOP Fuse Service Building.[209] It is likely that this building was used to store fuses prior to insertion into the shells.

Building I-1-19 was removed sometime between 1951 and 1960.[210]

Olin Building I-1-19

Olin Building I-1-19 was constructed just to the east of the former IOP building sometime between 1965 and 1971.[211] In 1984, Olin Building I-1-19 was an Olin mix house that was used to mix .50 Caliber (composed of R-284, R-256 and I-508[212]) and 20-mm mixes, which were placed into fiber packs in this building.[213] There was also a drench coil unit present in this building that discharged condensate water to the sewer in 1987.[214] It was reported that this mix house contained sumps.[215] Cleaning of buildings and sumps around probably involved the discharge of fluids to the grounds surrounding the buildings. These fluids would likely have contained explosive residues and volatile organic cleaning solvents. As discussed below, this building was also referred to as Olin Building I-1-32 in some Olin documents.

In 1985, Olin likely housed up to several thousand pounds of various materials and explosives in Building I-1-1 including hazardous waste scrap (see Table 13-3A).[216] By 1987, Olin noted that benzene, acetone, MEK and other solvents were in use in Building I-1-19 and that respirators

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[207] DPRA Document No. 00017649. Amendment No. 2 to Building and Igloos Lease Contract No. 14-16-0003-96-579, PRIMEX Technologies, Inc., dated July 1, 1998.

[208] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[209] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[210] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[211] 1965 and 1971 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[212] PRI-003274. Olin inter office memorandum entitled "50 Cal. Special Safety Committee," dated November 8, 1984.

[213] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[214] PRI-016550. Olin Corporation, Olin-Marion Wastewater Discharges/Sources: Group B, Status Report, dated June 1, 1987.

[215] PRI-00255. Map of I Area as an attachment to an Olin inter office memorandum entitled "Explosive Sumps," dated June 3, 1977.

[216] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

were likely going to be needed for this building.[217] Two 1991 Olin receiving reports listed 50 pounds of calcium resinate and 300 pounds of strontium peroxide with a location description of I-1-19.[218,219] A 1991 Olin receiving report listed 100 pounds of magnesium powder with a location of I-1-19.[220]

Primex assumed Olin's lease for this building in 1997 (lease noted for manufacturing purposes).[221] GDO&TS is the current tenant in Building I-1-19.[222]

Building I-1-20 – Assembly, Packing and Shipping Building

Building I-1-20 was the IOP Assembly, Packing and Shipping Building.[223] This building was connected via rampways to Buildings I-1-12 (IOP Drilling and Boostering Building), I-1-19 (IOP Fuse Service Magazine) and I-1-23 (IOP Propellant Charge Building).[224] It is likely that this building was used for the final assembly, packaging and shipping of the shells and anti-tank mines that were historically manufactured along Load Line I. This building contained three assembly machines and three staking machines.

Sangamo leased Building I-1-20 from 1956 to 1962.[225,226]

Olin began leasing Building I-1-20 in 1967.[227] In July 1970, pyrotechnic mixing operations were being done in Building I-1-20.[228] An internal Olin audit reported poor housekeeping in this

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[217] DPRA Document No. 00015741. Olin, Inter Office Memo entitled "Hi-Lite Report – September, 1987," dated September 25, 1987.
[218] DPRA Document No. 00014267/PRI-013188. Olin Defense Systems Ordnance, Receiving Report dated February 2, 1991.
[219] DPRA Document No. 00014355/PRI-013182. Olin Defense Systems Ordnance, Receiving Report dated February 2, 1991.
[220] DPRA Document No. 00014185/PRI-013174. Olin Defense Systems Ordnance, Receiving Report dated February 2, 1991.
[221] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[222] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[223] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[224] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[225] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.
[226] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.
[227] DPRA Document No. 00007503. Lease, Contract No. 14-16-0003-12613, dated January 1, 1967.
[228] PRI-004089. Olin inter office memorandum entitled "Safety Inspection Mix Area," dated July 24, 1970.

building at this time.[229] Olin noted that drains to the sumps in this building contained dry powder.[230] No other information could be found regarding sumps associated with this building.

It was also reported that Building I-1-20 was used for manufacturing nose cones for 20-mm and 25-mm ammunition.[231]

Beginning in the late 1970s, Olin utilized much of the northern half of Area 9 for their 30MM GAU 8/A production activities.[232] Production relating to this operation took place in Building I-1-20, specifically: flashtube assembly, primer assembly, HEI charging and fusing, cartridge loading, crimping, printing, gaging and weighing.[233] Associated propellant, primer, H761 pellet and IB-52 pellet staging and storage buildings (small) were all located immediately east of Building I-1-20.[234] Some materials associated with 30MM manufacturing included:[235]

- Boron
- Potassium Nitrate
- Graphite
- Polyvinyl Acetate
- Methylene Chloride
- Type A Ball Powder
- Ink (marking)
- Lacquer
- Enamel

By 1977, Olin noted "much" HEI dust in the 30MM charging Bay of Building I-1-20[236] as well as HEI pellets lying on the floor.[237] This same year, a small explosion of a 30MM projectile in the No. 2 charger bay occurred in this building.[238] Olin determined the accident was due to crushing or pinching of a raw unwaxed RDX crystal or crystals against tramp material or each other at the consolidation stage.[239]

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[229] PRI-004089. Olin inter office memorandum entitled "Safety Inspection Mix Area," dated July 24, 1970.
[230] PRI-004089. Olin inter office memorandum entitled "Safety Inspection Mix Area," dated July 24, 1970.
[231] Paul Moore, personal interview, July 14, 1999.
[232] DPRA Document No. 00011389\PRI-014851 to PRI-015001. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[233] DPRA Document No. 00011389/ PRI-014933. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[234] DPRA Document No. 00011389/PRI-014926. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[235] DPRA Document No. 00011389/PRI-014947. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[236] PRI-006677. Olin, Inter Office Memo entitled "I Area Third Quarter Hazard Audit," dated October 11, 1977.
[237] PRI-002906. Olin, Accident Investigation, September 27, 1977 Accident in # 2 Charger Bay, Bldg. I-1-20, Page 7.
[238] PRI-002900 to PRI-002909. Olin, Accident Investigation, September 27, 1977 Accident in # 2 Charger Bay, Bldg. I-1-20.
[239] PRI-002907. Olin, Accident Investigation, September 27, 1977 Accident in # 2 Charger Bay, Bldg. I-1-20, Page 8.

In 1983, debris from the 20-mm Deprime operation was analyzed to determine if the waste was considered to be hazardous waste.[240] Both barium and lead were found to pose health concerns.[241] Olin's 20MM Phalanx operations took place in Area 9,[242] and they used Building I-1-20 for processing related to these operations.[243]

This building was used for the .50 Caliber Trace Line (composed of R-284, R-256 and I-508[244]).[245] As noted above, dehumidification was necessary in this building to prevent caking or the trace mix as it goes into the projectile.[246] This building contained a drench coil unit, which at this time would discharge condensate water from the dehumidification process into the sewer system.[247]

Olin maintained a flammable liquid storage area south of Building I-1-20;[248] however, no information was found regarding the exact location of this storage area. Olin also maintained an explosive waste scrap area beside Building I-1-20.[249] (No information was found to determine if these two areas are in fact the same area). General pyrotechnics were placed in used magnesium cans, immersed in oil, covered with lids, then staged in the scrap area prior to begin taken to the burning grounds.[250] These may have been the burning grounds to the east of Area 9 as identified by Kermit Troutman, George Wisely, a former Olin chemist and manager, and John Miller, a former Olin chemist and manager.[251,252] High explosives wastes were also stored in covered magnesium cans; however, they were stored somewhere inside Building I-1-20 prior to transportation to the burning grounds.[253]

In 1980, the Olin's rotor ball preparation/assembly for the M505 fuse program took place in Building I-1-20. This operation involved the use of azide and styphnate (likely lead), HMX, RDX and primer mix.[254] In 1986, Olin stored "no-name" penetrators in Building I-1-20, [255] and

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[240] PRI-016684. Olin inter office memorandum entitled "I-1-20 20-mm Deprime," dated September 12, 1983.
[241] PRI-016684. Olin inter office memorandum entitled "I-1-20 20-mm Deprime," dated September 12, 1983.
[242] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988.
[243] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.
[244] PRI-003274. Olin inter office memorandum entitled "50 Cal. Special Safety Committee," dated November 8, 1984.
[245] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[246] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.
[247] PRI-016550. Olin Corporation, Olin-Marion Wastewater Discharges/Sources: Group B, Status Report, dated June 1, 1987.
[248] DPRA Document No. 00016102. Olin, Corrective Action Based on Hollander – Wisely Audit 7/28-7/30-81, Page 2.
[249] DPRA Document No. 00009999/PRI-005230. Olin, Inter Office Memo entitled "Procedures for Explosive Waste Burning at TSO," dated November 18, 1969.
[250] DPRA Document No. 00009999/PRI-005230. Olin, Inter Office Memo entitled "Procedures for Explosive Waste Burning at TSO," dated November 18, 1969.
[251] Deposition of George Wisely, June 28, 1999, Page 96 and Exhibit 3.
[252] Deposition of John Miller, April 9, 1998, Page 60 and Exhibit 2.
[253] DPRA Document No. 00009999/PRI-005231. Olin, Inter Office Memo entitled "Procedures for Explosive Waste Burning at TSO," dated November 18, 1969.
[254] DPRA Document No. 00025052. Olin, Constituents/Components of Waste Explosive Devices, (no date), Page 1.

in 1988, Olin noted explosives being stored in hallways in this building.[256] Olin used N-butanol in this building in at least 1986 and noted that the chemical was causing an odor problem.[257]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage purposes).[258] Primex also used this building as an area where hazardous wastes were accumulated on-site for less than 90 days (in Bays 5 and 9A) .[259]

GDO&TS is the current tenant in Building I-1-20.[260]

Building I-1-20P

Building I-1-20P is not an original IOP building. It appears in Area 9 sometime between 1971 and 1980[261] and was contained on three sides by an berm.[262,263] In 1985, Olin likely stored explosives called RS41 and RDX A4 in this building.[264] It is no longer on site.

Building I-1-21 – Smokeless Powder Service Building

IOP Building I-1-21 was the IOP Smokeless Powder Service Building.[265] It is likely that this building was used to store smokeless powder prior to its use in the IOP Propellant Charge Building (I-1-23).

In June of 1955, Sangamo took occupancy of this building (before a lease was signed). They used Building I-1-21 until October of that year when it burned down (along with part of the associated ramp).[266]

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[255] DPRA Document No. 00014468. Olin, Inter Office Memo entitled "November 19 Radiation Committee Meeting," dated December 12, 1986.
[256] DPRA Document No. 00016642. Olin, 1988 Safety Audit Action Items, dated March 7, 1988.
[257] DPRA Document No. 00012287. Olin, Inter Office Memo entitled "I-1-20 Phalanx Assembly," dated August 11, 1986.
[258] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[259] DPRA Document No. 00015017. Primex Technologies, Attachment C, Procedure 4.13: Plant Emergency Procedures, Procedure 4.14: Contingency Plan Arrangements for Emergencies with Local Authorities, dated December 1996, Pages 12 and 15.
[260] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[261] 1971 and 1980 aerial photographs obtained from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[262] 1980 and 1993 aerial photographs obtained from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[263] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[264] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[265] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

Building I-1-21N (Building I-1-23A)

In 1955, Sangamo signed a lease with the Refuge agreeing to construct a new building (and ramp) to replace I-1-21, designating the new building as I-1-21N. They leased this building until 1962.[267] Aerial photographs and Olin lease information indicate this building was likely the newly constructed building located immediately west of Building I-1-23.[268,269]

Olin began leasing Building I-1-21N in 1967,[270] and later designated the Building as I-1-23A. No information was found regarding how long Olin occupied this building.

Beginning in the late 1970s, Olin utilized much of the northern half of Area 9 for their 30MM GAU 8/A production activities,[271] and Building I-1-23A was used for pack out purposes.[272]

This building was removed sometime after 1993.[273]

Olin Building I-1-21

Sometime between 1980 and 1993, Olin Building I-1-21 appears just to the east of Olin Building I-1-19.[274] Information regarding the Olin's use of this building was not found.

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage purposes).[275] GDO&TS is the current tenant in Building I-1-21.[276]

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[266] DPRA Document No. 00022920. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.

[267] DPRA Document No. 00022920. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.

[268] DPRA Document No. 00014205. Olin, Rental Adjustment Thru 31 August 1980, Lease Contract No. 14-19-008-2675 and No. 14-16-0003-12613. While no map definitively labels Building I-1-21, the square-footage of this building and its associated annex are the same as that noted in both the Sangamo and Olin leases.

[269] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figure 2. The building identified as most likely being I-1-21N is the only new building in the northern portion of Area 9 during this time.

[270] DPRA Document No. 00007503. Lease, Contract No. 14-16-0003-12613, dated January 1, 1967.

[271] DPRA Document No. 00011389\PRI-014851 to PRI-015001. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[272] DPRA Document No. 00011389/PRI-014926. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[273] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[274] 1980 and 1993 aerial photographs obtained from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[275] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[276] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Building I-1-22 – Box Opening Building

It is assumed that this building was used to open boxes of smokeless powder.[277]

During the IOP era, this building was used for melting explosives and filling shells.

At the eastern end of the building, TNT and ammonium nitrate were heated and mixed in kettles. There were four ammonium nitrate pre-heaters on the third floor and two TNT melting units on the second floor. The mixing kettles were on the second floor.[278]

Olin began leasing Building I-1-22 in 1967.[279] Aerial photographs indicate this building was removed between 1980 and 1993. A 1997 Olin/Primex map shows Building I-1-22 at the location of the original Building I-1-19.[280] No information was found regarding whether or not this new I-1-22 is actually the old building moved, or a newly constructed building.

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage purposes).[281]GDO&TS is the current tenant in Building I-1-22.[282]

Building I-1-23 – Propellant Charge Building

This building contained eight assembly and crimping machines, one crimping press and 2 arbor presses.[283][284] It is assumed that primers were inserted in this building. There were also several assembly rooms in this building.

Sangamo leased this building from 1955 to 1962.

Olin began leasing Building I-1-23 in 1967.[285] In July 1970, an internal Olin audit reported poor housekeeping in this building (especially in the slurry area).[286] In October 1970, leakage of contaminated fuel oil that was used for storage of explosives on the dock was reported at this building.[287] Magnesium powder (likely from mortar magnesium flares, which were

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[277] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[278] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 7.
[279] DPRA Document No. 00007503. Lease, Contract No. 14-16-0003-12613, dated January 1, 1967.
[280] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan, dated July 22, 1997.
[281] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[282] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[283] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[284] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 3, Section 2, Page 7.
[285] DPRA Document No. 00007503. Lease, Contract No. 14-16-0003-12613, dated January 1, 1967.
[286] PRI-004091 - PRI-004092. Olin inter office memorandum entitled "Safety Inspection," dated July 24, 1970.
[287] PRI-004083. Olin inter office memorandum entitled "Scrap Loading Docks," dated October 7, 1970.

manufactured by Olin at this time) was also reported to be everywhere (assumed to be around dock of this building) at this time.[288] In 1977, sumps were reported in the "I" Area Mix House and in the 81mm mix bays in Building I-1-23.[289] Short-term trace and API operations in this building also used these sumps.[290] Prior to 1977, illuminating flare mixing also used these sumps.[291]

Beginning in the late 1970s, Olin utilized much of the northern half of Area 9 for their 30MM GAU 8/A production activities.[292] Production relating to this operation took place in Building I-1-30, specifically: primer assembly, HEI charging and fusing, cartridge loading, crimping, printing, gaging, weighing and pack out.[293] Some materials associated with 30MM manufacturing included:[294]

- Boron
- Potassium Nitrate
- Graphite
- Polyvinyl Acetate
- Methylene Chloride
- Type A Ball Powder
- Ink (marking)
- Lacquer
- Enamel

In 1981, an Olin 30mm GAU-8/A HEI projectile accidentally detonated in the charger bay of Building I-1-23. While no one was injured, the blast blew open the east door and some caused minimal damage to equipment. Also, loose dirt and RDS from machinery and overhead pipes was scattered all over the floor.[295]

It should be noted that cleaning of buildings and sumps around the Refuge would involve the discharge of fluids to the grounds surrounding the buildings. These fluids would likely have contained explosive residues and volatile organic cleaning solvents. Sumps were located south of this building, along a walkway[296] (adjacent to Building I-1-58).

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[288] PRI-004085. Olin inter office memorandum entitled "Loading, Transportation & Disposal of Scrap Pyrotechnic Materials," dated September 10, 1970.
[289] PRI-016594. Olin inter office memorandum entitled "Explosive Sumps," dated June 3, 1977.
[290] PRI-016594. Olin inter office memorandum entitled "Explosive Sumps," dated June 3, 1977.
[291] PRI-016599. Explosive Sump Descriptions, attachment to an Olin inter office memorandum entitled "Explosive Sumps," dated June 3, 1977.
[292] DPRA Document No. 00011389\PRI-014851 to PRI-015001. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[293] DPRA Document No. 00011389/ PRI-014933. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[294] DPRA Document No. 00011389/PRI-014947. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.
[295] DPRA Document No. 00026729. Olin, Inter Office Memo entitled "Preliminary Report on I-1-23 detonation of a 30mm GAU-8/A HEI Projectile," dated June 25, 1981.
[296] PRI-00255. Map of I Area as an attachment to an Olin inter office memorandum entitled "Explosive Sumps," dated June 3, 1977.

There was a Hoffman Wet Collector located in this building in 1982.[297] It filters out the HEI/HE and discards the wastewater into a holding tank where this water is recycled until it is visually clear and then it is discharged to the ground surface, outside of Building I-1-23.[298] The effluent would contain Royal Demolition Explosive (RDX) (waxed), aluminum, graphite and calcium stearate.[299]

In Building I-1-23, there was a boiler blowdown associated with the boilers in this building.[300] Heavy metals may have been present in the soil beneath the boiler blowdown.[301] The following chemicals were also added to boiler water: phosphate, alkaline solution, sulphite, ammonia, zeolite, and salt brime.[302]

Building I-1-23A

Refer to the discussion for Olin Building I-1-21N for a description of Building I-1-23A.

Building I-2-23P

In 1985, Olin stored hazardous waste in a building called I-1-23P.[303] It is unknown if this is actually Building I-1-23, I-1-23A, or a different building. No other information was found regarding this building.

Building I-1-24 – Primer Service Magazine

It is likely that this building was used to primers prior to their use in the IOP Propellant Charge Building (I-1-23).[304]

Sangamo leased this building from 1955 to 1962.

Olin began leasing Building I-1-24 in 1967.[305] No information was found regarding how long Olin leased this building; however, Olin documents indicate they were still occupying I-1-24 by 1981.[306]

This building was removed sometime after 1993.[307]

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[297] PRI-016297. Olin inter office memorandum entitled "Water Discharges," dated February 12, 1982, Page 1.
[298] PRI-016297. Olin inter office memorandum entitled "Water Discharges," dated February 12, 1982, Page 1.
[299] PRI-016298. Olin inter office memorandum entitled "Water Discharges," dated February 12, 1982, Page 2.
[300] PRI-016298. Olin inter office memorandum entitled "Water Discharges," dated February 12, 1982, Page 2.
[301] PRI-016297. Olin inter office memorandum entitled "Water Discharges," dated February 12, 1982, Page 1.
[302] PRI-016299. Olin inter office memorandum entitled "Water Discharges," dated February 12, 1982, Page 3.
[303] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.
[304] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[305] DPRA Document No. 00007503. Lease, Contract No. 14-16-0003-12613, dated January 1, 1967.
[306] DPRA Document No. 00026220. Olin, Inter Office Memo entitled "Smear Sampling Program," dated June 4, 1981.

Building I-1-25 – Change House

West of the main loading line, there were three IOP Change Houses and east of Building I-1-23 was a fourth IOP Change House.[308] The Change Houses (Buildings I-1-25, I-1-26 I-1-27 and I-1-28) contained locker rooms and lunchrooms.[309] Drains inside the change houses would drain to the sewers. Historically change house sewers for ordnance plants have contained explosives residues.

Sangamo leased this building from 1956 to 1962.

Olin began leasing Building I-1-25 in 1967.[310] Olin's 20MM Phalanx operations took place in Area 9,[311] and they used Building I-1-25 for processing related to these operations.[312] No information was found regarding how long Olin leased this building; however, Olin documents indicate they were still occupying I-1-25 by 1986.[313]

Building I-1-26 – Change House

West of the main loading line, there were three IOP Change Houses and east of Building I-1-23 was a fourth IOP Change House.[314] The Change Houses (Buildings I-1-25, I-1-26 I-1-27 and I-1-28) contained locker rooms and lunchrooms.[315] Drains inside the change houses would drain to the sewers. Historically change house sewers for ordnance plants have contained explosives residues.

Building I-1-26 was removed sometime prior to 1993.[316] CONWR documents indicate they likely razed this building.[317]

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[307] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[308] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[309] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 29.
[310] DPRA Document No. 00007503. Lease, Contract No. 14-16-0003-12613, dated January 1, 1967.
[311] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988.
[312] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.
[313] DPRA Document No. 00014441. Olin, Inter Office Memo entitled "February 1986, Radiation Safety Committee Meeting Minutes," dated March 19, 1986.
[314] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[315] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 29.
[316] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[317] DPRA Document No. 15527. CONWR, Memorandum regarding Olin's new lease, dated September 29, 1983.

Building I-1-27 – Change House

West of the main loading line, there were three IOP Change Houses and east of Building I-1-23 was a fourth IOP Change House.[318] The Change Houses (Buildings I-1-25, I-1-26 I-1-27 and I-1-28) contained locker rooms and lunchrooms.[319] Drains inside the change houses would drain to the sewers. Historically change house sewers for ordnance plants have contained explosives residues.

Building I-1-27 was removed sometime prior to 1993.[320] Refuge documents indicate they likely razed this building.[321]

Building I-1-28 – Change House

West of the main loading line, there were three IOP Change Houses and east of Building I-1-23 was a fourth IOP Change House.[322] The Change Houses (Buildings I-1-25, I-1-26 I-1-27 and I-1-28) contained locker rooms and lunchrooms.[323] Drains inside the change houses would drain to the sewers. Historically change house sewers for ordnance plants have contained explosives residues.

Sangamo leased this building from 1956 to 1962.

SIU-STC occupied Building I-1-28 from 1965 to 1983.[324,325,326,327,328]

Building I-1-28 was removed sometime prior to 1993.[329]

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[318] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[319] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 29.
[320] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[321] DPRA Document No. 15527. CONWR, Memorandum regarding Olin's new lease, dated September 29, 1983.
[322] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[323] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 29.
[324] DPRA Document No. 00020257/DOI 007811 – DOI 007813. Southern Illinois University at Carbondale, Attachment #1 to Response to First Set of Information Requests, dated June 29, 1989.
[325] DPRA Document No. 00023009. Lease Contract No. 14-16-0003-13449 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and The Board of Trustees, Southern Illinois University, dated April 15, 1971.
[326] DPRA Document No. 00027184. Lease Contract No. 14-16-0003-13,935 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Board of Trustees, Southern Illinois University (Employment Training Center), dated June 1973; and associated amendments.
[327] DPRA Document No. 00018338. Lease Contract No. 14-16-0003-13,937 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Board of Trustees, Southern Illinois University (Technical & Adult Education), dated June 1973; and associated amendments.
[328] DPRA Document No. 00027227. Lease Contract No. 14-16-0003-78,004 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Board of Trustees of Southern Illinois University (School of Technical Careers – Manpower Skill Center), dated June 20, 1977; and associated amendments.

Building I-1-29 – Boiler House

Southwest of the IOP Receiving and Storage Building (I-1-2) was the IOP Boiler House (I-1-29).[330] The Boiler House contained a sump pit, a fuel oil pump, a compressor, a feedwater heater tank, two boilers and a condensate storage tank.[331] This boiler house had four underground storage tanks (USTs) associated with it, which were located on the northeast side of the building.[332] Records were not found to confirm whether or not these USTs were removed or remain in place. There was a railroad spur that ran along the east side of the USTs and next to this spur was an unloading rack for unloading fuel oil into the USTs.[333]

To the north of the foundation is a grassy/gravelly area, which is believed to be the location of the IOP USTs if they are still present on site.

This boiler house was razed sometime between 1965 and 1971[334] and only the foundation is still present on site. According to Refuge personnel, Building I-1-29 was destroyed; however, no other information was found regarding how it was destroyed or a specific date.[335] During the site reconnaissance, there were several empty Olin/Primex/GDO&TS containers (drum-shaped) observed on a concrete slab located to the north of the former IOP Boiler House (Building I-1-29) foundation. There is reddish staining present on the concrete next to these containers. No information was found regarding the use of these containers.

Building I-1-30 – Timekeepers Building

West of the main loading line, there were also two IOP Timekeepers Buildings (Building I-1-30 and I-1-31). The Timekeepers Building contained office space, utility rooms, and time clock rooms.[336]

Sangamo leased this building from 1956 to 1962.

Building I-1-30 was removed sometime between 1980 and 1993[337]

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[329] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[330] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[331] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 30.

[332] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 30.

[333] ACO 4991. Environmental Science & Engineering, Inc., Crab Orchard National Wildlife Refuge, Former Illinois Ordnance Plant, Uncharacterized Sites Report, dated August 7, 1991, Figure 3-5.

[334] 1965 and 1971 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[335] Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed.

[336] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 31.

Building I-1-31 – Timekeepers Building

West of the main loading line, there were also two IOP Timekeepers Buildings (Building I-1-30 and I-1-31). The Timekeepers Building contained office space, utility rooms, and time clock rooms.[338]

Building I-1-31 was removed sometime between 1971 and 1980.[339]

IOP Building I-1-32 – Guard House

There were two IOP Guard Houses located in Area 9. One Guard House (Building I-1-33), was located at the southern gate entrance to Area 9 and the other (Building I-1-32) was located at the northern gate entrance to Area 9.[340]

IOP Building I-1-32 was removed sometime prior to 1965.[341]

Olin Building I-1-32

Since it appears that IOP Building I-1-32 was razed prior to Olin's tenure at the site, it is assumed that this building was rebuilt and given the same name as the former IOP Guard House (I-1-32). The location of Olin Building I-1-32 was identified on an Olin map[342] as the same building as Olin Building I-1-19[343]. In 1977, Olin identified a sump present on the south side of this building (shown on Figure 13-5) that was used in association with delay, fuse and trace blending prior to 1977.[344]

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[337] 1980 and 1993 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[338] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 8, Page 31.

[339] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[340] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[341] 1965 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[342] PRI-002626. Olin, 1975 Safety Performance, Technical Systems Operation, Marion, Illinois, Map of I Area Scrap Buildings.

[343] PRI-016719. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[344] PRI-016598 and PRI-016599. Document entitled "Explosive Sump Descriptions," and a map of the I Area as attachments to an Olin inter office memorandum entitled "Explosive Sumps," dated June 3, 1977.

IOP Building I-1-33 – Guard House

There were two IOP Guard Houses located in Area 9. One Guard House (Building I-1-33), was located at the southern gate entrance to Area 9 and the other (Building I-1-32) was located at the northern gate entrance to Area 9.[345]

IOP Building I-1-33 was removed sometime prior to 1965.[346]

Olin Building I-1-33

Since it appears that IOP Building I-1-33 was razed prior to Olin's tenure at the site, it is assumed that this building was rebuilt and given the same name as the former IOP Guard House (I-1-33). It was built sometime between 1971 and 1980[347] and is located east of Olin Buildings I-1-19 and I-1-21. Olin took occupancy of this building in 1975.[348] It is assumed that this building was used for explosives-related activities, since the building is surrounded by a berm.[349] According to a 1985 Olin map of Area 9, I-1-33 housed items such as "Tracer" and "API," likely explosives.[350]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage purposes).[351] GDO&TS is the current tenant in Building I-1-33.[352]

IOP Building I-1-34 – Condensate Pump House

This IOP Condensate Pump House (I-1-39) was located near the southeast corner of Building I-1-2, the IOP Receiving and Storage Building.[353]

This building was removed between 1971 and 1980.[354]

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[345] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[346] 1965 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[347] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[348] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.

[349] PRI-016719. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[350] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[351] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[352] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[353] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

Olin Building I-1-34

Olin Building I-1-34 appears between 1965 and 1971[355] and is located east of Building I-1-12. By the late 1970s, Olin used this building for storage of HEI pellets,[356] and in 1984, Olin noted the building was overloaded with trace mix.[357] According to a 1985 Olin map of Area 9, I-1-34 housed up to 200 pounds of explosives (see Table 13-3A).[358] By 1986, Olin was using I-1-34 as a scrap collection building.[359]

Primex assumed Olin's lease for this building in 1997 (lease noted for manufacturing purposes).[360] GDO&TS is the current tenant in Olin Building I-1-34.[361]

Building I-1-34 An #1

Building I-1-34 An #1 is not an original IOP building. No information was found regarding the location of this building. In 1998, Primex began leasing "Annex #1" to Building I-1-34 (which is likely Building I-1-34 An #1).[362]

GDO&TS is the current tenant in Building I-1-34 An #1.[363]

Building I-2-34P

In 1985, Olin stored hazardous waste in a building called I-1-34P.[364] It is unknown if this is actually Building I-1-34, I-1-34A, or a different building. No other information was found regarding this building.

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[354] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[355] 1965 and 1971 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[356] DPRA Document No. 00011389/PRI-014926. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[357] DPRA Document No. 00009511. Olin, Inter Office Memo entitled "DCAS Inspection, May 8-10, 1984, dated May 14, 1984.

[358] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[359] DPRA Document No. 00012281/PRI-003649. Olin, Inter Office Memo entitled "Safety Inspection," dated May 21, 1986.

[360] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[361] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[362] DPRA Document No. 00017649. Amendment No. 2 to Building and Igloos Lease Contract No. 14-16-0003-96-579, PRIMEX Technologies, Inc., dated July 1, 1998.

[363] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

IOP Building I-1-35 – Condensate Pump House

This IOP Condensate Pump House (I-1-35) was located near the southeast corner of Building I-1-3, the IOP Cleaning and Painting Building.[365]

This building was removed between 1971 and 1980.[366]

Olin Building I-1-35 (Building I-1-101)

Olin Building I-1-35 was built sometime between 1971 and 1980[367] and was located east of Building I-1-12.[368] It is assumed that this building was used for explosives-related activities, since the building is surrounded by a berm.[369] By the late 1970s, Olin used this building for storage of HEI pellets.[370]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage purposes);[371] however, by that time, the building was referred to as I-1-101.[372,373] Primex also used this building as an area where hazardous wastes were accumulated on-site for less than 90 days.[374]

GDO&TS is the current tenant in Building I-1-101.[375] Note, this building was located in an area that is currently covered by dense trees, therefore, it is shown on Figure 13-2a in this last known location.

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[364] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[365] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[366] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[367] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[368] DPRA Document No. 00011389/PRI-014926. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[369] PRI-016719. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[370] DPRA Document No. 00011389/PRI-014935. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[371] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[372] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[373] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, 1 Area North Site Plan, dated July 22, 1997.

[374] DPRA Document No. 00015017. Primex Technologies, Attachment C, Procedure 4.13: Plant Emergency Procedures, Procedure 4.14: Contingency Plan Arrangements for Emergencies with Local Authorities, dated December 1996, Pages 12 and 15.

[375] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Buildings I-1-35A and I-1-35B

Buildings I-1-35A and I-1-35B are not original IOP buildings. They are currently located immediately west of Olin Building I-1-35/Building I-1-101.[376] Olin began leasing these buildings in 1975.[377] In 1985, these buildings were located adjacent to Building I-1-35, to the southeast, and they housed up 5,000 pounds of RDX pellets.[378]

Primex assumed Olin's lease for these buildings in 1997 (lease noted for cold storage purposes).[379] GDO&TS is the current tenant in Buildings I-1-35A and I-1-35B.[380] Note, these buildings were located in an area that is currently covered by dense trees, therefore, they are shown on Figure 13-2a in this last known location.

Building I-1-36 – Condensate Pump House

There was an IOP Condensate Pump House (I-1-36) located between the Screening Building (I-1-8) and the IOP Melt Loading Building (I-1-6).[381]

Building I-1-36 was removed sometime between 1951 and 1960.[382]

Olin Buildings I-1-36A, I-1-36B, I-1-36C/Olin Building I-1-36

These buildings were built on the pad of the former IOP Building I-1-21.[383]Beginning in the late 1970s, Olin Building I-1-36 (later noted as I-1-36C) was used for Olin's propellant staging vacuums system which was a part of their 30MM GAU 8/A production activities in Area 9.[384]

Building I-1-37 – Condensate Pump House

There was an IOP Condensate Pump House (I-1-37) located between the IOP Vacuum Pump Houses (I-1-13 through I-1-18) and the IOP Drilling and Boostering Building (I-1-12).[385]

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[376] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan, dated July 22, 1997.
[377] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 for Lease Contracts No. 14-19-008-2675 and No. 14-16-12613U, dated September 5, 1980.
[378] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[379] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[380] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[381] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.
[382] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[383] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan, dated July 22, 1997.
[384] DPRA Document No. 00011389/PRI-014926. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

Building I-1-37 was removed sometime between 1960 and 1965.[386]

Olin Building I-1-37

Olin Building I-1-37 is first noted in Area 9 between 1965 and 1971,[387] located east of former Building I-1-22 and south of Building I-1-25. Olin took occupancy of this building in 1967.[388] By the late 1970s, Olin called this building the Mixer Control Building and was staging M36A2 primer and M505 fuses as well as MK-24 scrap in here.[389,390]

IOP Building I-1-38 – Condensate Pump House

This IOP Condensate Pump House (I-1-38) was located near the southeast corner of Building I-1-20, the IOP Assembly, Packing and Shipping Building.[391]

Building I-1-38 was removed sometime between 1965 and 1971.[392]

Olin Building I-1-38

Olin Building I-1-38 first appears in the 1971 aerial photograph,[393] located east of Olin Building I-1-37. It is assumed that this building was used for explosives-related activities, since the building is surrounded by a berm.[394] Some Olin documents refer to this Building as I-1-38P, which could indicate it is a portable building.[395] By the late 1970s, Olin used this building for staging RDX and HEI pellets.[396]

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[385] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[386] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figures 2 and 3.

[387] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figures 3 and 4.

[388] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 for Lease Contracts No. 14-19-008-2675 and No. 14-16-12613U, dated September 5, 1980.

[389] DPRA Document No. 00011389/PRI-014926, PRI-014935, and PRI-015089. Olin, Technical Systems Operation, 30MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[390] DPRA Document No. 00026971. Olin, Technical Systems Operations, Temporary Standard Operating Procedure, Packaging and Disposal of Flare Mix Scrap from MK-24 Mix House Sump, dated July 23, 1976, Page 2.

[391] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[392] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figures 3 and 4.

[393] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figure 4.

[394] PRI-016719. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[395] Many times, Olin noted portable buildings with the letter "P" after the building number.

[396] DPRA Document No. 00011389/PRI-014926 and PRI-014935. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

This building was removed sometime between 1980 and 1993.[397]

Building I-1-39 – Condensate Pump House

This IOP Condensate Pump House (I-1-39) was located to the east of Building I-1-23, the IOP Propellant Charge Building.[398]

Building I-1-39 was removed sometime between 1971 and 1980.[399]

Olin Building I-1-39

Olin Building I-1-39 first appears in the 1971 aerial photograph,[400] located north of Olin Building I-1-38. It is assumed that this building was used for explosives-related activities, since the building is surrounded by a berm.[401] By the late 1970s, Olin used this building for staging RDX and HEI pellets.[402]

This building was removed sometime between 1980 and 1993.[403]

Building I-1-40

Building I-1-40 was not an original IOP building. It first appears in Area 9 on the 1971 aerial photograph, located north of Building I-1-25. [404] Olin used this building for their phalanx (DU) operations until 1984.[405] No other information was found regarding Olin's use of this building.

Building I-1-41

Building I-1-41 was not an original IOP building. It was in place in Area 9 sometime between 1971 and 1980.[406] Olin/Primex/GDO&TS is the only known tenant for this building located on

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[397] 1980 and 1993 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[398] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

[399] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figures 4 and 5.

[400] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figure 4.

[401] PRI-016719. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[402] DPRA Document No. 00011389/PRI-014926 and PRI-014935. Olin, Technical Systems Operation, 30 MM GAU 8/A Production Readiness Review, dated September 17, 1975, revised July 1, 1976.

[403] 1980 and 1993 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[404] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[405] DPRA Document No. 00026764. Olin, Inter Office Memo entitled "Move of Phalanx (D.U.) Operations August 1984," dated August 9, 1984.

the Line between Building I-1-11 and former Building I-1-6 (east of former Building I-1-27).[407,408] In 1985, Olin housed up to 60,000 pounds of propellant in this building.[409]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[410] GDO&TS is the current tenant in Building I-1-41.[411]

Building I-1-42

Building I-1-42 was not an original IOP building. This building first appears in Area 9 on the 1971 photograph,[412] and is located just east of Building I-1-12.[413,414,415] In 1985, Olin housed up to as much as 150,000 pounds of explosives including propellant trace mix, fuses, and trace igniter in this building (see Table 13-3A).[416] In 1986, Olin noted the building as "fair" during a safety inspection.[417]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[418] GDO&TS is the current tenant in Building I-1-41.[419]

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[406] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[407] 1980 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[408] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[409] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[410] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[411] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[412] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[413] DPRA Document No. 00027104/PRI-016817. Olin-Marion Wastewater Program, Status 30 July 1986, Drawing entitled "I- Area Load Limits, Staging, Bunkers & Misc. Bldgs.

[414] DPRA Document No. 00027057/PRI-016719. Wastewater Point Source Survey Report, Final Draft, 11 September 1984, Drawing entitled "I- Area Load Limits, Staging, Bunkers & Misc. Bldgs.

[415] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[416] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[417] DPRA Document No. 00012283/PRI-003651. Olin, Safety Inspection Check List "I" Area Bunkers, Staging, Etc., dated May 21, 1986.

[418] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[419] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Building I-1-43

Building I-1-43 was not an original IOP building. It first appears in the 1971 aerial photograph,[420] located slightly northeast of Building I-1-42. In a 1985 Olin map of Area 9, Olin noted RDX duster filters in this building.[421] By 1986, Olin noted maintenance junk piled behind Building I-1-43 as well as residual left from the removal of an HEI charger.[422]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[423] GDO&TS is the current tenant in Building I-1-43.[424]

Building I-1-44

Building I-1-44 was not an original IOP building. It first appears in the 1971 aerial photograph,[425] located south of Olin Building I-1-19 and north of Building I-1-12. In 1985, Olin housed up to 200,000 pounds of primer in this building.[426]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[427] GDO&TS is the current tenant in Building I-1-44.[428]

Building I-1-45

Building I-1-45 was not an original IOP building. It first appears in the 1971 aerial photograph,[429] located west of Building I-1-44. Olin did occupy the building;[430] however no information was found regarding Olin's specific use of I-1-45. In 1986, Olin noted this building

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[420] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[421] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[422] DPRA Document No. 00012281/PRI-003649. Olin, Inter Office Memo entitled "Safety Inspection," dated May 21, 1986.

[423] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[424] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[425] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[426] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[427] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[428] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[429] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[430] DPRA Document No. 00012283/PRI-003651. Olin, Safety Inspection Check List "I" Area Bunkers, Staging, Etc., dated May 21, 1986.

was being used as an accumulation point for unused and unknown chemicals that needed to be disposed.[431] Another Olin document indicated in 1985, Olin used this building for "inert storage [of] obsolete chemicals."[432]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[433] GDO&TS is the current tenant in Building I-1-45.[434]

Building I-1-46

Building I-1-46 was not an original IOP building. It first appears in the 1971 aerial photograph,[435] located south of Olin Building I-1-19 and north of Building I-1-44. Olin did occupy the building;[436] and by at least 1985, Olin was using this building for primer storage.[437]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[438] GDO&TS is the current tenant in Building I-1-46.[439]

Building I-1-47

Building I-1-47 was not an original IOP building. It first appears in the 1971 aerial photograph,[440] located southwest of Olin Building I-1-19 and northwest of Building I-1-45. In 1985, Olin stored inert pellets in this building.[441]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[442] GDO&TS is the current tenant in Building I-1-47.[443]

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[431] DPRA Document No. 00012281/PRI-003649. Olin, Inter Office Memo entitled "Safety Inspection," dated May 21, 1986.

[432] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[433] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[434] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[435] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[436] DPRA Document No. 00012283/PRI-003651. Olin, Safety Inspection Check List "I" Area Bunkers, Staging, Etc., dated May 21, 1986.

[437] DPRA Document No. 00026949/PRI-006616. Olin, 1985 Air Source Inventory/OP/Marion/RC, dated October 7, 1985, Page 00008.

[438] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[439] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[440] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[441] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

Building I-1-48

Building I-1-48 was not an original IOP building. It first appears in the 1980 aerial photograph,[444] located just west of Olin Building I-1-19. Sometime prior to 1986, Olin used this building for solvent storage. By 1986, it was being used by Olin maintenance.[445]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[446] GDO&TS is the current tenant in Building I-1-48.[447]

Building I-1-49

Building I-1-49 was not an original IOP building. It was located south of Buildings I-1-11 and I-1-12.[448] In September 1984, Building I-1-12 contained a Hoffman Wet Collector to collect HEI Mix and water from milling operations.[449] The material collected was passed through a filter and discharged to a holding tank in Olin Building I-1-49.[450] After the water was filtered, it was discharged to the ground surface outside this building.[451] This building was noted as the Hoffman Slurry House.[452] A 1985 Olin map of Area 9 indicates up to 150 gallons of contaminated water was located in this building.[453] In 1988, Olin noted poor housekeeping conditions in Building I-1-49.[454]Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[455] GDO&TS is the current tenant in Building I-1-49.[456]

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[442] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[443] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[444] 1980 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[445] DPRA Document No. 00012281/PRI-003649. Olin, Inter Office Memo entitled "Safety Inspection," dated May 21, 1986.

[446] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[447] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[448] DPRA Document No. 00027104/PRI-016817. Olin-Marion Wastewater Program, Status 30 July 1986, Drawing entitled "I- Area Load Limits, Staging, Bunkers & Misc. Bldgs.

[449] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[450] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[451] PRI-016712. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, 11 September 1984.

[452] DPRA Document No. 00027019/PRI-016692. Olin, Point Source Discharges Inventory by Area, dated December 3, 1984.

[453] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[454] DPRA Document No. 00016642. Olin, 1988 Safety Audit Action Items, dated March 7, 1988.

[455] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[456] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Buildings I-1-52(P) and I-1-53(P)

These are not original IOP Buildings. They first appear on site in the 1980 aerial photograph,[457] located just south of Building I-1-12.[458] In 1985, Olin used these building for hazardous waste,[459] and in 1986, Olin was using I-1-52P and I-1-53P as scrap collection buildings[460] (they were likely portable buildings).

Primex assumed Olin's lease for these buildings in 1997 (lease noted for cold storage).[461] Primex also used these buildings as areas where hazardous wastes were accumulated on-site for less than 90 days.[462]

GDO&TS is the current tenant both buildings.[463]

Building I-1-54

Building I-1-54 (a.k.a. I-1-54P) is likely a portable building. In 1985, it was located northwest of Building I-1-53 and west of Building I-1-12.[464] No information was found regarding the current of this building.

Lease documents indicate Primex assumed Olin's lease for Building I-1-54 in 1997 (lease noted for cold storage).[465] GDO&TS is the current tenant in this building.[466] No information was found regarding Olin/Primex/GDO&TS' use of Building I-1-54.

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[457] 1980 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[458] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan.

[459] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[460] DPRA Document No. 00012281/PRI-003649. Olin, Inter Office Memo entitled "Safety Inspection," dated May 21, 1986.

[461] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[462] DPRA Document No. 00015017. Primex Technologies, Attachment C, Procedure 4.13: Plant Emergency Procedures, Procedure 4.14: Contingency Plan Arrangements for Emergencies with Local Authorities, dated December 1996, Pages 12 and 15.

[463] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[464] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[465] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[466] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Building I-1-55

No information was found regarding the location of this building; however, lease documents indicate Primex assumed Olin's lease for Building I-1-55 in 1997 (lease noted for cold storage).[467] One document shows Olin using this building by 1980.[468] GDO&TS is the current tenant in this building.[469] No information was found regarding Olin/Primex/GDO&TS' use of Building I-1-55.

Buildings I-1-56 and I-1-57

Buildings I-1-56 and I-1-57 first appear in the 1971 aerial photograph.[470] I-1-56 is located northeast of Building I-1-20 and Building I-1-57 is located southwest of Building I-1-23.[471,472,473] In 1985, Olin used Building I-1-56 as a maintenance office.[474]

Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[475] GDO&TS is the current tenant in both buildings.[476] No other information was found.

Building I-1-58

Building I-1-58 first appears in the 1971 aerial photograph.[477] Olin occupied this building;[478] however, no information was found regarding their specific use of I-1-58 or how long they used it. Also, no information was found regarding other possible tenants.

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[467] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[468] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 for Lease Contracts No. 14-19-008-2675 and No. 14-16-12613, dated September 5, 1980.

[469] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[470] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[471] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[472] DPRA Document No. 00027104/PRI-016817. Olin-Marion Wastewater Program, Status 30 July 1986, Drawing entitled "I- Area Load Limits, Staging, Bunkers & Misc. Bldgs.

[473] DPRA Document No. 00013836/PRI-00462. Map attachment to Olin letter sent to CONWR regarding plans for moving parking in the "I" area, dated April 16, 1985.

[474] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[475] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[476] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[477] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[478] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.

Building I-1-61

Building I-1-61 first appears in the 1980 aerial photograph located north of Olin Building I-1-21 and southwest of Building I-1-23.[479] No information was found regarding the location of this building. Olin occupied this building;[480] however, no information was found regarding their specific use of I-1-61. Lease documents indicate Primex assumed Olin's lease for I-1-61 in 1997 (lease noted for cold storage);[481] however nothing was found to indicate GDO&TS assumed Primex's lease.

Buildings I-1-62 and I-1-63

Buildings I-1-62 and I-1-63 first appear in the 1971 aerial photograph.[482] I-1-62 is located west of Building I-1-23 and northwest of Building I-1-57. I-1-63 is located south of Building I-1-23. Olin documents indicate the did occupy these buildings;[483] however, no information was found regarding their specific use of either one. While no lease information was found regarding Primex's use of these buildings, they were labeled on a Primex map of the I Area.[484]

GDO&TS is the current tenant in Building I-1-62.[485] No other information was found regarding I-1-63.

Building I-1-64

No information was found regarding the location of this building. Olin began occupying this building in 1978[486] however, no information was found regarding their specific use of I-1-64.

Buildings I-1-65P and I-1-66P

These were not original IOP buildings. They were located adjacent to the northeast of Building I-1-23.[487] They first appear on site between 1965 and 1971, and they are no longer on site. Olin documents indicate they did occupy both Buildings I-1-65P and I-1-66P;[488] however, no information was found regarding their specific use of either. They were likely portable buildings.

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[479] 1980 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[480] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.
[481] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[482] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[483] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.
[484] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan.
[485] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[486] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.
[487] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[488] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.

Buildings I-1-68P and I-1-69P

Buildings I-1-68P and I-1-69P appear in Area 9 sometime prior to 1986, located northeast of Building I-1-23 and just southwest of Building I-1-25. Olin did use these buildings[489] (likely portable storage buildings); however, no information was found regarding their specific use. Both buildings are removed at least by 1993.[490]

Buildings I-1-70P, I-1-71P, and I-1-72P

These buildings (likely portable) were located west of Buildings I-1-48 and I-1-39 and southwest of Building I-1-25[491] and first appear on the 1980 aerial photograph.[492] They are labeled on both Olin and Primex maps of Area 9;[493,494] however no information was found regarding how Olin/Primex used these buildings. Both buildings were removed sometime after 1993.[495]

Buildings I-1-73 and I-1-77 (Olin Guard Shacks)

Neither Building I-1-73 nor Building I-1-77 were original IOP buildings. They were used by Olin as guard shacks[496] and first appear on site between 1971 and 1980.[497] Olin began occupying Building I-1-77 in 1975.[498] Primex assumed Olin's lease for these buildings in 1997 (lease noted for cold storage).[499] GDO&TS is the current tenant in both buildings.[500]

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[489] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.
[490] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[491] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[492] 1980 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[493] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan.
[494] DPRA Document No. 00027104/PRI-016817. Olin-Marion Wastewater Program, Status 30 July 1986, Drawing entitled "I- Area Load Limits, Staging, Bunkers & Misc. Bldgs.
[495] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[496] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[497] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[498] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.
[499] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[500] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Building I-1-74P

Building I-1-74P was likely a portable building, and was located slightly east of Building I-1-12.[501] Olin began occupying this building in 1978.[502] Olin's 20MM Phalanx operations took place in Area 9,[503] and they used Building I-1-74P for storage related to these operations.[504]

Primex assumed Olin's lease for this building in 1997.[505] GDO&TS is the current tenant in Building I-1-75.[506]

Building I-1-75

Building I-1-75 first appears in aerial photographs in 1971 located immediately west of Building I-1-42.[507,508] No information was found regarding when Olin took occupancy of this building but an Olin inter office memo indicates they were using it sometime prior to 1984.[509] Primex assumed Olin's lease for this building in 1997.[510] GDO&TS is the current tenant in Building I-1-75.[511]

Building I-1-76

Building I-1-76 first appears on site sometime between the 1965 and 1971, located immediately adjacent (to the west) of Olin Building I-1-19.[512,513] Olin began occupying this building in

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[501] DPRA Document No. 00027057. Olin Corporation, Wastewater Point Source Survey Report, Final Draft, dated September 11, 1984, Drawing entitled "I Area Load Limits, Staging, Bunkers & Misc. Bldgs.

[502] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 for Lease Contracts No. 14-19-008-2675 and No. 14-16-12613U, dated September 5, 1980.

[503] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988.

[504] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.

[505] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[506] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[507] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[508] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[509] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.

[510] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[511] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[512] 1965 and 1971 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[513] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

1965.[514] Primex assumed Olin's lease for this building in 1997.[515] GDO&TS is the current tenant in Building I-1-76.[516]

Building I-1-78

Building I-1-78 first appears on site sometime between 1971 and 1980.[517] Olin began occupying this building in 1978.[518] This building contained a mixer[519] (no other information was found regarding the mixer). Primex assumed Olin's lease for this building in 1997.[520] GDO&TS is the current tenant in Building I-1-78.[521]

Building I-1-79

Building I-1-79 is located southeast of Olin Building I-1-19 and northwest of Building I-1-44.[522] Olin began occupying this building in 1976[523]and by 1985, Olin was using I-1-79 as a pump house (maintenance).[524] Primex assumed Olin's lease for this building in 1997 (lease noted for cold storage).[525] GDO&TS is the current tenant in Building I-1-79.[526]

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[514] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 for Lease Contracts No. 14-19-008-2675 and No. 14-16-12613U, dated September 5, 1980.

[515] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[516] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[517] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[518] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.

[519] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan, dated July 22, 1997.

[520] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[521] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[522] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[523] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.

[524] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[525] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[526] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

Buildings I-1-80, I-1-81, I-1-82, and I-1-83

These are not original IOP Buildings. They first appear in the 1971 aerial photograph,[527] and are located slightly west (and possibly adjoining) of Building I-1-23.[528] Olin began occupying these buildings in 1978,[529] and they were removed sometime after 1993.[530] No other information was found.

Buildings I-1-84 and I-1-85

These are not original IOP Buildings. They first appear in the 1971 aerial photograph,[531] and are located slightly east of Building I-1-23.[532] In 1985, this building was located adjacent to the northeast of Building I-1-20.[533] No information was found regarding Olin's activities in these buildings; however, Primex assumed Olin's lease for Building I-1-84 in 1997 (lease noted for cold storage).[534] GDO&TS is the current tenant in Building I-1-84.[535] No other information was found.

Building I-1-86

Building I-1-86 first appears on site sometime between 1965 and 1971 and it is located southwest of Building I-1-20.[536,537] Olin began occupying I-1-86P in 1980[538] (I-1-86 and I-1-86P are likely the same building).

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[527] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[528] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan, dated July 22, 1997.
[529] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.
[530] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[531] 1971 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[532] DPRA Document No. 00017531. Primex PCB site plan showing areas by number, I Area North Site Plan, dated July 22, 1997.
[533] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[534] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[535] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[536] 1965 and 197 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[537] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[538] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.

Primex assumed Olin's lease for Building I-1-86 in 1997 (lease noted for cold storage).[539] Primex also used this building as an area where hazardous wastes were accumulated on-site for less than 90 days.[540]

GDO&TS is the current tenant in this building.[541] No other information regarding this building was found.

Building I-1-87

Building I-1-87 first appears on site between 1951 and 1960, located slightly southwest of Building I-1-24.[542,543] It was removed sometime prior to 1993. Olin occupied Building I-1-87P (I-1-87 and I-1-87P are likely the same building) from 1967 to 1972,[544] and then again in the early 1980s.[545] This building was removed sometime prior to 1993.[546] No other information was found.

Building I-1-88

This building (I-1-88) was in place in the area of former IOP Buildings I-1-6 and I-1-8 sometime between 1971 and 1980.[547] Olin began leasing this building in 1981 calling it a " solar building."[548] Olin's 20MM Phalanx operations took place in Area 9,[549] and they used Building I-1-88 for storage related to these operations.[550] In 1985, Olin housed over 1,500,000 pounds of

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[539] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[540] DPRA Document No. 00015017. Primex Technologies, Attachment C, Procedure 4.13: Plant Emergency Procedures, Procedure 4.14: Contingency Plan Arrangements for Emergencies with Local Authorities, dated December 1996, Pages 12 and 15.

[541] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[542] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[543] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[544] DPRA Document No. 00013893. Olin, Additions to Updated Rental Adjustment Thru 31 August 1980 Lease Contracts 14-19-0008-2675 and 14-16-12613, September 5, 1980.

[545] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.

[546] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

[547] 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[548] DPRA Document No., 00018999/DOI 001759. Olin, Lease # 14-19-008-2675, Building Usage 2nd Quarter 1981.

[549] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988.

[550] DPRA Document No. 00027151. Chem-Nuclear Systems, Inc., Radiological Characterization Report, 20MM Phalanx Operation Areas for Olin Corporation Complex, Marion, Illinois, dated August 1, 1988, Page 5 and Table 1.

explosives and related product in this building (see Table 13-3A).[551] In 1988, Olin noted poor housekeeping conditions in this building.[552]

Ion 1977, Primex assumed Olin's lease for this building (lease noted for cold storage purposes).[553] GDO&TS is the current tenant in Building I-1-88.[554]

Building I-1-89

Building I-1-89 is located between Buildings I-1-44 and I-1-46.[555] Olin used I-1-89 for boiler maintenance.[556] In 1997, Primex assumed Olin's lease in Area 9 and this building was included.[557] GDO&TS is the current tenant in this building.[558]

Building I-1-90

According to a 1998 Primex map of Area 9, Building I-1-90 was located just west of Building I-1-23, partly between Buildings I-1-81 and I-1-82;[559] however, I-1-90 was not located on aerial photographs. Olin occupied this building in the early 1980s.[560] No other information was found regarding this building.

Building I-1-91

Building I-1-91 is not an original IOP building. It first appears in Area 9 sometime between 1980 and 1993, located adjacent to Olin Building I-1-19 (to the west) and north of Building I-1-76.[561,562] Olin used this building for air conditioner maintenance.[563] Primex assumed Olin's lease for this building in 1997.[564] GDO&TS is the current tenant in Building I-1-91.[565]

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[551] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[552] DPRA Document No. 00016642. Olin, 1988 Safety Audit Action Items, dated March 7, 1988.

[553] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[554] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[555] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[556] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[557] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[558] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[559] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[560] DPRA Document No. 00007582. Olin, Changes to Building Usage, Lease #14-16-0003-12613.

[561] 1980 and 1993 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

Building I-1-92

Building I-1-92 was located immediately southeast of Building I-1-78 and west of I-1-75. partly between Buildings I-1-81 and I-1-82;[566] however, I-1-92 was not located on aerial photographs. In 1985, Olin used this building for its vacuum dust system.[567] In 1997, Primex assumed Olin's lease for Area 9 in 1997 (lease noted for manufacturing purposes) and this building was included.[568] GDO&TS is the current tenant in Building I-1-92.[569]

Building I-1-93

No information was found regarding the location of this building. Olin likely occupied I-1-93 because Primex assumed Olin's lease for Area 9 in 1997 and this building was included (lease noted for cold storage purposes).[570] GDO&TS is the current tenant in Building I-1-93.[571]

Building I-1-95

Building I-1-95 first appears on site between 1951 and 1960, located west of Buildings I-1-3, I-1-4, and I-1-5.[572,573] Mark Twain Marine Industries reportedly leased Building #9, which is Building I-1-95, from 1968 through 1978.[574] They likely used this building for either

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[562] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[563] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[564] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[565] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[566] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[567] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.
[568] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[569] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[570] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.
[571] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[572] 1951 and 1960 aerial photographs 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland; and, the 1960 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).
[573] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[574] FWM 001010. Lease Contract No. 14-16-0003-12876 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Mark Twain Marine Industries, dated October 3, 1968, Page 2.

manufacturing their Mark Twain line of boats, manufacturing boat accessories and/or possibly for research and development.[575]

Lease documents indicate Olin occupied Building I-1-95 from 1975[576] to 1989.[577,578] Initially, Olin used this building for storage.[579] This conflicts with Mark Twain Marine Industries' lease information. In 1984,[580] Olin noted serious problems with the storage of chemicals/materials in this building and the other buildings grouped behind (to the east) Building I-1-3. Specifically, they noted spills, unknown chemicals present, and equipment not tagged as "decontaminated" with neither OSHA nor DOD storage requirements being met. According to Olin, some of the chemicals noted were:

- Calcium resinate
- Empty drums with the bungs open
- Acetone
- 510 Damping fluid (40MM)
- Iron powder
- Trichloroethylene
- Stearic acid
- Soda ash
- Calcium stearate
- Ethyl acetate

In 1985, Olin likely used this building for flammable chemicals storage.[581]

Building I-1-96 (Sangamo Building #8)

In 1947, Sangamo moved two buildings from Area 10 (FBM-1-4 and FBM-1-5) into Area 9,[582] designating this group as Building #8[583] (total square feet of 3,000). A 1951 aerial photograph[584]

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[575] CRO 000111. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1968 , Page 59.

[576] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #9. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #9 is in the location of Building I-1-95.

[577] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-81-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980.

[578] DPRA Document No. 00018833. Amendment No. 5 to Building Lease Contract No. 14-16-0003-81-525, Olin Corporation, dated March 1, 1989.

[579] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #8. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #8 is in the location of Building I-1-96.

[580] DPRA Document No. 00009535. Olin, Inter Office Memo entitled "Buildings and Contents Behind I-1-3/Request to Move," dated August 20, 1984.

[581] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[582] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.

of Area 9 indicates that these two buildings were positioned side-by-side and immediately east of building I-1-3, and west of Building I-1-35. This building group is later identified as Building I-1-96. Sangamo leased these buildings until 1962.[585,586,587,588,589]

Mark Twain Marine Industries reportedly leased Building #8, which is Building I-1-96, from 1968 through 1978.[590] They likely used this building for either manufacturing their Mark Twain line of boats, manufacturing boat accessories and/or possibly for research and development.[591]

Lease documents indicate Olin began occupying Building I-1-96 in 1975 for storage.[592,593,594] This conflicts with Mark Twain Marine Industries' lease information. In 1985, Olin stored old equipment in this building.[595] No information was found regarding how long Olin leased this building.

In 1984,[596] Olin noted serious problems with the storage of chemicals/materials in this building and the other buildings grouped behind (to the east) Building I-1-3. Olin noted spills, unknown chemicals present, and equipment not tagged as "decontaminated," with neither OSHA nor DOD storage requirements being met. Specifically, Olin noted an oil spill underneath equipment being stored at Building I-1-96.

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[583] DPRA Document No. 00009059. CONWR, Lease Data and Income Pertaining to Industrial Unit, Crab Orchard National Wildlife Refuge, dated April 12, 1949.

[584] 1951 aerial photograph 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland (same photograph used by Entech, Inc.).

[585] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.

[586] DOI 007669 – DOI 007672. Lease Renewal Agreement, Sangamo Electric Company, dated February 19, 1951, Pages 1-2.

[587] DOI 007683 – DOI 007692. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.

[588] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.

[589] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.

[590] FWM 001010. Lease Contract No. 14-16-0003-12876 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Mark Twain Marine Industries, dated October 3, 1968, Page 2.

[591] CRO 000111. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1968 , Page 59.

[592] DPRA Document No. 00025248/CRO 000469. Special Use Permit for Olin, Permit Number SUP-07-76, dated August 29, 1975. This SUP indicates Building #8. This document is used to compare to Original IOP Plan No.6544-101.14A, last revision December 10, 1945 with later notations added by Refuge personnel. The notations recorded some information about leases, building uses, and buildings that were removed or destroyed. This document notes that Building #8 is in the location of Building I-1-96.

[593] DPRA Document No. 00007587. Building Lease Contract No. 14-16-0003-81-525 by and between U.S. Fish and Wildlife Service and Olin Corporation, dated October 1, 1980.

[594] DPRA Document No. 00018833. Amendment No. 5 to Building Lease Contract No. 14-16-0003-81-525, Olin Corporation, dated March 1, 1989.

[595] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[596] DPRA Document No. 00009535. Olin, Inter Office Memo entitled "Buildings and Contents Behind I-1-3/Request to Move," dated August 20, 1984.

Building I-1-99

A 1998 Primex map indicates this building was located northwest of Building I-1-88 along the ramps connecting I-1-88 to I-1-12.[597] Building I-1-99 first appears on site sometime between 1980 and 1993.[598] No other information was found regarding this building.

Building I-1-101

Refer to the discussion for Olin Building I-1-35 for a description of Building I-1-101.

Building I-1-101 An#1

In 1998, Primex began leasing "Annex #1" to Building I-1-101 (which is likely Building I-1-101 An #1).[599] GDO&TS is the current tenant in this building.[600] No other information was found.

Buildings I-1-102 through I-1-108

These are not original IOP buildings. A 1998 Primex map[601] of Area 9 shows Buildings I-1-102P, I-1-106P, I-1-107P, and I-1-108P, just southwest of I-1-101 all in a row aligned toward Building I-1-12. (The "P" likely indicates these were portable buildings.) Buildings I-1-103P, I-1-104P, and I-1-105P are all shown slightly northeast of Building I-1-12. None of these buildings were noted on aerial photographs, due largely to dense tree coverage in the area.

It is likely Olin used these buildings because in 1997, Primex assumed Olin's lease for Area 9 and these buildings were included.[602] GDO&TS is the current tenant in these buildings.[603]

Note, buildings I-1-102, -106, -107, and –108 were located in an area that is currently covered by dense trees, therefore, they are shown on Figure 13-2a in this last known location.

Buildings I-1-109 and I-1-110

These buildings were located side-by-side, between Buildings I-1-41 and I-1-99, all northwest of Building I-1-88 (according to a 1998 Primex map).[604] These buildings were not seen on aerial

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[597] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[598] 1980 and 1993 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photographs used by Entech, Inc.).

[599] DPRA Document No. 00017649. Amendment No. 2 to Building and Igloos Lease Contract No. 14-16-0003-96-579, PRIMEX Technologies, Inc., dated July 1, 1998.

[600] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

[601] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.

[602] DPRA Document No. 00007524. Building and Igloos Lease Contract No. 14-16-0003-96-579 by and between U. S. Fish and Wildlife Service and PRIMEX Technologies, Inc., 8820 Route 148, Marion, Illinois 62959, dated January 1, 1997.

[603] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.

photographs due to tree coverage; however, by 1993, there are no trees in the area of these buildings and it appears they have been removed.[605] No other information was found.

Building I-1-111

The existence of this building is only known because of the document used to reference it as an area where Primex accumulated hazardous wastes on-site for less than 90 days.[606] No information was found regarding its location.

Sangamo Building #7

In 1947, Sangamo moved five buildings from Area 3 (FAM-3-5, FAM-3-6, FAM-3-7, FAM-4-5, FAM-4-6) into Area 9,[607] designating the group of them as Building #7[608] (total square feet of 51,250). A 1951 aerial photograph[609] of Area 9 indicates that these five buildings were positioned side-by-side with the short end of this building group perpendicular (immediately east) to buildings I-1-2, I-1-3, and I-1-35. Sangamo leased these buildings until 1962,[610,611,612,613,614] when it is likely they were removed (they are no longer present in the 1965 aerial photograph; only a ground scar remains).[615]

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[604] DPRA Document No. 00014144. Primex, Attachment (Site Map) to Primex memo entitled "I-Area Depleted Uranium Location Drawings," dated February 11, 1998.
[605] 1993 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).
[606] DPRA Document No. 00015017. Primex Technologies, Attachment C, Procedure 4.13: Plant Emergency Procedures, Procedure 4.14: Contingency Plan Arrangements for Emergencies with Local Authorities, dated December 1996, Page 12.
[607] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.
[608] DPRA Document No. 00009059. CONWR, Lease Data and Income Pertaining to Industrial Unit, Crab Orchard National Wildlife Refuge, dated April 12, 1949.
[609] 1951 aerial photograph from the National Archives and Records Administration, College Park, Maryland (same photograph used by Entech, Inc.).
[610] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.
[611] DOI 007669 – DOI 007672. Lease Renewal Agreement, Sangamo Electric Company, dated February 19, 1951, Pages 1-2.
[612] DOI 007683 – DOI 007692. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.
[613] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.
[614] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.
[615] 1965 aerial photograph from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah (same photograph used by Entech, Inc.).

Building #18

This 480 square ft building was located just west of Building I-1-28. SIU-STC occupied Building #18 from at least 1971 to 1980.[616,617,618,619] Building #18 was in place sometime between 1951 and 1960 and was removed between 1971 and 1980.[620]

Underground Storage Tanks

There were five USTs identified in Area 9 (not including the four USTs that were associated with the IOP Boiler House (I-1-29) which are discussed above). These five USTs were identified during a Freedom of Information Act (FOIA) request to the Illinois State Fire Marshall and the following information regarding these tanks was obtained from this source. The tanks are as follows:

- #1 – 9,000 gallon steel Gasoline UST that was installed in 1972, used through 1984, and removed in 1996
- #2 – 1,065 gallon steel Gasoline UST that was installed in 1972, used through 1984 and removed in 1996
- #3 – 550 gallon steel Gasoline UST that was installed in1972, used through 1984 and removed in 1996
- #4 – 10,000 gallon steel No. 2 Fuel Oil or Diesel UST that was installed in 1967, used through 1995 and removed in 1996
- #5 – 10,000 gallon steel No. 2 Fuel Oil UST that was installed in 1972, was used through 1985, was found to be leaking and finally was removed in1995

The locations of these USTs were not identified in the Illinois Fire Marshall's notes. It is assumed that all of these tanks were cleaned up and closed in accordance with Illinois Environmental Protection Agency (IEPA) regulations. The information provided by the Illinois Fire Marshall is included at the end of this section.

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[616] DPRA Document No. 00023009. Lease Contract No. 14-16-0003-13449 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and The Board of Trustees, Southern Illinois University, dated April 15, 1971.

[617] DPRA Document No. 00027184. Lease Contract No. 14-16-0003-13,935 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Board of Trustees, Southern Illinois University (Employment Training Center), dated June 1973; and associated amendments.

[618] DPRA Document No. 00018338. Lease Contract No. 14-16-0003-13,937 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Board of Trustees, Southern Illinois University (Technical & Adult Education), dated June 1973; and associated amendments.

[619] DPRA Document No. 00027227. Lease Contract No. 14-16-0003-78,004 by and between U.S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Board of Trustees of Southern Illinois University (School of Technical Careers – Manpower Skill Center), dated June 20, 1977; and associated amendments.

[620] 1951, 1960, 1971 and 1980 aerial photographs from the U.S. Department of Agriculture, Agricultural Stabilization and Conservation Service, Aerial Photography Field Office, Salt Lake City, Utah. The 1951 aerial photograph was obtained from the National Archives and Records Administration, College Park, Maryland. These are the same photographs used by Entech, Inc.

Small Military-Related Facility, Southwest of Area 9

According to Entech, Inc.'s review of aerial photographs,[621] in 1943, a small "military-related" facility was located approximately 395 yards southwest of Area 9 at the end of a dead-end road. Three, empty, concrete (or similar rigid material), side-by-side trenches (each approximately 4ft wide by 12 ft long) appear to be located north of the largest structure in this area. Additional aerial photographic interpretation indicates that by 1951, the facility has been removed; however, several ground scars or "footprints" of the former structures are visible.[622] A pattern created by scarring suggests the trenches are still present although they are not clearly visible. Further, the former dead-end road appears to have been extended to the southwest to create a through road. By 1960, only two of the three trenches are visible and the site remains visually the same in subsequent years of aerial photography.[623] Note, this area is located too far southwest of Area 9 to be shown on figures.

Olin Explosives Storage Area

A 1985 Olin map of Area 9 indicates Olin stored 78,000 pounds of Class 1.2 explosives just west of the northwestern most portion of the load line (Figure 13-2a).[624] Explosives classified as 1.2 by the Department of Transportation are characterized with a dangerous projection hazard.[625] A 1971 aerial photograph of this area shows what appears to be several trailers (which may have been the mechanism used to store the explosives). The site it still present in 1980 with more trailers noted in this area. By 1993, no trailers are present and minor ground scarring remains, and there appears to be little to now activity as the site is mostly grown over with vegetation.

13.1.3 Area 9 Previous Sampling Results

O'Brien & Gere RI, 1988

Three sites in Area 9 were investigated during the O'Brien & Gere RI done in 1988. These were Site 32 (called the Area 9 Landfill), Site 33 (called the Area 9 Building Complex) and Site 35 (called Area 9 Waterway). Both Sites 32 and 33 were remediated for PCBs and will therefore not be discussed in this section. Figure 13-3 shows the assumed excavation limits of the remediated area.

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[621] Entech, Inc., August 1999. Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion, Illinois, Volume I: Text, Page 3-51 and Volume II: Maps, Page DD.

[622] Entech, Inc., August 1999. Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion, Illinois, Volume I: Text, Page 3-51 and Volume II: Maps, Page DD.

[623] Entech, Inc., August 1999. Historical Aerial Photographic Analysis – Inventory of Potential Disposal Sites: Additional and Uncharacterized Sites (AUS) Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion, Illinois, Volume I: Text, Page 3-51 and Volume II: Maps, Page DD.

[624] DPRA Document No. CO02159. Olin Ordnance Products, Quantity/Distance Map "I" Area – North Portion, Drawing No. 6000121, dated May 1985.

[625] These classifications were obtained from the Department of Transportation Hazmat Transport Regulations, 49 CFR 173.58: Assignment of class and division for new explosives.

Site 35 was described as a low-lying spot in an agricultural field to the east of Area 9. According to O'Brien & Gere, this site did not have significant contamination and therefore was eliminated from further investigation. The site was included in the MISCA OU but, based on O'Brien and Gere's findings, no investigation was done. A discussion of this site was not included in this report.

13.1.4 Observations During Site Visit

The area along the former load line contains several buildings surrounded by grassy areas. Some of the buildings require maintenance. All of the buildings are within the Olin/Primex/GDO&TS fenced area. There is also debris located in various portions of Area 9. For instance, on a concrete slab observed to the north of the former IOP Boiler House (Building I-1-29), there were several empty Primex containers (drum-shaped) observed. There is reddish staining present on the concrete next to these containers.

There were two dry sump-like features noted to the east of Building I-1-3 during the site reconnaissance (noted on Figure 13-5). One is filled with soil and construction debris such as bricks and concrete. The other is empty and it appears that piping from the building would empty into this sump. Existing monitoring well 33-MWCC-14 (see Figure 13-4) appears to be located about midway between these two sumps. These sump-like features were not a part of the original IOP construction as seen in the original construction diagrams.[626]

On the east side of Building I-1-3 (near the northwest corner) a ponded area was observed near the building. It appeared that this ponded area contained layered, reddish soil staining during the site reconnaissance. This is in the area previously remediated (PCB OU).

The location of the former IOP evaporation basin was observed during the site reconnaissance also. Part of the former basin is currently a mounded grassy area and the other part appears to be covered by a concrete loading dock. No information was found regarding when this dock first appears on site.

13.1.5 Recommendations Based on Preliminary Assessment

The parts of Area 9 that have been remediated for PCB-contamination and are currently under investigation for volatile organic compound (VOC) groundwater contamination have not been included in the AUS OU Site AUS-0A09. The remainder of Area 9 was retained as Site AUS-0A09 in the SI because of industrial activity and potential release that have not been investigated.

13.2 SITE INVESTIGATION INFORMATION

URS conducted a Site Investigation at AUS-0A09 from March 30 through April 3, April 11, May 3 through May 4, and May 23, 2000. The rationale for sample locations, media, and

[626] U.S. Army Corps of Engineers, 1944, War Department Facilities Inventory of the Illinois Ordnance Plant – Carbondale, Illinois, Part 1, Section 5, Page 8.

analytes is presented in the Field Sampling Plan (FSP)[627] for the AUS OU PA/SI. Since the time the FSP was prepared, additional information has become available, and the historic discussion (Section 13.1) has been updated to include that information. The sampling locations discussed below are based on the information that was available at the time the FSP was developed, and may not address all areas of potential releases.

AUS OU SI sample locations are shown on Figures 13-5 and 14-6. Survey coordinates for all sample locations in Area 9 are listed in Table 13-4. Table 13-7 lists the sample locations and the matrix sampled at that location. All samples were soil. A groundwater sample was taken from the monitoring well.

13.2.1 Field Investigation

Sampling was done in accordance with the FSP, except as noted. The field investigation is summarized in this section, following the same order of description of site features as Section 13.1.2.8 of this report.

Building I-1-6 – Melt Loading Building

Samples 0A09-017 and 0A09-018 were located next to the former IOP Melt Loading Building (I-1-6). Melting and pouring of TNT and amatol were done in this building. This building also had settling tanks (sump) and an evaporation basin associated with the melting and pouring operations. Sample 0A09-017 was collected from the assumed location of the former evaporation basin, and sample 0A09-018 was collected from the assumed location of the former settling tanks. Both of these samples were collected to determine whether contamination still exists from IOP melting and pouring activities in this building, since melting and pouring were historically very messy operations.

All samples were collected in accordance with the tables in the FSP with the following exceptions:

- AUS-0A09-017-SD-0X Analyzed for metals instead of explosives.

[627] 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.

IOP Building I-1-11 – Booster Service Magazine (Olin Building I-1-49)

Sample 0A09-016 was located south of Olin Building I-1-49, at the reported location of the wastewater discharge to the ground surface. This building was used as an IOP Booster Service Magazine and it was also used by Technical Tape, Good Luck Glove and Olin/Primex/ GDO&TS. Technical Tape may have manufactured gift wrap in this building and Good Luck Glove may have manufactured gloves in this building. Olin discharged wastewater (from HEI mixing operations that were done in Building I-1-12), from Olin Building I-1-49.

Building I-1-12 – Drilling and Boostering Building

Samples 0A09-011 through 0A09-015 were collected from the soil surrounding Building I-1-12. This building was the IOP Drilling and Boostering Building and it was also used by Technical Tape, by Good Luck Glove and by Olin/Primex/GDO&TS. Technical Tape may have manufactured gift wrap in this building and Good Luck Glove may have manufactured gloves in this building. Olin used building I-1-12 for loading trace mix into projectiles. Olin used the dock of this building as an explosive scrap pickup point for materials such as pyro-propellant, explosives, ammunition, and primers. Sample 0A09-011 was located to the north of the building, 0A09-012 and 0A09-013 were located on the east side of the building. Sample 0A09-014 was located northwest of the building and sample 0A09-015 was located on the south side of the building.

Olin Building I-1-19

Samples 0A09-001 and 0A09-002 were collected from next to Olin Building I-1-19, which is used as a mix house. This mix house contained sumps. It should be noted that cleaning of buildings and sumps around the Refuge would involve the discharge of fluids to the grounds surrounding the buildings. These fluids would likely have contained explosive residues and volatile organic cleaning solvents. Monitoring well 0A09-W01 was also installed next to this building to determine if the discharge of fluids to the ground surrounding the building impacted the groundwater in this area.

Building I-1-20 – Assembly, Packing and Shipping Building

Samples 0A09-003, 0A09-005 and 0A09-006 were collected from next to Building I-1-20 (former IOP Assembly, Packing and Shipping Building). Olin used this building for pyrotechnic mixing operations, manufacturing nose cones for 20mm and 25mm ammunition, and as a .50 caliber trace line. Olin also reported poor housekeeping in this building in the 1970s. Sample 0A09-003 was collected from the west side of the building and samples 0A09-005 and 0A09-006 were collected from the east side of the building. These samples were collected to determine if contamination exists from the spillage of materials outside the building.

Building I-1-23 – Propellant Charge Building

Samples 0A09-007, 0A09-008 and 0A09-009 were collected from the along the west side of Building I-1-23 (former IOP Propellant Charge Building). Olin reportedly had pyrotechnic and ammunition mix loading facilities in this building. Sample 0A09-007 was collected near the center of this building, to detect potential contamination resulting from spillage of wastewater

outside the building. Samples 0A09-008 and 0A09-009 were collected from next to the sumps that were reportedly present at the southern end of this building.

Building I-1-26 – Change House

Sample 0A09-019 was collected from a drainage ditch that was located near former Building I-1-26. It is possible that this drainage ditch received drainage from the former IOP Change House. Sample 0A09-004 was collected from inside sewer manholes that also may have received drainage from the former Change Houses. It should be noted that Pyramid also leased this building in 1956. They were reported to have produced industrial lacquers and paints therefore it is possible that the drainage ditches and sewers in this area may have received both organic and metals contamination also.

Building I-1-27 – Change House

Sample 0A09-020 was collected from a drainage ditch that was located near former Building I-1-27. It is possible that this drainage ditch received drainage from the former IOP Change House. Sample 0A09-004 was collected from inside sewer manholes that also may have received drainage from the former Change Houses. It should be noted that Engineers Explosives, Inc. also reportedly leased this building in 1964. It is assumed that they were involved in explosives-related activities; however, this was not confirmed.

Building I-1-28– Change House

Sample 0A09-021 was collected from a drainage ditch that was located near former Building I-1-28. It is possible that this drainage ditch received drainage from the former IOP Change House. Sample 0A09-004 was collected from inside sewer manholes that also may have received drainage from the former Change Houses.

Olin Building I-1-33

It is assumed that Olin Building I-1-33 was used for explosives-related activities since there was a berm surrounding this building. Sample 0A09-010 was located near the exit door of this building, to detect any potential contamination in this area that may have resulted from spillage of wash waters used to clean out the building. Both volatile organic cleaning solvents and explosives residues may have been present in the wash waters.

13.2.2 Field Results

13.2.2.1 Site Conditions

13.2.2.1.1 Geologic Conditions

Little geologic information was obtained during this investigation. The geology of this site is discussed in detail in other reports done by RMT, Inc. as part of the current investigation of groundwater contamination at this site.[628]

13.2.2.1.2 Hydrogeologic Conditions

As a result of investigations at the PCB OU, the hydrogeology of this site is well characterized. Detailed discussions are provided in reports by RMT, Inc., referenced above. This section presents the results from this investigation.

Groundwater was encountered in the soil boring during drilling at a depth of 20.5 ft bgs. Table 13-6 presents the groundwater elevations measured in the Area 9 well in May, July, September, and October 2000. A slug test was performed on the well that was installed within Area 9 during the AUS OU investigation, resulting in a hydraulic conductivity value of 3.98E-04 centimeters per second(cm/sec). The slug test result is presented in Table 13-5. Hydraulic conductivity values from slug tests are greater than the trigger values for State of Illinois Class I Groundwater (Title 35 of the Illinois Administrative Code (35 IAC) 620.210(a)(4)(B)(ii)). Based on the boring at the site, the aquifer appears to meet the criteria for Class I Groundwater (35 IAC 620).

This classification is consistent with groundwater information from the RMT reports referenced above.

13.2.2.1.3 Hydrologic Conditions

The overall surface flow at the site is north toward Crab Orchard Lake. There are drainage ditches along the roadways.

13.2.2.2 Chemical Results

The following tables list all the chemicals detected in Area 9 during this investigation, along with the frequency and range of detections[629]:

- Table 13-8 – soil samples results, and
- Table 13-9 – groundwater samples results.

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[628] Refer to RMT, Inc., 2000. Groundwater Investigation Report/Focused Feasibility Study, Crab Orchard National Wildlife Refuge, PCB Operable Unit—Sites 32/33, Revision 1, January 2000; and RMT, Inc., 2001. Preliminary Design Report for the Groundwater Remedial Action, Crab Orchard National Wildlife Refuge, PCB Operable Unit—Sites 32/33, Revision 0, May 2001.

[629] Duplicate results were not included in the range except when the maximum value detected was in a duplicate sample. Therefore there may be some duplicate samples with results below the low end of the range reported in the tables, that are not shown in the tables.

These tables list all the chemicals detected in Area 2D 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 figures as follows:

- Figure 13-5 – organic results for soil and groundwater samples, and
- Figure 13-6 – inorganic results for soil and groundwater samples at this site.

13.3 SCREENING RISK ASSESSMENT

Results of the screening are presented in Tables 13-10 through 13-12 as follows:

- Table 13-10--human health risk screening for soils,
- Table 13-11--human health risk screening for groundwater, and
- Table 13-12--ecological risk screening for soils.

Each table lists the maximum detected concentration for each constituent analyzed at Area 9. 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 13-5 through 13-6 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 13-13 (human health risk) and 13-14 (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 13-13) and COPECs (Table 13-14) are shaded in the tables.

13.3.1 Human Health Risk

13.3.1.1 Soil

Human health screening results for soil samples are presented in Table 13-10. 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 x 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.

13.3.1.2 Groundwater

Human health screening results for groundwater are presented in Table 13-11. The maximum groundwater concentrations from Area 9 were screened against maximum contaminant levels (MCLs) and Illinois Class I groundwater standards.

13.3.2 Ecological Risk

13.3.2.1 Soil

Ecological screening results for soil samples are presented in Table 13-12, respectively. Soil screening concentrations for direct exposures were developed using toxicity reference values (TRVs) derived from several sources, including the following:

- USEPA (2000)[630]
- Environment Canada (1995)[631]
- Talmage *et al.* (1999)[632]
- Efroymson *et al.* (1997a, 1997b)[633]
- CCME (1999)[634]

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

[631] 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.

[632] 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.

[633] 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.

- MHSPE (1994)[635]
- 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)[636] 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.

13.4 SCIENTIFIC MANAGEMENT DECISION POINT

An RI is recommended for Site AUS-0A09, 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 be retained as COPCs/COPECs for further evaluation. These are the constituents coded with "D" on the COPC list, Table 13-13; and on the COPEC list, Table 13-14. COPCs in this category include barium, nickel, and selenium in soil. COPECs coded with "D" on Table 13-14 include manganese and selenium in soil. These chemicals may later be included in the RI for other reasons (for example, as standard components in an analytical method; if new information on site usage suggests they should be evaluated; or if they are of concern in other media) 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 evaluated in the RI. In addition, all analytes listed as uncertainties on these tables should be considered for further evaluation in the RI Work Plan.

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[634] Canadian Council of Ministers of the Environment. 1999. Canadian Environmental Quality Guidelines.
[635] 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.
[636] USEPA 1991. Assessment and Control of Bioconcentratable Contaminants in Surface Waters (Draft). US Environmental Protection Agency Office of Research and Development, Washington, D.C.

Chemicals that exceeded screening criteria and Refuge background (if applicable) are listed in Table 13-15.

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. The discussion of past usage included in this section should be carefully reviewed during work plan development, since this information was updated after the field investigation, and all potential release areas at this site may not have been investigated in the SI.

TABLE 13-1
AREA 9 OPERATORS/LESSEES

Operator/Lessee	Years of Operation	Buildings Occupied	Industrial Use of Buildings
Sherwin Williams Defense Corporation/War Department	1942-1945	All of Area 9	Loading of artillery shells
Sangamo [637,638,639,640,641,642]	Various times from 1946 to 1962	I-1-1, I-1-2, I-1-3, I-1-3A, I-1-4, I-1-5, I-1-21, I-1-20, IOP I-1-21, I-1-21N, I-1-22, I-1-23, I-1-25, I-1-28, I-1-30, I-1-96,Building #7,	Manufacturing of various kinds of AC and DC capacitors including mica capacitors, electrolytic capacitors, oil-filled paper capacitors, molded paper capacitors, and power factor capacitors and other equipment such as transducers for sonar apparatus, small dry transformers, and delay line equalizers
Knute Aronson [643,644]	1955-1966	I-1-31	Unknown
Pyramid Industrial Finishes [645]	1956	I-1-26	Produced industrial lacquers and paints
SIU - Geology Department [646,647]	1964-1973	I-1-30	Storage of rock samples and core drillings.

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[637] DOI 007663 – DOI 007674. Lease, Sangamo Electric Company, dated September 27, 1946.
[638] DOI 007679 – DOI 007674. Amendment to Lease, Sangamo Electric Company, dated December 17, 1947.
[639] DOI 007669 – DOI 007672. Lease Renewal Agreement, Sangamo Electric Company, dated February 19, 1951, Pages 1-2.
[640] DOI 007683 – DOI 007692. Amendment Two to Lease, Sangamo Electric Company, dated September 7, 1955.
[641] FWM 001252 – FWM 001257. Lease Contract No. 14-19-003-2694, Lands Designation M-22, by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1956.
[642] DOI 007693 – DOI 007711. Lease Contract No. 14-16-0003-4751, Lands Designation M-22 by and between Sangamo Electric Company and the U. S. Department of the Interior, Fish and Wildlife Service, dated September 1, 1961; and DOI 007714. Fish and Wildlife Service, Letter to Sangamo Electric Company relieving Sangamo Electric Company of the terms and conditions under Lease No. 14-16-0003-4751, dated March 20, 1962.
[643] DPRA Document No. 0009369. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, January through April, 1959, Page 24.
[644] CRO 000096. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1966, Table No. 1.
[645] ACO 000364. U. S. Department of the Interior, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, January Through April, 1956, Page 16.
[646] DPRA Document No. 00020257/DOI 007811 – DOI 007813. Southern Illinois University at Carbondale, Attachment #1 to Response to First Set of Information Requests, dated June 29, 1989.
[647] DPRA Document No. 00020255/DOI 007807 – DOI 007810. Southern Illinois University at Carbondale, Response to First Set of Information Requests, dated June 29, 1989.

TABLE 13-1
AREA 9 OPERATORS/LESSEES

Operator/Lessee	Years of Operation	Buildings Occupied	Industrial Use of Buildings
Engineers Explosives, Inc.	1964	I-1-27	Records do not indicate whether the company ever began operations at this site.[648,649] It is assumed that they were involved in explosives-related activities. The company was reportedly started in 1963 by a former Universal Match Corporation official.[650]
Technical Tape Corporation[651,652]	1963-1964 possibly until 1970?	I-1-11 and I-1-12 and other Buildings	Gift Wrap Manufacturing and Warehousing. The Refuge 1964 narrative report indicated that Technical Tape leased space in Load Line I for wrapping paper manufacturing, and that a fire destroyed 52,000 square feet (ft) of warehouse space;[653] however, as observed in aerial photographs in 1965, both Buildings I-1-11 and I-1-12 were still present on site.[654]
Fidelity Manufacturing[655]	1948	I-1-21	Unknown

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[648] CRO 000085. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1965, Table No. (illegible) (Industrial Leasing, Revenue, & Employment).
[649] CRO 000075. U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1964, Table No. 5.
[650] CRO 000065. U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Narrative Report, September through December, 1963, Page 34.
[651] DPRA Document No. 00016036. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Crab Orchard National Wildlife Refuge, Narrative Report, January Through April, 1963, Page 27.
[652] DPRA Document No. 00009339. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1964, Page 47.
[653] DPRA Document No. 00009339. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1964, Page 47.
[654] Entech, Inc., 2000, Historical Aerial Photographic Analysis – Selected Area Facilities: Additional and Uncharacterized Sites Operable Unit, Crab Orchard National Wildlife Refuge (CONWR), Marion Illinois, Figure 3. 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).
[655] DPRA Document No. 00009041. CONWR, Office Memorandum regarding leases at Crab Orchard Refuge, dated April 13, 1948.

TABLE 13-1
AREA 9 OPERATORS/LESSEES

Operator/Lessee	Years of Operation	Buildings Occupied	Industrial Use of Buildings
SIU - STC[656]	1961-1983	I-1-1, I-1-2, I-1-26, I-1-27, I-1-28, I-1-31, Building #18	Vocational Training School. Included auto body work (such as spray painting), food service training, fiberglass production, soda case and pallet repair, typing, secretarial, carpentry, basic electricity and remedial reading.[657]
Good Luck Glove Co.[658,659]	Sometime before 1963	I-1-11, I-1-12	Operations included manufacturing work gloves and mittens, cotton flannels, and jersey and leather combinations.[660] Tanning processes for leather includes the use of chromium. It is possible that this was done in Area 9; however, it was not confirmed.
Mark Twain Marine Industries[661,662]	1968-1978	I-1-3, I-1-4, I-1-5, I-1-95, I-1-96	Possible manufacturing of Mark Twain line of boats, boat accessories, and possibly research and development.[663]
Ora Collard[664,665,666]	1949-1950	I-1-30	Unknown

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[656] DOI 007811 – DOI 007813. Attachment to SIU's 104(e) response, dated 06/29/89.
[657] DOI 007808. SIU's response to Section 104(e) request for information, Page 2.
[658] ISH 000047 – ISH 000048. Illinois Manufacturers Directory – 1964, Pages 709 and 711.
[659] DPRA Document No. 00009353. U. S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, Narrative Report, January through April, 1963, Page 27.
[660] ISH 000047 – ISH 000048. Illinois Manufacturers Directory – 1964, Pages 709 and 711.
[661] FWM 001010. Lease Contract No. 14-16-0003-12876 by and between U. S. Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife and Mark Twain Marine Industries, dated October 3, 1968, Page 2.
[662] CRO 000111. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1968 , Page 59.
[663] CRO 000111. U. S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, Narrative Report, 1968 , Page 59.
[664] DPRA Document No. 00009075. Undated Refuge lease information document showing new leases up until 10/1/49, from the CONWR files.
[665] DPRA Document No. 00009059. Lease Data and Income Pertaining to Industrial Unit, Crab Orchard National Wildlife Refuge, April 12, 1949, Page 2; and DPRA Document No. 00009081. CONWR, Lease Data – Industrial Unit, Crab Orchard Refuge, dated August 31, 1949, Page 1.
[666] DPRA Document No. 00009071. CONWR, Lease Data – Industrial Unit, Crab Orchard Refuge, dated January 4, 1950, Page 1.

TABLE 13-1
AREA 9 OPERATORS/LESSEES

Operator/Lessee	Years of Operation	Buildings Occupied	Industrial Use of Buildings
Mental Health Services of Franklin and Williamson Co.[667,668]	1974-1976	I-1-31	Mental health facility (possible manufacturing)
Diagraph-Bradley Industries, Inc.[669,670,671] (corporate successor to Diagraph Corporation)	1974-1988	I-1-30	Conference building.[672,673,674]
Midwest Brush[675] (a division of Diagraph Corporation, formerly Diagraph Bradley Industries, Inc.)	1973-1974	I-1-30	Unknown
Pate Roofing and Insulating Co.[676,677,678]	1947-1949	I-1-9	Unknown

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[667] CRO 001366. Amendment No. 1 to Lease Contract No. 14-16-0003-30,634, Mental Health Services of Franklin and Williamson Counties, Inc., dated June 1, 1974.
[668] CRO 0001368. Amendment No. 5 to Lease Contract No. 14-16-0003-30,634, Mental Health Services of Franklin and Williamson Counties, Inc., dated February 29, 1976.
[669] DOI 007813. Attachment to SIU's 104(e) response, dated 06/29/89.
[670] DOI 000571 – DOI 000572. Building Lease Contract No. 14-16-0003-82-534 by and between U. S. Fish and Wildlife Service and Diagraph Bradley Industries, Inc., dated April 1, 1982, Pages 1-2 (this document is Attachment B to Diagraph's response to 104(e) request).
[671] DPRA Document No. 00007094. Amendment No. 7 to Building Lease Contract No. 14-16-0003-82-534, dated June 1, 1988.
[672] DOI 007813. Attachment to SIU's 104(e) response, dated 06/29/89.
[673] DOI 000571 – DOI 000572. Building Lease Contract No. 14-16-0003-82-534 by and between U. S. Fish and Wildlife Service and Diagraph Bradley Industries, Inc., dated April 1, 1982, Pages 1-2 (this document is Attachment B to Diagraph's response to 104(e) request).
[674] DPRA Document No. 00007094. Amendment No. 7 to Building Lease Contract No. 14-16-0003-82-534, dated June 1, 1988.
[675] DOI 007813. Attachment to SIU's 104(e) response, dated 06/29/89.
[676] DPRA Document No. 00009075. Undated Refuge lease information document showing new leases up until 10/1/49, from the CONWR files.
[677] DPRA Document No. 00009059. Lease Data and Income Pertaining to Industrial Unit, Crab Orchard National Wildlife Refuge, April 12, 1949, Page 9.
[678] DPRA Document No. 00009060. Crab Orchard National Wildlife Refuge, Industrial Area (Tenant Listing).

TABLE 13-1
AREA 9 OPERATORS/LESSEES

Operator/Lessee	Years of Operation	Buildings Occupied	Industrial Use of Buildings
Olin Corporation/Primex Technologies/ GDO&TS [1,679]	1967-Present	Several buildings throughout Area 9 (48 acres)	Pyrotechnic operations (manufacturing mortar flares), medium caliber ammo production[680,681]

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[1] GDO&TS currently occupies all of the buildings in Area 9.

[679] Industrial Tenant Roster – March 2001, Crab Orchard National Wildlife Refuge, Section 1, Table 1-3 of this report.
[680] DOI 001199. Olin's response to First Set of Information Requests, Page 4.
[681] Interview with Mr. Norm Thomas as found in TechLaw, Inc., 1992, Final Draft Report, Site Operations and Ownership History, Crab Orchard National Wildlife Refuge, Page B-1.

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-1	1942-1945	SWDC/War Department	Inert Storage Building
	1946-1962	Sangamo	Capacitor manufacturer
	1965-1983	Southern Illinois University – School of Technical Careers	Vocational training school; possible painting operations
	1983-1997	Olin	Phalanx operations
	1985	Olin	Chemical storage, 20mm/30mm inert parts
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-2	1942-1945	SWDC/War Department	Receiving and Storage Building
	1946-1962	Sangamo	Capacitor manufacturer
	1965-1983	SIU-STC	Vocational training school
	1983-1989 1991-1997	Olin	Phalanx operations (1985); receiving and storage of completed rounds (1988)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-3	1942-1945	SWDC/War Department	Cleaning and Painting Building
	1946-1962	Sangamo	Capacitor manufacturer
	1968-1978	Mark Twain Industries	Boat manufacturer
	1975-1997	Olin	Warehouse, receiving and storage associated with 20MM phalanx operations; penetrator storage; dry storage of low-level explosives.
	1997-Present	Primex/GDO&TS	No information found regarding use of this building. (1999-building housed raw materials contained low-level explosives)
I-1-3A	1951-1962	Sangamo	Capacitor manufacturer
	1975-Present	Olin/Primex/GDO&TS	Storage building for both Olin and Primex. No information found regarding GDO&TS' use of this building.
I-1-4	1942-1945	SWDC/War Department	Paint Shield Cleaning Building
	1946-1962	Sangamo	Capacitor manufacturer
	1968-1978	Mark Twain Industries	Boat manufacturer
	1975-1989	Olin	Flammable chemical storage (1985); chemical storage (1984)
I-1-5	1942-1945	SWDC/War Department	Paint Service Building
	1946-1962	Sangamo	Capacitor manufacturer
	1968-1978	Mark Twain Industries	Boat manufacturer
	1975-1989	Olin	Flammable chemical storage (1985); chemical storage (1984)
I-1-6	1942-1945	SWDC/War Department	Melt Loading Building
I-1-8	1942-1945	SWDC/War Department	Screening Building

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TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-9	1942-1945	SWDC/War Department	TNT Service Building
	1947-1949	Pate Roofing & Insulating	No information was found regarding Pate Roofing & Insulating's use of this building.
I-1-10	1942-1945	SWDC/War Department	Ammonium Nitrate Service Building
I-1-11 (I-1-49)	1942-1945	SWDC/War Department	Booster Service Magazine
	<1963	Good Luck Glove	Manufacturer of mittens, cotton flannels, jersey, leather combinations, and work gloves
	1963 – possibly up to 1970	Technical Tape Corp.	Gift wrap manufacturer
	1969-1997	Olin	Pyrotechnic mix operations
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-12	1942-1945	SWDC/War Department	Drilling and Boostering Building
	<1963	Good Luck Glove	Manufacturer of mittens, cotton flannels, jersey, leather combinations, and work gloves
	1963 - possibly up to 1970	Technical Tape Corp.	Gift wrap manufacturer
	1969-1997	Olin	Explosives mixing, loading and assembly, 20MM phalanx operations; explosive scrap pick up point (1975); 25mm trace operation (1977)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-13	1942-1945	SWDC/War Department	Vacuum Pump House
I-1-14	1942-1945	SWDC/War Department	Vacuum Pump House
I-1-15	1942-1945	SWDC/War Department	Vacuum Pump House
Olin I-1-15	?-1997	Olin (likely)	No information was found regarding Olin's use of this building
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-16	1942-1945	SWDC/War Department	Vacuum Pump House
I-1-17	1942-1945	SWDC/War Department	Vacuum Pump House
I-1-18	1942-1945	SWDC/War Department	Vacuum Pump House
IOP I-1-19	1942-1945	SWDC/War Department	Fuse Service Building
Olin I-1-19	1984-1997	Olin	Mix house (20-mm and .50 Caliber mixes); hazardous waste scrap pick up point (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-20	1942-1945	SWDC/War Department	Assembly, Packing and Shipping Building
	1956-1962	Sangamo	Capacitor manufacturer
	1967-1997	Olin	Pyrotechnic mixing; 20MM deprime operations; 25MM ammunition manufacturing; .50 caliber trace line; M505 fuse program; 30mm GAU 8/A production
	1997-2001	Primex	90-day hazardous waste accumulation area; storage
	Present	GDO&TS	No information found regarding GDO&TS' use of this building.
I-1-20P	1985	Olin	Explosives storage
IOP I-1-21	1942-1945	SWDC/War Department	Smokeless Powder Service Building
	1948	Fidelity Manufacturing	Information regarding Fidelity's use of this building was not found
	1955	Sangamo	Capacitor manufacturer
	?-Present	Olin/Primex/GDO&TS	No information found regarding use of this building.
I-1-21N (I-1-23A)	1955-1962	Sangamo	Capacitor manufacturing
	1967-?	Olin	30MM GAU 8/A production activities
I-1-22	1942-1945	SWDC/War Department	Box Opening Building
	1955-1962	Sangamo	Capacitor manufacturing
	1967-1997	Olin	Information regarding Olin's use of this building was not found
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-23	1942-1945	SWDC/War Department	Propellant Charge Building
	1955-1962	Sangamo	Capacitor manufacturing
	1967	Olin	Explosives mixing (for illuminating flares), 30MM GAU 8/A production activities
I-1-23P	?	Olin	Hazardous waste (1985)
I-1-24	1942-1945	SWDC/War Department	Primer Service Magazine
	1955-1962	Sangamo	Capacitor manufacturing
	1967-?	Olin	Information regarding Olin's use of this building was not found
I-1-25	1942-1945	SWDC/War Department	Change House
	1956-1962	Sangamo	Capacitor manufacturing
	1967-?	Olin	20MM phalanx operations
I-1-26	1942-1945	SWDC/War Department	Change house
	1956	Pyramid Industrial Finishes	Produced industrial lacquers and paints
	1961-1983	SIU-STC	Vocation training for handicapped persons
I-1-27	1942-1945	SWDC/War Department	Change House
	1964	Engineers Explosives	Assume explosives-related activities
	1965-1983	SIU-STC	Vocation training

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-28	1942-1945	SWDC/War Department	Change House
	1956-1962	Sangamo	Capacitor manufacturing
	1965-1983	SIU-STC	Vocation training
I-1-29	1942-1945	SWDC/War Department	Boiler House
I-1-30	1942-1945	SWDC/War Department	Timekeeper Building
	1949-1950	Ora Collard	No information was found regarding Ora Collard's use of this building.
	1956-1962	Sangamo	Capacitor manufacturing
	1964-1973	SIU-Geology Department	Rock sample and core drilling storage
	1973-1974	Midwest Brush	Brush and glue manufacturer
	1974-1988	Diagraph Bradley	Conference room
I-1-31	1942-1945	SWDC/War Department	Timekeeper Building
	1955-1966	Knute Aronson	No information was found regarding Knute Aronson's use of this building .
	1966-1974	SIU-STC	Vocational training
	1974-1976	Mental Health Services of Franklin and Williamson Counties	Some type of manufacturing
IOP I-1-32	1942-1945	SWDC/War Department	Guard House
Olin I-1-32	<1977	Olin	Delay, fuse, and trace Blending
IOP I-1-33	1942-1945	SWDC/War Department	Guard House
Olin I-1-33	1975-1997	Olin	Possible mix house
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
IOP I-1-34	1942-1945	SWDC/War Department	Condensate Pump House
Olin I-1-34	?-1997	Olin	Possible mix house, scrap collection building
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-34 An #1	1998-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-34P	1985	Olin	Hazardous waste
IOP I-1-35	1942-1945	SWDC/War Department	Condensate Pump House
Olin I-1-35 (I-1-101)	?-1997	Olin	Possible mix house, HEI pellet storage
	1997-2001	Primex	90-day hazardous waste accumulation area
	2001	GDO&TS	No information found regarding GDO&TS' use of this building.
I-1-35A, I-1-35B	1975-1997	Olin	Storage of RDX pellets (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
IOP I-1-36	1942-1945	SWDC/War Department	Condensate Pump House
Olin I-1-36 (I-1-36A, I-1-36B, I-1-26C)	?	Olin	30MM GAU 8/A production activities (1970s); propellant staging vacuum system
IOP I-1-37	1942-1945	SWDC/War Department	Condensate Pump House
Olin I-1-37	1967-?	Olin	Storage of M36A2 primer and M505 fuses
IOP I-1-38	1942-1945	SWDC/War Department	Condensate Pump House
Olin I-1-38	?	Olin	Possible mix house, storage of RDX and HEI pellets
IOP I-1-39	1942-1945	SWDC/War Department	Condensate Pump House
Olin I-1-39	?	Olin	Possible mix house, storage of RDX and HEI pellets
I-1-40	?	Olin	Phalanx operations
I-1-41	?	Olin	Propellant storage (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-42	?	Olin	Housing of explosives (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-43	?	Olin	RDX duster filter (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-44	?	Olin	Primers (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-45	?	Olin	Possible storage/staging location for chemicals/waste; storage of obsolete chemicals (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-46	?	Olin	Phalanx primers (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-47	?	Olin	Inert pellets storage (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-48	?	Olin	Solvent storage, maintenance building
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-49	?-1997	Olin	Explosives related activities
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-52, I-1-53	?	Olin	Scrap collection building (hazardous waste)
	1997-2001	Primex	90-day hazardous waste accumulation area
	Present	GDO&TS	No information found regarding GDO&TS' use of this building.
I-1-54, I-1-55	?-2001	Olin/Primex/GDO&TS	No information found regarding use of this building.
I-1-56	?	Olin	Maintenance Office (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-57	?	Olin	No information found regarding Olin's use of this building
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-61	?	Olin	No information found regarding Olin's use of this building
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-62	?	Olin	No information found regarding Olin's use of this building
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-63	?	Olin/Primex	No information found regarding use of this building
I-1-64	1978-?	Olin	No information found regarding Olin's use of this building.
I-1-65P, I-1-66P, I-1-68P, I-1-69P	?	Olin	No information found regarding Olin's use of this building.
I-1-70P, I-1-71P, I-1-72P	?	Olin/Primex	No information found regarding use of this building
I-1-73	?-Present	Olin/Primex/GDO&TS	Guard Shack
I-1-74	1978-1997	Olin	Storage related to 20MM phalanx operations
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-75	<1984-Present	Olin/Primex/GDO&TS	No information found regarding use of this building.
I-1-76	1965-Present	Olin/Primex/GDO&TS	No information found regarding use of this building.
I-1-77	1975-Present	Olin/Primex/GDO&TS	Guard Shack
I-1-78	1978-1997	Olin	Possible mix house
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-79	1976-1997	Olin	Pump maintenance (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-80, I-1-81, I-1-82, I-1-83	1978-?	Olin	No information found regarding Olin's use of this building.
I-1-84	?-Present	Olin/Primex/GDO&TS	No information found regarding Olin's use of this building.
I-1-85	?	Olin	No information found regarding Olin's use of this building.
I-1-86	1980-1997	Olin	No information found regarding Olin's use of this building.
	1997-2001	Primex	90-day hazardous waste accumulation area
	Present	GDO&TS	No information found regarding GDO&TS' use of this building.
I-1-87	1967-1972	Olin	No information found regarding Olin's use of this building.
I-1-88	1981-1997	Olin	Solar building, storage for 20MM phalanx operations
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-89	?	Olin	Boiler maintenance (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-90	?	Olin	No information found regarding Olin's use of this building.
I-1-91	?	Olin	Air conditioning maintenance (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-92	?	Olin	Vacuum dust system (1985)
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-93	?	Olin	No information found regarding Olin's use of this building.
	1997-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-95	1968-1978	Mark Twain Marine Industries	Boat manufacturing
	1975-1989	Olin	Storage of chemicals
I-1-96	1947-1962	Sangamo	Capacitor manufacturer
	1968-1978	Mark Twain Marine Industries	Boat manufacturing
	1975-?	Olin	Storage of old equipment and chemicals
I-1-99	?	Primex	No information found regarding Primex's use of this building.
I-1-101 An #1	1998-Present	Primex/GDO&TS	No information found regarding use of this building.

TABLE 13-2
AREA 9 OPERATORS/LESSEES AND BUILDING USES

Building Number	Dates of Occupancy	Operator/Lessee	Building Use or Product
I-1-102, I-1-103, I-1-104, I-1-105, I-1-106, I-1-107, I-1-108	?-Present	Primex/GDO&TS	No information found regarding use of this building.
I-1-109, I-1-110	1998	Primex	No information found regarding Primex's use of this building.
I-1-111	1997-?	Primex	90-day waste accumulation area
Sangamo Building #7	1947-1962	Sangamo	Capacitor manufacturing
Building #18	1971-1980	SIU-STC	Vocational training

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References for the information in this table can be found in Section 13.1.2 of this report.

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Explosive	Smoke Candles	First Fire LUU-10/B	fuel
		Smoke Mix LUU-10/B	fuel
Explosive	Smoke Mix LUU-10/B	TEGDN	
		Ethyl Centralite	fuel
		Red Dye	dye
		Sodium Picrate	
		Nitrocellulose	fuel
		Di-Octylphthalate	smoke generator
		Lead Stearate	binder
		Graphite	lubricator
Ammunition	120-mm Combustible Cases	Nitrocellulose	fuel
		Cellulose Wood Pulp	fuel
		N-Methyl-N-N-Diphenylurea	
		Polyurethane Resin	binder
Ammunition	20-mm Cartridge Case	Copper Alloy	body
		20-mm Primer	detonator
Explosive	HE/HEI (H761) Mix	RDX with 3% Wax (Comp A-4)	explosive
		Aluminum Powder	fuel
		Graphite	lubricator
		Calcium Stearate	binder
Ammunition	20-mm HEI Projectile	Carbon Steel	body
		HEI MIX	explosive
		M505 Fuze	detonator

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Ammunition	20-mm HEI-T Projectile	Carbon Steel	body
		HEI MIX	explosive
		R-505 Tracer Mix	tracer
		I-548 Igniter Mix	fuel
		I-547 Igniter Mix	fuel
		M505 Fuze	explosive
Ammunition	20-mm HEIT-SD Projectile	Carbon Steel	projectile
		HEI Propellant	explosive
		R-505 Tracer Mix	tracer
		I-548 Igniter Mix	fuel
		M505 Fuse	fuse
Ammunition	20-mm Tp-t Projectile	Carbon Steel	body
		R-505 Tracer Mix	tracer
		I-548 Igniter Mix	fuel
		I-547 Igniter Mix	fuel
Ammunition	20-mm API Projectile	Carbon Steel	projectile
		20-mm API Nosecone Aluminum Alloy	projectile body
		API #136	projectile
		API #68	projectile
Explosive	M505 Fuze	Steel	body
		HMX	explosive
		Graphite	burn rate modifier
		Calcium Resinate	binder

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Ammunition	25-mm Cartridge	Copper Alloy	body
		25-mm Primer	primer
Ammunition	25-mm Primer	Copper Alloy	body
		Lead Styphnate	detonator
		Calcium Silicide	
		Barium Nitrate	oxidizer
Ammunition	25-mm HEI Projectile	Carbon Steel	body
		HEI Mix	explosive
		M505 Fuze	detonator
Ammunition	30mm Cartridge Case	Aluminum Alloy	body
		30mm Primer	detonator
		Flashtube	detonator
Ammunition	30mm Primer	Copper Alloy	body
		Barium Nitrate	oxidizer
		Lead Styphnate	detonator
		Calcium Silicide	
		Trinitroresorcinol	
		Gum Arabic	binder
		Acetylene Black	fuel
Ammunition	30mm HEI Projectile	Steel	body
		HEI MIX	explosive
		M505 Fuze	explosive
Ammunition	30mm Flashtube	Clad Steel Copper Alloy	body
		IB-52 Pellets	igniter

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Ammunition	40mm Cartridge Case	Aluminum Alloy	body
		40mm primer	primer
Ammunition	40mm Cartridge	Aluminum Alloy	case
		40mm Primer	primer
		Propellant	projectile
Ammunition	40mm Primers	Copper Alloy	primer
		Barium Nitrate	oxidizer
		Lead Styphnate	detonator
		Antimony Silicide	
		Calcium Silicide	
		Tetracine	
Explosive	Igniter	Steel	body
		IB-50	explosive
		IB-51	explosive
		Boron Potassium Nitrate Pellets	
		Black Powder	fuel
Ammunition	.50 Cal M17 Tracer Projectiles	Steel Brass Plated Body	body
		I-508 Tracer Mix	tracer
		R-256 Tracer Mix	tracer
		R-284 Tracer Mix	tracer
Ammunition	.50 Cal MPC Projectile	Steel Body w/Copper Jacket	body
		RS-41	explosive
		Comp. A-4	explosive
		Zirconium	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Ammunition	.50 Cal Primed Cases	Brass	body
		Copper Alloy	detonator
		Lead Styphnate	detonator
		Calcium Silicide	
		Barium Nitrate	oxidizer
Ammunition	.50 Cal M17 tracer cartridges	.50 cal Tracer Projectile	tracer
		Propellant	projectile
		Cartridge Case, Primed	case
Ammunition	.50 Cal MPC Cartridge	.50 cal Tracer Projectile	tracer
		.50 Cal Primed Case	case
		Propellant	projectile
Ammunition	20-mm MPC Nosecone	Aluminum	body
		RS-41	explosive
Ammunition	20-mm MPC Projectiles	steel	body
		RS-41	explosive
		RS-40	explosive
		Comp A-4	explosive
		Zirconium	
Ammunition	.50 Cal MPC Charge Core Body	Steel Body w/Tungsten Core	body
		Comp A-4	explosive
		Zirconium	
Ammunition	.50 Cal SLAP Tracer Projectile	Plastic Sabot/Tungsten Penetrator	body
		I-276F Igniter Mix	fuel
		R-284CF Tracer Mix	tracer

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Ammunition	.50 Cal SLAP Tracer Cartridge Cartridge	.50 Cal SLAP Tracer Projectile	
		.50 Cal Primed Case	case
		Propellant	projectile
Ammunition	20-mm MP-T-SD (XM940) Charged Projectile Body Assembly	Carbon Steel	body
		Comp A-4	explosive
		RS-40	explosive
		WI-2 Tracer Mix	tracer
		Propellant	projectile
Ammunition	20-mm MP-T-SD Traced Projectile Projectile Body Assembly	Carbon Steel	body
		I-547 Igniter Mix	Igniter
		I-548 Igniter Mix	Igniter
		WI-2 Tracer Mix	tracer
Ammunition	20-mm MP-T-SD Charged nose Nose Assembly	Aluminum	cap
		RS-41	explosive
		Potassium Chlorate	oxidizer
Ammunition	20-mm PGU-30/B Projectiles	Carbon Steel	body
		MTV Tracer Pellets	tracer
Ammunition	5.56mm Cartridges	Brass	case
		Primer Mix 257W	primer
		Propellant	projectile
		R-258 Tracer Mix	tracer
		I-194 Igniter Mix	Igniter
Ammunition	5.56MM Trace Primed Case	Brass	cap
		Primer Mix 257W	primer

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Ammunition	5.56MM Trace Projectile	Copper Coated Steel Jacket	body
		Lead Filler at point	body
		R528 Tracer Mix	tracer
		I194 Igniter Mix	Igniter
Ammunition	30MM HEDP Projectile	Carbon Steel	body
		Copper Rotating Band	body
		PBXN-5	explosive
		Copper Liner	
Explosive	30mm AAH PDM759 Fuze	Aluminum	body
		PBXN-5	explosive
		Primer Mix 257W	primer
		Lead Azide	detonator
		RDX	
Ammunition	120-mm Primer	Black Powder	primer
Explosive	PBXN-5	HMX	
		Vinylidene Fluoride	
		Hexafluoropropylene	
Gas Generators	Inhibitor Mix	Acetyl Triethyl Citrate	
		4-Dinitrophenoxy Ethanol	
		Cellulose Acetate	
		Ammonium Oxalate	oxidizer

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	20,25,30,40mm &.50 cal	Nitrocellulose	
		Graphite	
		Potassium Nitrate	oxidizer
		Sodium Sulfate	
		Calcium Carbonate	
		Nitroglycerin	fuel
		Diphenylamine	
		Dibutylphthalate	
		Tin Dioxide	
		Potassium Sulphate	
		Ethyl Centralite	
		Barium Nitrate	oxidizer
Propellant	WI-2 Tracer Mix	Magnesium Powder	fuel
		Strontium Nitrate	oxidizer
		Calcium Resinate	
		Oxamide	oxidizer
		Polyethylene	
Propellant	R-256 Tracer	Strontium Peroxide	
		Strontium Oxalate	oxidizer
		Strontium Nitrate	
		Calcium Resinate I	
		Calcium Resinate II	
		Magnesium Powder III	fuel

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	I-276F Igniter Mix	Magnesium	
		Barium Peroxide	
		Zinc Stearate	binder
		Toluidine Red Toner	
Propellant	R-284 Tracer	Strontium Nitrate	oxidizer
		Magnesium Powder Type III	fuel
		Polyvinyl Chloride	
		Silicon Dioxide	
Propellant	R284CF Tracer Comp	Magnesium Powder	
		Strontium Nitrate	oxidizer
		Polyvinyl Chloride	
		Carbon Black	
Propellant	R505 Tracer Mix	Strontium Nitrate	oxidizer
		Magnesium Powder	fuel
		Oxamide	oxidizer
		Calcium Resinate I	
		Polyethylene Powder	fuel
Propellant	Trace Igniter Mix I-547	Strontium Peroxide	
		Calcium Resinate I	
		Calcium Resinate II	
Propellant	Trace Igniter Mix I-548	Strontium Peroxide	
		Calcium Resinate I	
		Calcium Resinate II	
		Magnesium Powder	fuel

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	I-508 Igniter Mix	Barium Peroxide	
		Toluidine Red Toner, Dry Pigment	
		Zinc Stearate	binder
		Parlon	
		Magnesium Powder Type III	fuel
Propellant	R-528 Tracer Mix	Strontium Nitrate	oxidizer
		Magnesium	
		Polyvinyl Chloride	
Propellant	I-136 Igniter Mix	Strontium Peroxide	
		Calcium Resinate	
Propellant	I-194 Igniter Mix	I-136 Igniter Mix	fuel
		Magnesium	
Propellant	I-548 Igniter Mix	Calcium Resinate I	
		Strontium Peroxide	
		Magnesium Powder	fuel
		Calcium Resinate II	
Propellant	I-547 Igniter Mix	Calcium Resinate I	
		Strontium Peroxide	
		Calcium Resinate II	
Propellant	R-505 Mix	Calcium Resinate II	
		Strontium Nitrate	
		Magnesium Powder	fuel
		Oxamide	oxidizer
		Polyethylene	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	IB-17 Igniter Mix	Ammonium Perchlorate	oxidizer
		c-Rubber	fuel
		Melamine	
		Carbon Black	
Propellant	IB-50 Igniter Mix	Boron Powder	
		Polyvinyl Acetate	
		Aluminum Powder	fuel
		Potassium Perchlorate	oxidizer
		Graphite	lubricator
		Methylene Chloride	
Propellant	IB-51 Igniter Mix	Graphite	lubricator
		Ammonium Chloride	
		Polyvinyl Acetate	
		Ammonium Perchlorate	oxidizer
		Aluminum Powder	fuel
		Methylene Chloride	
Propellant	IB-43 Mix	Polyvinyl Acetate	
		Potassium Nitrate	oxidizer
		Boron Powder	
		Graphite	lubricator
Propellant	SPI-2 Igniter	Potassium Nitrate	oxidizer
		Silicon	
		c-Rubber	fuel
		Carbon Black	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	Double Based Propellant	Lead Resorcinol	
		Lead Resorcylate	
		Lead Salicylate	
		Lead Stearate	binder
		Lead 2-Ethyl Hexoate	
Propellant	N-28	Cellulose Acetate	
		Acetyl Triethyl Citrate	
		DNPE	
		Carbon Black	
		Sodium Barbiturate	
		Toluene 2-4 Diamine	
		Ammonium Nitrate	
		Ferri-Ferro Cyanide	
		n-Phenyl Morpholine	
		Ammonium Oxalate	oxidizer
Propellant	GAP	Glycidyle Azide Polymer	binder
		Ammonium Nitrate	oxidizer
		Polyethylene Glycol	
		Carbon Black	
		Triaminoguanidine Nitrate	oxidizer
		N-100	curing agent
Propellant	AN	Ammonium Nitrate	oxidizer
		Ammonium Oxalate	oxidizer
		Polyester	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	AN (cont.)	Polybutadiene Acrylic Acid Copolymer	binder
		Hydroxy Terminated Polybutadiene	
		Cellulose Acetate	
		Acetyl Triethyl Citrate	
		Dinitrophenoxy Ethanol	fuel
		c-Rubber	fuel
		Guanidine Nitrate	oxidizer
		Ferric Oxide	oxidizer
		4' Glycidyloxy-N'N-Diglycidylaniline	
		Chinese Blue	tracer
		Isophorone Diisocyanate	
		Toulenediamine	
		Ammonium Ferri-Ferro Cyanide	
		M-Phenylmorphonline	
		Aromatic Tri-Functional Aziridine	
		Chromium Octoate	
		Melamine	
		Sodium Barbiturate	
		Carbon Black	
		2,2' Methylene Bis (4 Methyl-6 Tert.butyl Phenol)	
Propellant	AN-Propellant Grain	Ammonium Nitrate	oxidizer
		Cellulose Acetate	
		Acetyl Triethyl Citrate	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	AN-Propellant Grain (cont.)	Dinitrophenoxy Ethanol	fuel
		Sodium Barbiturate	
		Carbon Black	
		Toluenediamine	
		N-phenylmorpholine	
		Ammonium Oxalate	oxidizer
Propellant	JA-2	Nitrocellulose	fuel
		Nitroglycerin	fuel
		N-Methyl-N'-N'-Diphenylurea	
		Diethylene Glycoldinitrate	oxidizer
		Magnesium Oxide	oxidizer
		Graphite	lubricator
Propellant	F21-D	Ammonium Oxalate	oxidizer
		Rubber	
		Polybutadiene Acrylic Acid copolymer	binder
		Asbestos Fiber	binder
		Stearic Acid	
Propellant	BKNO3 Ignition Pellets	Boron	
		Potassium Nitrate	oxidizer
		Laminac	
Propellant	OMAX 400 Series	Ammonium Nitrate	oxidizer
		Polybutadiene Acrylic Acid Copolymer	binder
		Guanidine Nitrate	oxidizer

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	OMAX 400 Series (cont.)	Ammonium Oxalate	oxidizer
		Carbon Black	
		Melamine	
		Sodium Barbiturate	
		Ammonium Ferri-Ferro Cyanide (Milori Blue)	tracer
Propellant	OMAX 600 Series	Ammonium Nitrate	oxidizer
		Hydroxy Terminated Polybutadiene	oxidizer
		Isophorone Diisocyanate	
		Ferric Oxide	oxidizer
		Carbon Black	
		2,2' Methylene Bis (4 Methyl, 6-Tert, Butyl Phenol)	fuel
		Aromatic Tri-Functional Aziridine	
		Sodium Barbiturate	
		Chinese Blue	tracer
Propellant	OMAX 700 Series	Ammonium Nitrate	oxidizer
		Polyester (Carboxy Terminated)	
		4,Glycidyloxy-N,N'-Di Glycidyl Aniline	
		Chromium Octoate	
		Carbon Black	
Propellant	OMAX 800 Series and N-28	Ammonium Nitrate	oxidizer
		Cellulose Acetate	
		Acetyl Triethyl Citrate	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	OMAX 800 Series and N-28 (cont.)	Dinitrophenoxyethanol	fuel
		Sodium Barbiturate	
		Carbon Black	
		N-Phenylmorpholine	
		Ammonium Oxalate	oxidizer
		toluene diamine	
		Ammonium Ferri-Ferro Cyanide (Milori Blue)	tracer
Propellant	RS 40 Mix	Magnesium Aluminum Alloy powder	fuel
		Ammonium Nitrate	oxidizer
		Barium Nitrate	oxidizer
		Calcium Resinate	binder
Propellant	IB-27 Igniter Mix	c-Rubber	fuel
		Ammonium Perchlorate	oxidizer
		Polybutadiene-Acrylic Acid Copolymer	
		Copper Phthalocyanine (Monastral Blue)	tracer
		Carbon Black	
		Hexane	fuel
Propellant	IS-102 Igniter Mix	c-Rubber	fuel
		Ammonium Nitrate	oxidizer
		Ammonium Perchlorate	oxidizer
		Guanidine Nitrate	oxidizer
		Sodium Barbiturate	
		Carbon Black	

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	IS-102 Igniter Mix (cont.)	Polybutadiene Acrylic Acid Copolymer	
		Hexane	binder
Propellant	IB-52 Igniter Mix	Potassium Nitrate	oxidizer
		Type A Fluid Ball (Nitrocellulose and 2-NDPA)	fuel
		Boron Powder	
		Polyvinyl Acetate	
		Graphite	lubricator
Propellant	20-mm Primer Mix	Lead Styphnate	
		Calcium Silicide	
		Barium Nitrate	oxidizer
Propellant	Comp A4	RDX	explosive
		Wax	binder
Propellant	Fluid Ball Powder Type B	Nitrocellulose	fuel
		Carbon Black	
		Nitroglycerin	fuel
		2-Nitrodiphenylamine	
Propellant	Fluid Ball Powder Type A	Nitrocellulose	
		2-Nitrodiphenylamine	
Propellant	API Mix #68	Magnesium-Aluminum Alloy powder	fuel
		Barium Nitrate	oxidizer
		Ammonium Nitrate	oxidizer
Propellant	API Mix #136 (RS41)	Magnesium-Aluminum Alloy powder	fuel
		Potassium Perchlorate	oxidizer
		Calcium Resinate	binder

TABLE 13-3
OLIN PRODUCT LIST

Product Type	Product Name	Constituents	Purpose
Propellant	First Fire LUU-10/B	2-Chloroanthraquinone	
		Sodium Picrate	
Pyrotechnic	Illuminating Flare	Ammonium Perchlorate	oxidizer
		Magnesium	fuel
		Plastic Binder	binder
Pyrotechnic	Illuminating Flare	Sodium Nitrate	oxidizer
		Magnesium	fuel
		Organic Binder	binder
Propellant	MTV Tracer Pellets	Magnesium	
		Viton	
		Teflon	
		Strontium Nitrate	
		Graphite	
		Carbon Black	
		Ethyl Cellulose	
MISC	Electric Squibs/Matches	Paper laminated with brass or tin-plated copper or nickel	
		Lead Styphnate	
MISC	Phalanx Ammunition	Depleted Uranium	
MISC	Powder	Manganese Dioxide	

Sources:
(1) DPRA Document No. 00014894/PRI-006258. Olin, Inter Office Memo entitled "Chemical Description of Hazardous Waste," dated January 6, 1982.
(2) DPRA Document No. 00014896/PRI-006259-PRI-006263. Attachment to Source #1, referenced above, entitled "Incinerator Disposal."
(3) DPRA Document No. 00014897/PRI-006265-PRI-006268. Attachment to Source #1, referenced above, entitled "Retort Disposal."
(4) DPRA Document No. 00014898/PRI-006269-PRI-006271. Attachment to Source #1, referenced above, entitled "Disposal TBD."

TABLE 13-3A
LOCATIONS OF OLIN EXPLOSIVES AND OTHER PRODUCTS IN AREA 9 (1985) [682]

Building		Product	Department of Transportation (DOT) Classification[683]	Net Explosive Weight (in pounds)[684]
I-1-1		20mm/30mm Inert Parts	1.2	N/A
I-1-2		20mm/30mm Inert Parts	1.2	N/A
I-1-3		Miscellaneous	N/A	N/A
I-1-4		Flammable Chemicals	N/A	N/A
I-1-5		Flammable Chemicals	N/A	N/A
I-1-19	Bay 1	Cal Resinate API, Cal Resinate	N/A	200, 200
		Peroxide – R.C. Trace	N/A	20
	Bay 2	AN, Barium N, Cal Resinate	N/A	200, 200, 100
		Strontium	N/A	200
	Bay 3	Incendiary Mix #68, #136	N/A	20, 20
		Tracer Mix	N/A	35
		Igniter Mix	N/A	25
	Bay 4	Potassium Perchlorate AN, Barium	N/A	200, 20
		Nitrate or Oxamide, Stronium	N/A	20, 200
		Peroxide, Stronium Nitrate	N/A	250, 150
	Bay 5	AN, Barium Nitrate or Peroxide	N/A	200,200
		Resonate Cake	N/A	200
	Bay 6	Incendiary Mix #68, #136	N/A	20, 20
		Calcium Resonate - Alcohol	N/A	45
	Bay 7	Magnesium/Aluminum PD	N/A	300
		Calcium Resinate	N/A	300
		Calcium Resinate, Magnesium	N/A	150, 500
		Polyethylene	N/A	150
	Bay 8	Hazardous Waste Scrap	N/A	25
	Bay 9	Isopropyl Alcohol	N/A	55 Gallons
	Bay 10	Calcium Resinate	N/A	200
I-1-20P		RS41, RDX A4	1.1, 1.1	10, 15
I-1-23P		Hazardous Waste	1.2, 1.4	100
I-1-33		Tracer, API	N/A	N/A
I-1-34		R-505, T-Mix, I-547, I-548, T-Igniter	N/A	200, 100
		IM-68, IM-136, APT Mix	N/A	200, 100
I-1-34P		Hazardous Waste	1.3	1,000
I-1-35 (A & B)		RDX Pellets	1.1	5,000
I-1-41		Propellant	1.3	60,000

Sheet 1 of 2

[682] DPRA Document No. CO02156. Olin Ordnance Products, Quantity/Distance B-Area Map, Drawing No. 6020063, dated June 1985. This map was likely developed to indicate explosives allowances in buildings and to ensure safe distances between these buildings based on the type of explosive and the amount present.

[683] These classifications were obtained from the Department of Transportation Hazmat Transport Regulations, 49 CFR 173.58: Assignment of class and division for new explosives.

[684] This indicated either the maximum amount allowed in a particular building/bay, or it indicated the amount that was actually located in these buildings at the time the map was created.

TABLE 13-3A
LOCATIONS OF OLIN EXPLOSIVES AND OTHER PRODUCTS IN AREA 9 (1985) [682]

Building		Product	Department of Transportation (DOT) Classification[683]	Net Explosive Weight (in pounds)[684]
I-1-42		Incendiary Mix #68, #136	1.3, 1.2	50, 50
		Propellant Trace Mix	N/A	30
		Trace Igniter	1.3	100,000
		I-547 M505 Fuses/L-Flashtubes	N/A	150,000
I-1-43		RDX Duster Filter	1.1	5
I-1-44		Primers	1.1	200,000
I-1-45		Inert Storage Obsolete Chemicals	N/A	N/A
I-1-46		Phalanx Primers	N/A	200,000
I-1-47		Inert Pellets	N/A	N/A
I-1-48		Solvents	N/A	3 Drums
I-1-49		Filtered HEI Slurry HEI	N/A	24
		Contaminated Water	N/A	150 Gallons
I-1-52P		Hazardous Waste	1.1, 1.2, 1.3	150
I-1-53P		Hazardous Waste	1.1	150
I-1-88		Phalanx CTGS in M548 Cans	1.4	1,500,000
		30mm CTGS HEI, API, TP	1.2	5,000
		20mm CTGS TP	1.4	5,000
I-1-95		Flammable Chemicals	N/A	N/A
I-1-96		Old Equipment	N/A	N/A

Sheet 2 of 2

DOT Classifications:

1.1 Explosives characterized with a mass explosion hazard.
1.2 Explosives characterized with a dangerous projections hazard.
1.3 Explosives characterized with a radiant heat or violent buring, or both hazard, but no blast or projection hazard.
1.4 Explosives characterized with a small hazard with no mass explosion and no project of fragments of appreciable size or range.

N/A = This left blank on source document.

TABLE 13-4

SURVEY COORDINATES FOR SAMPLE LOCATIONS IN AUS-0A09

Sample Location	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Comments
0A09-001	373701.1	786262.9	423.27	NA	
0A09-002	373629.9	786178.5	425.05	NA	
0A09-003	373709.3	785975.1	421.46	NA	
0A09-004	373519.9	786083.0	418.83	NA	Sample was composited from three manholes
	373554.4	785939.8	424.11	NA	
	373731.5	785839.5	421.83	NA	
0A09-005	373769.8	786078.2	446.66	NA	
0A09-006	373939.6	785986.9	419.30	NA	
0A09-007	373783.4	786525.2	448.63	NA	
0A09-008	373701.4	786579.4	422.85	NA	
0A09-009	373669.1	786608.9	422.77	NA	
0A09-010	373574.8	786482.9	425.86	NA	
0A09-011	373327.3	786311.1	423.30	NA	
0A09-012	373112.1	786462.7	423.46	NA	
0A09-013	373016.7	786559.8	421.59	NA	
0A09-014	373523.1	786078.5	419.59	NA	
0A09-015	372817.7	786498.8	420.69	NA	
0A09-016	372692.6	786554.8	421.56	NA	
0A09-017	372619.1	786596.6	421.62	NA	
0A09-018	372580.1	786618.2	421.15	NA	
0A09-019	373401.3	785639.0	416.90	NA	
0A09-020	372374.7	786213.7	424.13	NA	
0A09-021	371375.0	786782.5	423.11	NA	
0A09-W01	373570.0	786226.0	423.71	426.35	New Monitoring Well

N/A – Not Applicable

TABLE 13-5
SLUG TEST RESULTS

Well ID Number	Hydraulic Conductivity (cm/sec)
A09-W01	3.98E-04

Sheet 1 of 1

cm/sec = centimeters per second

TABLE 13-6
AREA 9 GROUNDWATER ELEVATIONS

Monitoring Well 0A09-W01		
Ground Surface Elevation (feet MSL)		423.71
TOC Elevation (feet MSL)		426.35
Sampling Dates	**DTW (feet BTOC)**	**Water Elevation (feet MSL)**
May-00	12.71	413.64
July-00	12.08	414.27
September-00	17.04	409.31
October-00	17.27	409.08

Sheet 1 of 1

TOC = Top of Casing
MSL = Mean Sea Level
BTOC = Below Top of Casing
DTW = Depth to Water

TABLE 13-7
MATRICES SAMPLED AT EACH SAMPLE LOCATION AT AUS-0A09

Soil	Groundwater
AUS-0A09-001	AUS-0A09-W01
AUS-0A09-002	
AUS-0A09-003	
AUS-0A09-004	
AUS-0A09-005	
AUS-0A09-006*	
AUS-0A09-007*	
AUS-0A09-008	
AUS-0A09-009	
AUS-0A09-010	
AUS-0A09-011	
AUS-0A09-012*	
AUS-0A09-013	
AUS-0A09-014	
AUS-0A09-015	
AUS-0A09-016*	
AUS-0A09-017*	
AUS-0A09-018*	
AUS-0A09-019*	
AUS-0A09-020*	
AUS-0A09-021*	
AUS-0A09-W01	

Sheet 1 of 1

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

TABLE 13-8
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Semivolatile Organic Compounds		
2-Methylnaphthalene	2/13	52 ug/kg to 2,100 ug/kg
Acenaphthylene	1/13	82 ug/kg
Anthracene	1/13	130 ug/kg
Benzo(a)anthracene	1/13	290 ug/kg
Benzo(a)pyrene	1/13	320 ug/kg
Benzo(b)fluoranthene	1/13	330 ug/kg
Benzo(g,h,i)perylene	1/13	200 ug/kg
Benzo(k)fluoranthene	1/13	340 ug/kg
Benzyl butyl phthalate	3/13	210 ug/kg to 2,000 ug/kg
Bis(2-ethylhexyl) phthalate	5/13	50 ug/kg to 1,600 ug/kg
Carbazole	1/13	78 ug/kg
Chrysene	1/13	430 ug/kg
Dibenzofuran	2/13	90 ug/kg to 760 ug/kg
Dimethyl phthalate	2/13	190 ug/kg to 200 ug/kg
Di-n-butyl phthalate	2/13	58 ug/kg to 92 ug/kg
Fluoranthene	1/13	380 ug/kg
Indeno(1,2,3-c,d)pyrene	1/13	140 ug/kg
Naphthalene	1/13	1,000 ug/kg
Phenanthrene	2/13	93 ug/kg to 1,100 ug/kg
Pyrene	1/13	440 ug/kg
Explosives		
2,4-Dinitrotoluene	2/23	860 ug/kg to 2,100 ug/kg
4-Amino-2,6-dinitrotoluene	1/23	1,300 ug/kg
4-Nitrotoluene	1/23	760 ug/kg
HMX	1/23	850 ug/kg
Metals		
Aluminum	21/21	4,660 mg/kg to 14,500 mg/kg
Antimony	4/21	0.24 mg/kg to 3.7 mg/kg
Arsenic	21/21	3 mg/kg to 25.2 mg/kg
Barium	21/21	38.2 mg/kg to 173 mg/kg
Beryllium	7/21	0.27 mg/kg to 0.54 mg/kg
Boron	11/21	1.6 mg/kg to 18.1 mg/kg
Cadmium	8/21	0.22 mg/kg to 3.8 mg/kg
Calcium	21/21	1,330 mg/kg to 157,000 mg/kg
Chromium, Total	21/21	7.6 mg/kg to 34.6 mg/kg
Cobalt	9/21	2.8 mg/kg to 8.9 mg/kg
Copper	21/21	4.7 mg/kg to 169 mg/kg
Iron	21/21	7,530 mg/kg to 19,900 mg/kg
Lead	21/21	9 mg/kg to 103 mg/kg
Magnesium	21/21	794 mg/kg to 23,700 mg/kg
Manganese	21/21	130 mg/kg to 2,470 mg/kg

Sheet 1 of 2

TABLE 13-8
SOIL SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Mercury	12/21	0.017 mg/kg to 0.54 mg/kg
Nickel	21/21	4.6 mg/kg to 14.5 mg/kg
Potassium	21/21	230 mg/kg to 1,150 mg/kg
Selenium	10/21	0.42 mg/kg to 1.7 mg/kg
Silver	4/21	0.91 mg/kg to 59.4 mg/kg
Sodium	5/21	48 mg/kg to 189 mg/kg
Vanadium	21/21	12 mg/kg to 32.8 mg/kg
Zinc	21/21	18.6 mg/kg to 1,180 mg/kg
Other Inorganics		
Total Organic Carbon	2/2	12,700 mg/kg to 16,700 mg/kg

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: ARE 5/30/01

TABLE 13-9
GROUNDWATER SAMPLE ANALYTICAL RESULTS SUMMARY

Constituents	Number of Detections	Range of Detections
Volatile Organic Compounds		
cis-1,2-Dichloroethylene	1/1	3 ug/L
Trichloroethylene (TCE)	1/1	11 ug/L
Semivolatile Organic Compounds		
1,4-Dichlorobenzene	1/1	1.4 ug/L
Metals		
Barium	1/1	11.3 ug/L
Calcium	1/1	243,000 ug/L
Chromium, Total	1/1	3.2 ug/L
Magnesium	1/1	192,000 ug/L
Manganese	1/1	22 ug/L
Nickel	1/1	2.8 ug/L
Sodium	1/1	572,000 ug/L
Other Inorganics		
Nitrogen, Nitrate+Nitrite	1/1	0.058 mg/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: ARE 5/30/01

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	8	U	UG/KG			2.40E-06	8.00E-02
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG		8.91E-09	2.05E-06	4.00E+01
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG		4.21E-09	5.26E-05	8.89E+00
75-34-3	1,1-Dichloroethane	8	U	UG/KG			3.88E-06	8.00E-03
75-35-4	1,1-Dichloroethene	8	U	UG/KG		6.74E-08	1.19E-04	2.67E+00
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG		1.05E-08	2.27E-04	8.00E+00
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG			5.43E-05	4.00E-01
78-87-5	1,2-Dichloropropane	8	U	UG/KG		1.04E-08	3.76E-04	8.00E+00
78-93-3	2-Butanone (MEK)	15	U	UG/KG			5.41E-07	
591-78-6	2-Hexanone	15	U	UG/KG				
108-10-1	4-Methyl-2-pentanone (MIBK)	15	U	UG/KG			5.20E-06	
67-64-1	Acetone	21	U	UG/KG			3.38E-06	2.63E-02
71-43-2	Benzene	8	U	UG/KG		5.46E-09	3.30E-04	4.00E+00
75-27-4	Bromodichloromethane	8	U	UG/KG		3.39E-09	7.66E-06	2.67E-01
75-25-2	Bromoform	8	U	UG/KG		2.56E-11	4.54E-07	2.00E-01
74-83-9	Bromomethane	8	U	UG/KG			6.09E-04	8.00E-01
75-15-0	Carbon disulfide	8	U	UG/KG			6.62E-06	4.00E-03
56-23-5	Carbon tetrachloride	8	U	UG/KG		1.51E-08	1.14E-03	2.67E+00
108-90-7	Chlorobenzene	8	U	UG/KG			1.47E-05	1.14E-01
75-00-3	Chloroethane	8	U	UG/KG		1.23E-09	4.24E-07	
67-66-3	Chloroform	8	U	UG/KG		1.54E-08	6.21E-03	2.67E-01
74-87-3	Chloromethane	8	U	UG/KG		3.01E-09		
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG			5.43E-05	4.00E-01

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	8	U	UG/KG		4.50E-08	1.82E-04	
124-48-1	Dibromochloromethane	8	U	UG/KG		3.01E-09	5.02E-06	4.00E-01
100-41-4	Ethylbenzene	8	U	UG/KG			1.34E-06	1.14E-02
75-09-2	Methylene chloride	8	U	UG/KG		3.90E-10	8.18E-07	8.00E+00
110-54-3	N-Hexane	8	U	UG/KG			1.98E-05	
100-42-5	Styrene	8	U	UG/KG			3.91E-07	4.00E-02
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG		4.29E-10	4.70E-06	2.67E+00
108-88-3	Toluene	8	U	UG/KG			4.03E-06	1.33E-02
1330-20-7	total Xylenes	8	U	UG/KG			1.80E-06	8.00E-04
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG			3.74E-05	2.67E-01
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG		4.50E-08	1.82E-04	
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG		1.31E-09	1.01E-04	2.67E+00
75-01-4	Vinyl chloride	8	U	UG/KG		1.64E-07		1.14E+01
Semivolatile Organic Compounds								
120-82-1	1,2,4-Trichlorobenzene	490	U	UG/KG			6.43E-05	1.63E+00
95-50-1	1,2-Dichlorobenzene	490	U	UG/KG			1.48E-04	5.44E-01
541-73-1	1,3-Dichlorobenzene	490	U	UG/KG			9.47E-03	
106-46-7	1,4-Dichlorobenzene	490	U	UG/KG		6.03E-08	2.55E-04	4.90E+00
95-95-4	2,4,5-Trichlorophenol	2500	U	UG/KG			2.84E-05	2.50E-01
88-06-2	2,4,6-Trichlorophenol	490	U	UG/KG		2.19E-09		6.13E+01
120-83-2	2,4-Dichlorophenol	490	U	UG/KG			1.85E-04	9.80E+00
105-67-9	2,4-Dimethylphenol	490	U	UG/KG			2.78E-05	1.23E+00
51-28-5	2,4-Dinitrophenol	2500	U	UG/KG			1.42E-03	2.50E+02
91-58-7	2-Chloronaphthalene	490	U	UG/KG			1.80E-05	

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	490	U	UG/KG			2.03E-03	2.45E+00
91-57-6	2-Methylnaphthalene	2100		UG/KG			3.87E-05	1.05E-02
95-48-7	2-Methylphenol	490	U	UG/KG			1.11E-05	6.13E-01
88-74-4	2-Nitroaniline	2500	U	UG/KG			4.97E-02	
88-75-5	2-Nitrophenol	490	U	UG/KG			6.95E-05	
91-94-1	3,3'-Dichlorobenzidine	490	U	UG/KG		8.94E-08		1.63E+03
99-09-2	3-Nitroaniline	2500	U	UG/KG			4.97E-02	
534-52-1	4,6-Dinitro-2-methylphenol	2500	U	UG/KG				
101-55-3	4-Bromophenyl phenyl ether	490	U	UG/KG				
59-50-7	4-Chloro-3-methylphenol	490	U	UG/KG			1.11E-05	
106-47-8	4-Chloroaniline	980	U	UG/KG			2.78E-04	3.27E+01
7005-72-3	4-Chlorophenyl phenyl ether	490	U	UG/KG				
106-44-5	4-Methylphenol	490	U	UG/KG			1.11E-04	
100-01-6	4-Nitroaniline	2500	U	UG/KG			4.97E-02	
100-02-7	4-Nitrophenol	2500	U	UG/KG			3.55E-04	
83-32-9	Acenaphthene	490	U	UG/KG			1.28E-05	1.63E-02
208-96-8	Acenaphthylene	82	J	UG/KG			1.51E-06	4.10E-04
120-12-7	Anthracene	130	J	UG/KG			3.34E-07	2.17E-04
56-55-3	Benzo(a)anthracene	290	J	UG/KG		1.00E-07		3.63E+00
50-32-8	Benzo(a)pyrene	320	J	UG/KG		1.11E-06		8.00E-01
205-99-2	Benzo(b)fluoranthene	330	J	UG/KG		1.14E-07		1.65E+00
191-24-2	Benzo(g,h,i)perylene	200	J	UG/KG			3.69E-06	1.00E-03
207-08-9	Benzo(k)fluoranthene	340	J	UG/KG		1.18E-08		1.70E-01
111-91-1	bis(2-Chloroethoxy)methane	490	U	UG/KG				

ND = Not Detected E = Outside of Range UJ = Estimated Nondetect
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TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	490	U	UG/KG		7.90E-07		2.45E+04
108-60-1	bis(2-Chloroisopropyl) ether	490	U	UG/KG		6.07E-08	1.15E-04	
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1600		UG/KG		9.08E-09	9.08E-05	
85-68-7	Butyl benzyl phthalate	2000		UG/KG			1.14E-05	2.50E-03
86-74-8	Carbazole	78	J	UG/KG		6.32E-10		2.60E+00
218-01-9	Chrysene	430		UG/KG		1.49E-09		5.38E-02
84-74-2	Di-n-butyl phthalate	92	J	UG/KG			1.04E-06	3.07E-04
117-84-0	Di-n-octyl phthalate	490	U	UG/KG			2.78E-05	4.90E-05
53-70-3	Dibenz(a,h)anthracene	490	U	UG/KG		1.70E-06		6.13E+00
132-64-9	Dibenzofuran	760		UG/KG			1.50E-04	
84-66-2	Diethyl phthalate	490	U	UG/KG			6.95E-07	
131-11-3	Dimethyl phthalate	200	J	UG/KG			2.27E-08	
206-44-0	Fluoranthene	380	J	UG/KG			1.26E-05	1.90E-03
86-73-7	Fluorene	490	U	UG/KG			1.48E-05	1.63E-02
118-74-1	Hexachlorobenzene	490	U	UG/KG		3.18E-07	6.95E-04	4.90E+00
87-68-3	Hexachlorobutadiene	490	U	UG/KG		1.55E-08	2.78E-03	4.90E+00
77-47-4	Hexachlorocyclopentadiene	490	U	UG/KG			8.31E-05	2.45E-02
67-72-1	Hexachloroethane	490	U	UG/KG		2.78E-09	5.56E-04	2.45E+01
193-39-5	Indeno(1,2,3-c,d)pyrene	140	J	UG/KG		4.85E-08		2.00E-01
78-59-1	Isophorone	490	U	UG/KG		1.89E-10	2.78E-06	1.63E+01
621-64-7	N-Nitroso-di-n-propylamine	490	U	UG/KG		1.39E-06		2.45E+05
86-30-6	N-Nitrosodiphenylamine	490	U	UG/KG		9.73E-10		8.17E+00
91-20-3	Naphthalene	1000		UG/KG			5.30E-03	2.50E-01
87-86-5	Pentachlorophenol	2500	U	UG/KG		2.25E-07	1.75E-04	2.50E+03

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TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	1100		UG/KG			2.03E-05	5.50E-03
108-95-2	Phenol	490	U	UG/KG			9.27E-07	9.80E-02
129-00-0	Pyrene	440		UG/KG			8.11E-06	2.20E-03
Explosives								
99-35-4	1,3,5-Trinitrobenzene	370	U	UG/KG			1.40E-05	
99-65-0	1,3-Dinitrobenzene	370	U	UG/KG			4.20E-03	
118-96-7	2,4,6-Trinitrotoluene (TNT)	750	U	UG/KG		9.12E-09	1.70E-03	
121-14-2	2,4-Dinitrotoluene	2100		UG/KG			1.19E-03	5.25E+04
606-20-2	2,6-Dinitrotoluene	750	U	UG/KG			8.51E-04	2.50E+04
	Dinitrotoluene Mixture	2100		UG/KG		5.83E-07		5.25E+04
35572-78-2	2-Amino-4,6-Dinitrotoluene	750	U	UG/KG				
88-72-2	2-Nitrotoluene (ONT)	750	U	UG/KG				
99-08-1	3-Nitrotoluene	750	U	UG/KG			3.69E-04	
19406-51-0	4-Amino-2,6-Dinitrotoluene	1300		UG/KG				
99-99-0	4-Nitrotoluene (PNT)	760		UG/KG			3.74E-04	
2691-41-0	HMX	850	J	UG/KG			1.93E-05	
98-95-3	Nitrobenzene	370	U	UG/KG			3.23E-03	
121-82-4	RDX	750	U	UG/KG		3.34E-08	2.84E-04	
479-45-8	Tetryl	1100	U	UG/KG			1.25E-04	
Metals								
7429-90-5	Aluminum	14500		MG/KG	5.03E-01		8.65E-03	
7440-36-0	Antimony	3.7		MG/KG	4.46E+00		4.53E-03	1.23E+01
7440-38-2	Arsenic	25.2		MG/KG	1.87E+00	9.24E-06	5.74E-02	2.52E+01
7440-39-3	Barium	191		MG/KG	9.79E-01		1.53E-03	2.39E+00

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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)
7440-41-7	Beryllium	0.54	J	MG/KG	7.11E-01	2.41E-10	1.46E-04	1.80E-01
7440-42-8	Boron	18.1		MG/KG	3.42E+00		2.29E-04	
7440-43-9	Cadmium	3.8		MG/KG	2.00E+01	1.27E-09	4.69E-03	9.50E+00
7440-70-2	Calcium	157000		MG/KG	6.29E+01			
7440-47-3	Chromium	54.1		MG/KG	2.15E+00	1.21E-07		2.71E+01
7440-48-4	Cobalt	8.9		MG/KG	4.10E-01		7.26E-05	
7440-50-8	Copper	296	J	MG/KG	2.62E+01		3.90E-03	
7439-89-6	Iron	19900		MG/KG	1.03E+00		3.25E-02	
7439-92-1	Lead	103		MG/KG	4.40E+00			
7439-95-4	Magnesium	23700		MG/KG	1.53E+01			
7439-96-5	Manganese	2470		MG/KG	6.79E-01		7.66E-02	
7439-97-6	Mercury	0.54		MG/KG	9.00E+00			
7440-02-0	Nickel	14.5		MG/KG	7.67E-01		3.55E-04	2.07E+00
2023695	Potassium	1150		MG/KG	1.84E+00			
7782-49-2	Selenium	2.2		MG/KG	9.40E-01		2.15E-04	7.33E+00
7440-22-4	Silver	59.4		MG/KG	1.02E+02		5.81E-03	2.97E+01
7440-23-5	Sodium	189	J	MG/KG	1.11E+00			
7440-28-0	Thallium	4.9	U	MG/KG	1.20E+01		3.42E-05	
7440-62-2	Vanadium	32.8		MG/KG	6.95E-01		2.29E-03	1.09E-01
7440-66-6	Zinc	1330		MG/KG	2.59E+01		2.17E-03	2.22E+00
Other Parameters								
7601-90-3	Perchlorate	6600	U	UG/KG			6.46E-03	
TOC	TOC	16700		MG/KG	5.32E-01			

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	8	U	UG/KG			4.00E-03
79-34-5	1,1,2,2-Tetrachloroethane	8	U	UG/KG			
79-00-5	1,1,2-Trichloroethane	8	U	UG/KG	9.76E-07	9.76E-07	4.00E-01
75-34-3	1,1-Dichloroethane	8	U	UG/KG	4.00E-08	4.00E-08	3.48E-04
75-35-4	1,1-Dichloroethene	8	U	UG/KG	4.44E-07	4.44E-06	1.33E-01
107-06-2	1,2-Dichloroethane (EDC)	8	U	UG/KG	1.27E-04	5.71E-06	4.00E-01
540-59-0	1,2-Dichloroethene (total)	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02
78-87-5	1,2-Dichloropropane	8	U	UG/KG	9.52E-05	4.44E-06	2.67E-01
78-93-3	2-Butanone (MEK)	15	U	UG/KG			
591-78-6	2-Hexanone	15	U	UG/KG			
108-10-1	4-Methyl-2-pentanone (MIBK)	15	U	UG/KG			
67-64-1	Acetone	21	U	UG/KG	1.05E-07	1.05E-07	1.31E-03
71-43-2	Benzene	8	U	UG/KG	4.00E-05	1.86E-06	2.67E-01
75-27-4	Bromodichloromethane	8	U	UG/KG	8.70E-05	4.00E-06	1.33E-02
75-25-2	Bromoform	8	U	UG/KG	1.11E-05	5.00E-07	1.00E-02
74-83-9	Bromomethane	8	U	UG/KG	2.76E-06	8.00E-06	4.00E-02
75-15-0	Carbon disulfide	8	U	UG/KG	4.00E-08	4.00E-07	2.50E-04
56-23-5	Carbon tetrachloride	8	U	UG/KG	1.82E-04	1.95E-05	1.14E-01
108-90-7	Chlorobenzene	8	U	UG/KG	1.95E-07	1.95E-06	8.00E-03
75-00-3	Chloroethane	8	U	UG/KG			
67-66-3	Chloroform	8	U	UG/KG	8.51E-06	4.00E-06	1.33E-02
74-87-3	Chloromethane	8	U	UG/KG			
156-59-2	cis-1,2-Dichloroethene	8	U	UG/KG	4.00E-07	4.00E-07	2.00E-02

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	8	U	UG/KG			
124-48-1	Dibromochloromethane	8	U	UG/KG	1.95E-07	1.95E-07	2.00E-02
100-41-4	Ethylbenzene	8	U	UG/KG	4.00E-08	4.00E-07	6.15E-04
75-09-2	Methylene chloride	8	U	UG/KG	1.05E-05	6.67E-07	4.00E-01
110-54-3	N-Hexane	8	U	UG/KG			
100-42-5	Styrene	8	U	UG/KG	1.95E-08	1.95E-07	2.00E-03
127-18-4	Tetrachloroethylene (PCE)	8	U	UG/KG	7.27E-05	3.33E-06	1.33E-01
108-88-3	Toluene	8	U	UG/KG	1.95E-08	1.95E-08	6.67E-04
1330-20-7	total Xylenes	8	U	UG/KG	8.00E-09	1.95E-08	5.33E-05
156-60-5	trans-1,2-Dichloroethene	8	U	UG/KG	1.95E-07	1.95E-07	1.14E-02
10061-02-6	trans-1,3-Dichloropropene	8	U	UG/KG			
79-01-6	Trichloroethylene (TCE)	8	U	UG/KG	1.54E-05	6.67E-06	1.33E-01
75-01-4	Vinyl chloride	8	U	UG/KG	2.67E-03	1.23E-04	8.00E-01
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene	490	U	UG/KG	2.45E-05	2.45E-04	9.80E-02
95-50-1	1,2-Dichlorobenzene	490	U	UG/KG	2.72E-06	2.72E-05	2.88E-02
541-73-1	1,3-Dichlorobenzene	490	U	UG/KG			
106-46-7	1,4-Dichlorobenzene	490	U	UG/KG			2.45E-01
95-95-4	2,4,5-Trichlorophenol	2500	U	UG/KG	1.25E-05	1.25E-05	9.26E-03
88-06-2	2,4,6-Trichlorophenol	490	U	UG/KG	9.42E-04	4.45E-05	2.45E+00
120-83-2	2,4-Dichlorophenol	490	U	UG/KG	8.03E-05	8.03E-04	4.90E-01
105-67-9	2,4-Dimethylphenol	490	U	UG/KG	1.20E-05	1.20E-05	5.44E-02
51-28-5	2,4-Dinitrophenol	2500	U	UG/KG	6.10E-04	6.10E-03	1.25E+01
91-58-7	2-Chloronaphthalene	490	U	UG/KG			

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	490	U	UG/KG	4.90E-05	4.90E-05	1.23E-01
91-57-6	2-Methylnaphthalene	2100		UG/KG	3.44E-05	3.44E-05	5.00E-04
95-48-7	2-Methylphenol	490	U	UG/KG	4.90E-06	4.90E-06	3.27E-02
88-74-4	2-Nitroaniline	2500	U	UG/KG			
88-75-5	2-Nitrophenol	490	U	UG/KG			
91-94-1	3,3'-Dichlorobenzidine	490	U	UG/KG	3.77E-02	1.75E-03	7.00E+01
99-09-2	3-Nitroaniline	2500	U	UG/KG			
534-52-1	4,6-Dinitro-2-methylphenol	2500	U	UG/KG			
101-55-3	4-Bromophenyl phenyl ether	490	U	UG/KG			
59-50-7	4-Chloro-3-methylphenol	490	U	UG/KG			
106-47-8	4-Chloroaniline	980	U	UG/KG	1.20E-04	1.20E-03	1.40E+00
7005-72-3	4-Chlorophenyl phenyl ether	490	U	UG/KG			
106-44-5	4-Methylphenol	490	U	UG/KG			
100-01-6	4-Nitroaniline	2500	U	UG/KG			
100-02-7	4-Nitrophenol	2500	U	UG/KG			
83-32-9	Acenaphthene	490	U	UG/KG	4.08E-06	4.08E-06	8.60E-04
208-96-8	Acenaphthylene	82	J	UG/KG	1.34E-06	1.34E-06	1.95E-05
120-12-7	Anthracene	130	J	UG/KG	2.13E-07	2.13E-07	1.08E-05
56-55-3	Benzo(a)anthracene	290	J	UG/KG	3.63E-02	1.71E-03	1.45E-01
50-32-8	Benzo(a)pyrene	320	J	UG/KG	4.00E-01	1.88E-02	4.00E-02
205-99-2	Benzo(b)fluoranthene	330	J	UG/KG	4.13E-02	1.94E-03	6.60E-02
191-24-2	Benzo(g,h,i)perylene	200	J	UG/KG	3.28E-06	3.28E-06	4.76E-05
207-08-9	Benzo(k)fluoranthene	340	J	UG/KG	4.36E-03	2.00E-04	6.94E-03
111-91-1	bis(2-Chloroethoxy)methane	490	U	UG/KG			

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

TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	490	U	UG/KG	9.80E-02	6.53E-03	1.23E+03
108-60-1	bis(2-Chloroisopropyl) ether	490	U	UG/KG			
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)	1600		UG/KG	3.90E-03	3.90E-04	4.44E-04
85-68-7	Butyl benzyl phthalate	2000		UG/KG	4.88E-06	4.88E-06	2.15E-03
86-74-8	Carbazole	78	J	UG/KG	2.69E-04	1.26E-05	1.30E-01
218-01-9	Chrysene	430		UG/KG	5.51E-04	2.53E-05	2.69E-03
84-74-2	Di-n-butyl phthalate	92	J	UG/KG	4.60E-07	4.60E-07	4.00E-05
117-84-0	Di-n-octyl phthalate	490	U	UG/KG	1.20E-05	1.20E-04	4.90E-05
53-70-3	Dibenz(a,h)anthracene	490	U	UG/KG	6.13E-01	2.88E-02	2.45E-01
132-64-9	Dibenzofuran	760		UG/KG			
84-66-2	Diethyl phthalate	490	U	UG/KG	4.90E-07	4.90E-07	1.04E-03
131-11-3	Dimethyl phthalate	200	J	UG/KG			
206-44-0	Fluoranthene	380	J	UG/KG	4.63E-06	4.63E-06	8.84E-05
86-73-7	Fluorene	490	U	UG/KG	5.98E-06	5.98E-06	8.75E-04
118-74-1	Hexachlorobenzene	490	U	UG/KG	1.23E-01	6.28E-03	2.45E-01
87-68-3	Hexachlorobutadiene	490	U	UG/KG			
77-47-4	Hexachlorocyclopentadiene	490	U	UG/KG	3.50E-05	3.50E-05	1.23E-03
67-72-1	Hexachloroethane	490	U	UG/KG	2.45E-04	2.45E-04	9.80E-01
193-39-5	Indeno(1,2,3-c,d)pyrene	140	J	UG/KG	1.75E-02	8.24E-04	1.00E-02
78-59-1	Isophorone	490	U	UG/KG	1.20E-06	1.20E-06	6.13E-02
621-64-7	N-Nitroso-di-n-propylamine	490	U	UG/KG	6.13E-01	2.72E-02	9.80E+03
86-30-6	N-Nitrosodiphenylamine	490	U	UG/KG	4.08E-04	1.96E-05	4.90E-01
91-20-3	Naphthalene	1000		UG/KG	1.22E-05	1.22E-04	1.19E-02
87-86-5	Pentachlorophenol	2500	U	UG/KG	1.04E-01	4.81E-03	8.33E+01

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TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	1100		UG/KG	1.80E-05	1.80E-05	2.62E-04
108-95-2	Phenol	490	U	UG/KG	4.90E-07	4.08E-06	4.90E-03
129-00-0	Pyrene	440		UG/KG	7.21E-06	7.21E-06	1.05E-04
Explosives							
99-35-4	1,3,5-Trinitrobenzene	370	U	UG/KG			
99-65-0	1,3-Dinitrobenzene	370	U	UG/KG			
118-96-7	2,4,6-Trinitrotoluene (TNT)	750	U	UG/KG			
121-14-2	2,4-Dinitrotoluene	2100		UG/KG	2.50E-01	1.17E-02	2.63E+03
606-20-2	2,6-Dinitrotoluene	750	U	UG/KG	8.93E-02	4.17E-03	1.07E+03
	Dinitrotoluene Mixture	2100		UG/KG			
35572-78-2	2-Amino-4,6-Dinitrotoluene	750	U	UG/KG			
88-72-2	2-Nitrotoluene (ONT)	750	U	UG/KG			
99-08-1	3-Nitrotoluene	750	U	UG/KG			
19406-51-0	4-Amino-2,6-Dinitrotoluene	1300		UG/KG			
99-99-0	4-Nitrotoluene (PNT)	760		UG/KG			
2691-41-0	HMX	850	J	UG/KG			
98-95-3	Nitrobenzene	370	U	UG/KG	3.70E-04	3.70E-04	3.70E+00
121-82-4	RDX	750	U	UG/KG			
479-45-8	Tetryl	1100	U	UG/KG			
Metals							
7429-90-5	Aluminum	14500		MG/KG			
7440-36-0	Antimony	3.7		MG/KG	4.51E-03	4.51E-02	7.40E-01
7440-38-2	Arsenic	25.2		MG/KG	8.40E+00	4.13E-01	9.00E-01
7440-39-3	Barium	191		MG/KG	1.36E-03	1.36E-02	1.59E-01

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TABLE 13-10
HUMAN HEALTH SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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
7440-41-7	Beryllium	0.54	J	MG/KG	5.40E-01	1.86E-02	8.18E-02
7440-42-8	Boron	18.1		MG/KG	1.01E-04	1.01E-03	
7440-43-9	Cadmium	3.8		MG/KG	1.90E-03	1.90E-02	1.03E+00
7440-70-2	Calcium	157000		MG/KG			
7440-47-3	Chromium	54.1		MG/KG	5.41E-03	1.32E-02	1.93E+00
7440-48-4	Cobalt	8.9		MG/KG	7.42E-05	7.42E-04	
7440-50-8	Copper	296	J	MG/KG	3.61E-03	3.61E-02	2.69E-02
7439-89-6	Iron	19900		MG/KG			
7439-92-1	Lead	103		MG/KG	2.58E-01	2.58E-01	
7439-95-4	Magnesium	23700		MG/KG			
7439-96-5	Manganese	2470		MG/KG	2.57E-02	2.57E-01	
7439-97-6	Mercury	0.54		MG/KG	8.85E-04	8.85E-03	3.60E+00
7440-02-0	Nickel	14.5		MG/KG	3.54E-04	3.54E-03	1.91E-01
2023695	Potassium	1150		MG/KG			
7782-49-2	Selenium	2.2		MG/KG	2.20E-04	2.20E-03	9.17E-01
7440-22-4	Silver	59.4		MG/KG	5.94E-03	5.94E-02	3.96E+01
7440-23-5	Sodium	189	J	MG/KG			
7440-28-0	Thallium	4.9	U	MG/KG	3.06E-02	3.06E-02	2.04E+00
7440-62-2	Vanadium	32.8		MG/KG	2.34E-03	2.34E-02	3.35E-02
7440-66-6	Zinc	1330		MG/KG	2.18E-03	2.18E-02	3.69E-01
Other Parameters							
7601-90-3	Perchlorate	6600	U	UG/KG			
TOC	TOC	16700		MG/KG			

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TABLE 13-11
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 9 (AUS-0A09)

ADDTIONAL 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	3		UG/L		4.93E-02	4.29E-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	

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TABLE 13-11
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 9 (AUS-0A09)

ADDTIONAL 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)	11		UG/L	6.71E-06	3.01E-01	2.20E+00
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	1.4	J	UG/L	2.79E-06	7.67E-03	1.87E-02
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
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TABLE 13-11
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 9 (AUS-0A09)

ADDTIONAL 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 13-11
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 9 (AUS-0A09)

ADDTIONAL 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 13-11
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 9 (AUS-0A09)

ADDTIONAL 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	UJ	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	UJ	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	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	200	U	UG/L		5.48E-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	11.3	J	UG/L		4.42E-03	5.65E-03
7440-41-7	Beryllium	5	U	UG/L		6.85E-02	1.25E+00
7440-42-8	Boron	100	U	UG/L		3.04E-02	5.00E-02
7440-43-9	Cadmium	5	U	UG/L		2.74E-01	1.00E+00
7440-70-2	Calcium	243000		UG/L			
7440-47-3	Chromium	3.2	J	UG/L			3.20E-02
7440-48-4	Cobalt	50	U	UG/L		2.28E-02	5.00E-02
7440-50-8	Copper	10	U	UG/L		7.38E-03	1.54E-02

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

TABLE 13-11
HUMAN HEALTH SCREENING OF GROUNDWATER RESULTS FROM AREA 9 (AUS-0A09)

ADDTIONAL 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	100	U	UG/L		9.13E-03	2.00E-02
7439-92-1	Lead	3	U	UG/L			4.00E-01
7439-95-4	Magnesium	192000		UG/L			
7439-96-5	Manganese	22		UG/L		2.51E-02	1.47E-01
7439-97-6	Mercury	0.2	U	UG/L			1.00E-01
7440-02-0	Nickel	2.8	J	UG/L		3.84E-03	2.80E-02
2023695	Potassium	1000	U	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	572000		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	20	U	UG/L		1.83E-03	4.00E-03
Other Parameters							
7664-41-7	Nitrogen, Ammonia (as N)	0.1	U	MG/L			
Nitrate+Nitrite	Nitrogen, Nitrate-Nitrite	0.058	J	MG/L		5.80E-02	5.80E-02
7601-90-3	Perchlorate	500	UJ	UG/L		2.74E+01	

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

TABLE 13-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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		8	U	UG/KG	2.68E-04	
79-34-5	1,1,2,2-Tetrachloroethane		8	U	UG/KG	6.29E-02	
79-00-5	1,1,2-Trichloroethane		8	U	UG/KG	2.80E-04	
75-34-3	1,1-Dichloroethane		8	U	UG/KG	3.98E-04	
75-35-4	1,1-Dichloroethene		8	U	UG/KG	9.66E-04	
107-06-2	1,2-Dichloroethane (EDC)		8	U	UG/KG	3.77E-04	
540-59-0	1,2-Dichloroethene (total)		8	U	UG/KG	1.02E-02	
78-87-5	1,2-Dichloropropane		8	U	UG/KG	1.14E-05	
78-93-3	2-Butanone (MEK)		15	U	UG/KG	1.67E-04	
591-78-6	2-Hexanone		15	U	UG/KG	1.19E-03	
108-10-1	4-Methyl-2-pentanone (MIBK)		15	U	UG/KG	3.39E-05	
67-64-1	Acetone		21	U	UG/KG	8.40E-03	
71-43-2	Benzene		8	U	UG/KG	5.00E-04	
75-27-4	Bromodichloromethane		8	U	UG/KG	1.48E-02	
75-25-2	Bromoform		8	U	UG/KG	5.03E-04	
74-83-9	Bromomethane		8	U	UG/KG	3.40E-02	
75-15-0	Carbon disulfide		8	U	UG/KG	8.50E-02	
56-23-5	Carbon tetrachloride		8	U	UG/KG	8.00E-06	
108-90-7	Chlorobenzene		8	U	UG/KG	2.00E-04	
75-00-3	Chloroethane		8	U	UG/KG		
67-66-3	Chloroform		8	U	UG/KG	6.72E-03	
74-87-3	Chloromethane		8	U	UG/KG	7.69E-04	
156-59-2	cis-1,2-Dichloroethene		8	U	UG/KG	1.02E-02	
10061-01-5	cis-1,3-Dichloropropene		8	U	UG/KG	2.01E-02	
124-48-1	Dibromochloromethane		8	U	UG/KG	3.90E-03	
100-41-4	Ethylbenzene		8	U	UG/KG	1.60E-03	
75-09-2	Methylene chloride		8	U	UG/KG	1.98E-03	
110-54-3	N-Hexane		8	U	UG/KG		
100-42-5	Styrene		8	U	UG/KG	2.67E-05	
127-18-4	Tetrachloroethylene (PCE)		8	U	UG/KG	6.15E-04	
108-88-3	Toluene		8	U	UG/KG	2.67E-03	
1330-20-7	total Xylenes		8	U	UG/KG	1.33E-02	
156-60-5	trans-1,2-Dichloroethene		8	U	UG/KG	1.02E-02	
10061-02-6	trans-1,3-Dichloropropene		8	U	UG/KG	2.01E-02	
79-01-6	Trichloroethylene (TCE)		8	U	UG/KG	8.89E-04	
75-01-4	Vinyl chloride		8	U	UG/KG	1.24E-02	
Semivolatile Organic Compounds							
120-82-1	1,2,4-Trichlorobenzene		490	U	UG/KG	2.45E-02	
95-50-1	1,2-Dichlorobenzene		490	U	UG/KG	1.66E-01	
541-73-1	1,3-Dichlorobenzene		490	U	UG/KG	1.30E-02	
106-46-7	1,4-Dichlorobenzene		490	U	UG/KG	2.45E-02	

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

TABLE 13-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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		2500	U	UG/KG	6.25E-01	
88-06-2	2,4,6-Trichlorophenol		490	U	UG/KG	4.90E-02	
120-83-2	2,4-Dichlorophenol		490	U	UG/KG	5.60E-03	
105-67-9	2,4-Dimethylphenol		490	U	UG/KG	4.90E+01	
51-28-5	2,4-Dinitrophenol		2500	U	UG/KG	1.25E-01	
91-58-7	2-Chloronaphthalene		490	U	UG/KG	4.02E+01	
95-57-8	2-Chlorophenol		490	U	UG/KG	2.02E+00	
91-57-6	2-Methylnaphthalene		2100		UG/KG	6.48E-01	YES
95-48-7	2-Methylphenol		490	U	UG/KG	1.21E-02	
88-74-4	2-Nitroaniline		2500	U	UG/KG	3.37E-02	
88-75-5	2-Nitrophenol		490	U	UG/KG	3.06E-01	
91-94-1	3,3'-Dichlorobenzidine		490	U	UG/KG	7.58E-01	
99-09-2	3-Nitroaniline		2500	U	UG/KG	7.91E-01	
534-52-1	4,6-Dinitro-2-methylphenol		2500	U	UG/KG		
101-55-3	4-Bromophenyl phenyl ether		490	U	UG/KG		
59-50-7	4-Chloro-3-methylphenol		490	U	UG/KG	6.16E-02	
106-47-8	4-Chloroaniline		980	U	UG/KG	8.91E-01	
7005-72-3	4-Chlorophenyl phenyl ether		490	U	UG/KG		
106-44-5	4-Methylphenol		490	U	UG/KG	3.01E-03	
100-01-6	4-Nitroaniline		2500	U	UG/KG	1.14E-01	
100-02-7	4-Nitrophenol		2500	U	UG/KG	3.57E-01	
83-32-9	Acenaphthene		490	U	UG/KG	7.18E-04	
208-96-8	Acenaphthylene		82	J	UG/KG	1.20E-04	
120-12-7	Anthracene		130	J	UG/KG	8.78E-05	YES
56-55-3	Benzo(a)anthracene		290	J	UG/KG	5.57E-02	YES
50-32-8	Benzo(a)pyrene		320	J	UG/KG	7.27E-05	YES
205-99-2	Benzo(b)fluoranthene		330	J	UG/KG	5.52E-03	YES
191-24-2	Benzo(g,h,i)perylene		200	J	UG/KG	1.68E-03	YES
207-08-9	Benzo(k)fluoranthene		340	J	UG/KG	5.69E-03	YES
111-91-1	bis(2-Chloroethoxy)methane		490	U	UG/KG	1.62E+00	
111-44-4	bis(2-Chloroethyl) ether		490	U	UG/KG	2.07E-02	
108-60-1	bis(2-Chloroisopropyl) ether		490	U	UG/KG		
117-81-7	bis(2-Ethylhexyl) phthalate (DEHP)		1600		UG/KG	1.73E+00	YES
85-68-7	Butyl benzyl phthalate		2000		UG/KG	8.37E+00	YES
86-74-8	Carbazole		78	J	UG/KG		YES
218-01-9	Chrysene		430		UG/KG	9.09E-02	YES
84-74-2	Di-n-butyl phthalate		92	J	UG/KG	4.60E-04	YES
117-84-0	Di-n-octyl phthalate		490	U	UG/KG	6.91E-04	
53-70-3	Dibenz(a,h)anthracene		490	U	UG/KG	2.66E-02	
132-64-9	Dibenzofuran		760		UG/KG		YES
84-66-2	Diethyl phthalate		490	U	UG/KG	4.90E-03	
131-11-3	Dimethyl phthalate		200	J	UG/KG	1.00E-03	

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

TABLE 13-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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		380	J	UG/KG	3.11E-03	YES
86-73-7	Fluorene		490	U	UG/KG	1.63E-02	
118-74-1	Hexachlorobenzene		490	U	UG/KG	4.90E-04	
87-68-3	Hexachlorobutadiene		490	U	UG/KG	1.23E+01	
77-47-4	Hexachlorocyclopentadiene		490	U	UG/KG	4.90E-02	
67-72-1	Hexachloroethane		490	U	UG/KG	8.22E-01	
193-39-5	Indeno(1,2,3-c,d)pyrene		140	J	UG/KG	1.28E-03	YES
78-59-1	Isophorone		490	U	UG/KG	3.53E-03	
621-64-7	N-Nitroso-di-n-propylamine		490	U	UG/KG	9.01E-01	
86-30-6	N-Nitrosodiphenylamine		490	U	UG/KG	2.45E-02	
91-20-3	Naphthalene		1000		UG/KG	4.02E-03	
87-86-5	Pentachlorophenol		2500	U	UG/KG	4.17E-01	
85-01-8	Phenanthrene		1100		UG/KG	2.41E-02	YES
108-95-2	Phenol		490	U	UG/KG	1.23E-02	
129-00-0	Pyrene		440		UG/KG	5.61E-03	YES
Explosives							
99-35-4	1,3,5-Trinitrobenzene		370	U	UG/KG	9.84E-01	
99-65-0	1,3-Dinitrobenzene		370	U	UG/KG	5.65E-01	
118-96-7	2,4,6-Trinitrotoluene (TNT)		750	U	UG/KG	2.50E-02	
121-14-2	2,4-Dinitrotoluene		2100		UG/KG	1.64E+00	
606-20-2	2,6-Dinitrotoluene		750	U	UG/KG	2.28E+01	
35572-78-2	2-Amino-4,6-Dinitrotoluene		750	U	UG/KG	9.38E-03	
88-72-2	2-Nitrotoluene (ONT)		750	U	UG/KG		
99-08-1	3-Nitrotoluene		750	U	UG/KG		
19406-51-0	4-Amino-2,6-Dinitrotoluene		1300		UG/KG		
99-99-0	4-Nitrotoluene (PNT)		760		UG/KG		
2691-41-0	HMX		850	J	UG/KG	3.40E-02	
98-95-3	Nitrobenzene		370	U	UG/KG	9.25E-03	
121-82-4	RDX		750	U	UG/KG	7.50E-03	
479-45-8	Tetryl		1100	U	UG/KG		
Metals							
7429-90-5	Aluminum	28800	14500		MG/KG		
7440-36-0	Antimony	0.83	3.7		MG/KG	7.40E-01	
7440-38-2	Arsenic	13.5	25.2		MG/KG	2.80E+00	
7440-39-3	Barium	195	191		MG/KG	3.82E-01	
7440-41-7	Beryllium	0.76	0.54	J	MG/KG	5.40E-02	
7440-42-8	Boron	5.3	18.1		MG/KG	3.62E+01	
7440-43-9	Cadmium	0.19	3.8		MG/KG	1.31E-01	
7440-70-2	Calcium	2497	157000		MG/KG		
7440-47-3	Chromium	25.2	54.1		MG/KG	1.08E+01	
7440-48-4	Cobalt	21.7	8.9		MG/KG	4.45E-01	
7440-50-8	Copper	11.3	296	J	MG/KG	9.55E+00	

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

TABLE 13-12
ECOLOGICAL SCREENING OF SOIL RESULTS FROM AREA 9 (AUS-0A09)

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	19900		MG/KG	9.95E+01	
7439-92-1	Lead	23.4	103		MG/KG	2.38E-01	
7439-95-4	Magnesium	1552	23700		MG/KG		
7439-96-5	Manganese	3640	2470		MG/KG	2.47E+01	
7439-97-6	Mercury	0.06	0.54		MG/KG	7.71E-02	YES
7440-02-0	Nickel	18.9	14.5		MG/KG	4.83E-01	
2023695	Potassium	625	1150		MG/KG		
7782-49-2	Selenium	2.34	2.2		MG/KG	2.20E+00	YES
7440-22-4	Silver	0.58	59.4		MG/KG	2.97E+01	
7440-23-5	Sodium	170	189	J	MG/KG		
7440-28-0	Thallium	0.41	4.9	U	MG/KG	4.90E+00	
7440-62-2	Vanadium	47.2	32.8		MG/KG	7.13E-01	
7440-66-6	Zinc	51.4	1330		MG/KG	1.11E+01	
Other Parameters							
7601-90-3	Perchlorate		6600	U	UG/KG		
TOC	TOC	31393	16700		MG/KG		

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

TABLE 13-13, AUS-0A09
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	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	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	Yes	E	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	Yes	E	NA	NA	Uncertainty	B
2,4,5-Trichlorophenol	NA	NA	No	A	NA	NA	No	A

TABLE 13-13, AUS-0A09
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	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	F
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	Yes	E
Benzo(b)fluoranthene	NA	NA	Uncertainty	B	NA	NA	Yes	E
Benzo(g,h,i)perylene	NA	NA	No	A	NA	NA	No	F
Benzo(k)fluoranthene	NA	NA	Uncertainty	B	NA	NA	No	F
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	F
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	F
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	F
Fluoranthene	NA	NA	No	A	NA	NA	No	F

TABLE 13-13, AUS-0A09
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	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	F
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	A	NA	NA	No	F
Antimony	NA	NA	Uncertainty	B	NA	NA	Yes	E
Arsenic	NA	NA	Uncertainty	B	NA	NA	Yes	E
Barium	NA	NA	No	F	NA	NA	Yes	D
Beryllium	NA	NA	Uncertainty	B	NA	NA	No	F
Boron	NA	NA	No	A	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	F	NA	NA	Yes	E
Cobalt	NA	NA	No	A	NA	NA	No	F
Copper	NA	NA	No	A	NA	NA	No	F
Cyanide, Total	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	No	A	NA	NA	No	F
Lead	NA	NA	No	A	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	Yes	E
Nickel	NA	NA	No	F	NA	NA	Yes	D
Potassium	NA	NA	No	C	NA	NA	No	H
Selenium	NA	NA	No	A	NA	NA	Yes	D
Silver	NA	NA	No	A	NA	NA	Yes	E
Sodium	NA	NA	No	H	NA	NA	No	H
Thallium	NA	NA	Uncertainty	B	NA	NA	Uncertainty	B
Vanadium	NA	NA	No	A	NA	NA	No	F
Zinc	NA	NA	No	A	NA	NA	Yes	E
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 13-13, AUS-0A09
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	No	A	NA	NA	No	A
2,4-Dinitrotoluene	NA	NA	No	A	NA	NA	Yes	E
2,6-Dinitrotoluene	NA	NA	No	A	NA	NA	Uncertainty	B
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	Uncertainty	G
4-Nitrotoluene (PNT)	NA	NA	No	A	NA	NA	No	F
HMX	NA	NA	No	A	NA	NA	No	F
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	A
Other Parameters								
Nitrogen, Nitrate-Nitrite	NA	NA	No	F	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 13-14, AUS-0A09
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 13-14, AUS-0A09
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	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	Yes	E
Carbazole	NA	NA	NA	NA	Yes	E
Chrysene	NA	NA	NA	NA	Yes	E
Di-n-butyl phthalate	NA	NA	NA	NA	Yes	E
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	F
Fluoranthene	NA	NA	NA	NA	Yes	E

TABLE 13-14, AUS-0A09
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	Yes	E
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	E
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	Yes	E
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 13-14, AUS-0A09
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	Yes	E
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	Uncertainty	G
4-Nitrotoluene (PNT)	NA	NA	NA	NA	Uncertainty	G
HMX	NA	NA	NA	NA	No	F
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 exceeeded 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 13-15
AUS-0A09 - IOP LOAD LINE I
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)			NA	H	NA
SVOCs					
1,4-Dichlorobenzene			NA	H	NA
2-Methylnaphthalene		E	NA		NA
Anthracene		E	NA		NA
Benzo(a)anthracene		H,E	NA		NA
Benzo(a)pyrene		H,E	NA		NA
Benzo(b)fluoranthene		H,E	NA		NA
Benzo(g,h,i)perylene		E	NA		NA
Benzo(k)fluoranthene		E	NA		NA
bis(2-Ethylhexyl)phthalate		E	NA		NA
Butyl benzyl phthalate		E	NA		NA
Carbazole		H,E	NA		NA
Chrysene		E	NA		NA
Di-n-butyl phthalate		E	NA		NA
Dibenzofuran		E	NA		NA
Fluoranthene		E	NA		NA
Indeno(1,2,3-c,d)pyrene		E	NA		NA
Phenanthrene		E	NA		NA
Pyrene		E	NA		NA
Metals					
Antimony		H	NA		NA
Arsenic		H,E	NA		NA
Boron		E	NA		NA
Cadmium		H	NA		NA
Chromium		H,E	NA		NA
Copper		E	NA		NA
Iron		E	NA		NA
Mercury		H,E	NA		NA
Silver		H,E	NA		NA
Zinc		H,E	NA		NA
Explosives					
2,4-Dinitrotoluene		H,E	NA		NA

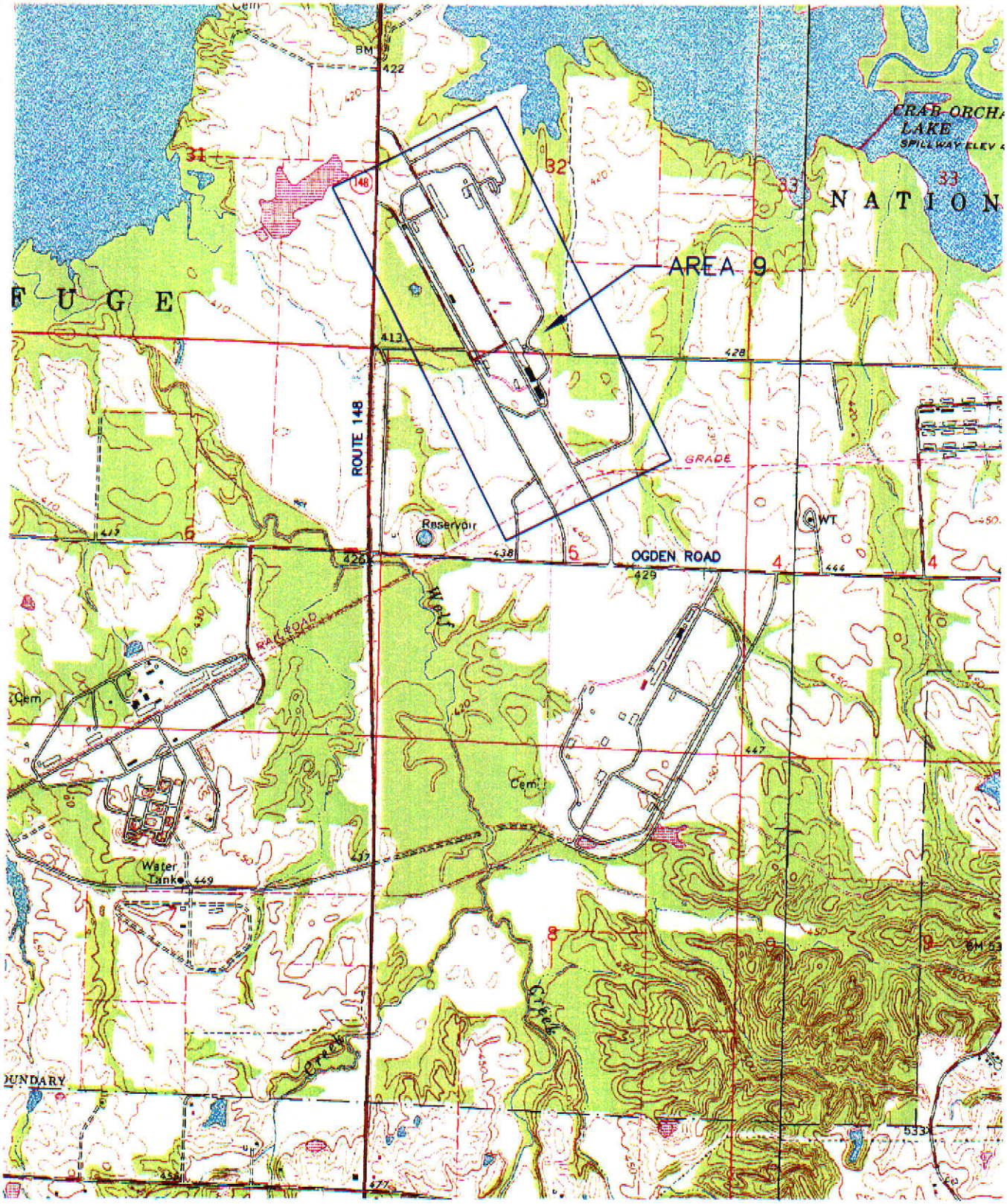
Key:

[1] Drums were not present at this site.

NA = not analyzed

H = human health screening criteria exceeded

E = ecological screening criteria exceeded



SOURCE: USGS DIGITAL RASTER GRAPHIC

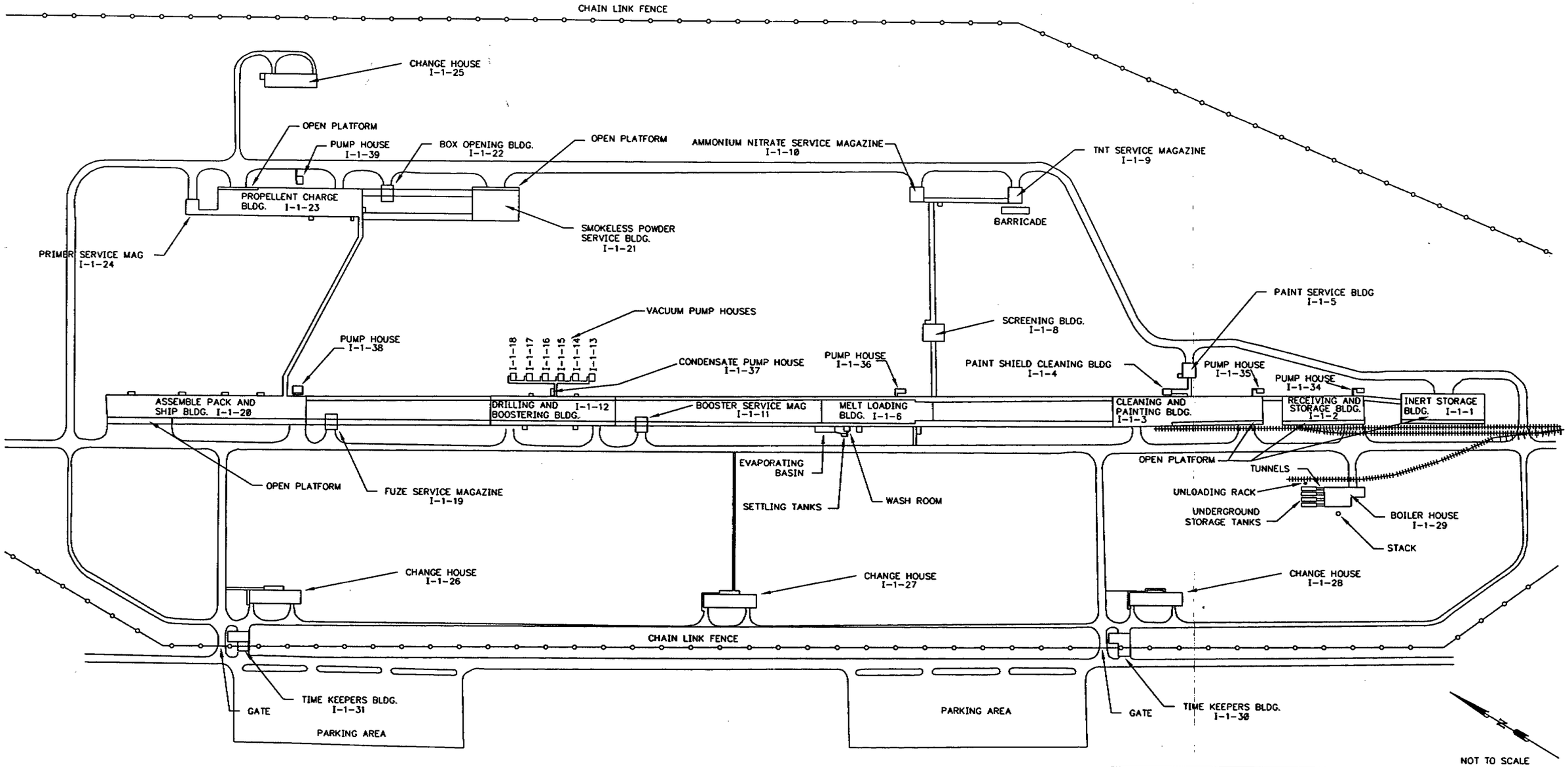
N

0 2000

SCALE FEET

PA/SI REPORT–AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: djd 8/25/99 DSGN. BY: mch CHKD. BY: cmw	Area 9 Site Location Map FIG. NO. 13–1

File: E:\45FOM9602N\FIG_13-1.DWG Last edited: 07/02/01 @ 5:12 p.m. @ WCC-ST.LOUIS



PA/SI REPORT – AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: djd 8/21/99 DSGN. BY: ja CHKD. BY: cmw	Original IOP Configuration for Area 9
	FIG. NO. 13–2

File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG13-2LS.DWG Last edited: 07/25/01 @ 4:19 p.m. WC-ST.LOUIS, MO

NOTES:

(1) ALL BUILDING LOCATIONS ARE APPROXIMATE; DASHED OUTLINES INDICATE FORMER BUILDINGS.
(2) IOP BUILDING I-1-32 AND IOP BUILDING I-1-33 ARE FORMER GUARD SHACKS AT EITHER END OF LOAD LINE I AND ARE NOT SHOWN ON THIS FIGURE.
(3) SOURCES: DPRA DOCUMENT NO. 00017531. PRIMEX PCB SITE PLAN SHOWING AREAS BY NUMBER, I AREA NORTH SITE PLAN.
DPRA DOCUMENT NO. 00011389/PRI-014926. OLIN, TECHNICAL SYSTEMS OPERATION, 30 MM GAU 8/A PRODUCTION READINESS REVIEW, DATED SEPTEMBER 17, 1975, REVISED JULY 1, 1976.
DPRA DOCUMENT NO. 00027104/PRI-016817. OLIN -MARION WASTEWATER PROGRAM, STATUS 30 JULY 1986, DRAWING ENTITLED "I-AREA LOAD LIMITS, STAGING, BUNKERS & MISC. BLDGS.
DPRA DOCUMENT NO. 00014144. PRIMEX, ATTACHMENT (SITE MAP) TO PRIMEX MEMO ENTITLED "I-AREA DEPLETED URANIUM LOCATION DRAWINGS, DATED FEBRUARY 11, 1998.
DPRA DOCUMENT NO. C002159. OLIN ORDNANCE PRODUCTS, QUATITY/DISTANCE MAP "I" AREA-NORTH PORTION, DRAWING NO. 5000121, DATED MAY 1985.

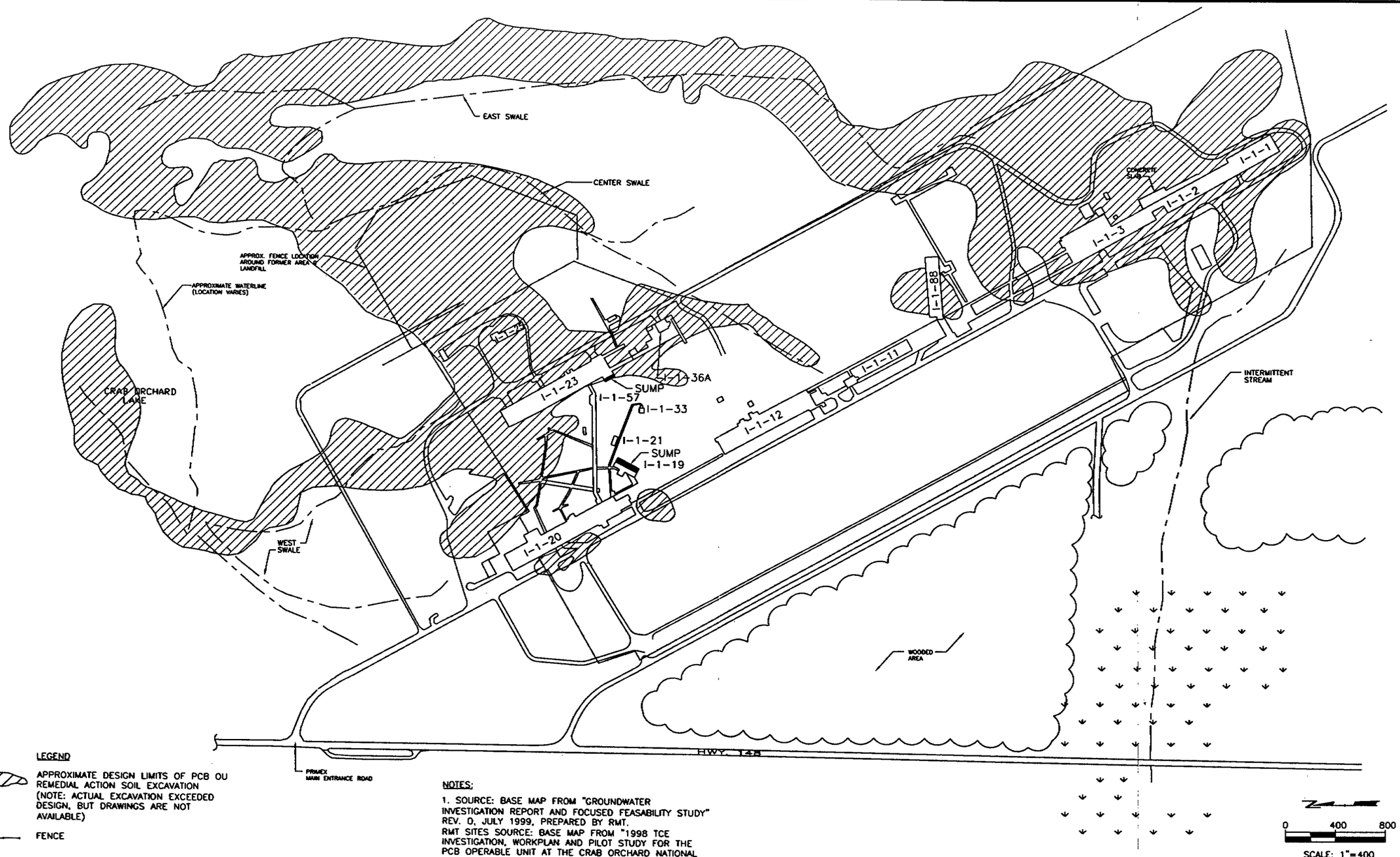
EARTHEN BARRICADE

OLIN EXPLOSIVES STORAGE AREA
FENCE
OLIN BUILDING I-1-36 (A,B, & C)
DENSE TREE AREA (1993)
SUNGAMO (BUILDING CLUSTER) #7
FORMER I-1-84
OLIN I-1-19 (FORMER OLIN I-1-32)
I-1-21N (I-1-23A)
OLIN I-1-35 (I-1-101)
I-1-96 (SANGAMO #8)
ANNEX #3
CONCRETE SLAB OF FORMER I-1-29
BUILDING #18

NOT TO SCALE

PA/SI REPORT - AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS	
DRN. BY: chs DSGN. BY: cmw CHKD. BY: cmw	Current Configuration for Area 9 — FIG. NO. 13-2a

File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG13-2A.DWG Last edited: 09/18/01 @ 2:48 p.m. WC-ST.LOUIS, MO



LEGEND

- APPROXIMATE DESIGN LIMITS OF PCB OU REMEDIAL ACTION SOIL EXCAVATION (NOTE: ACTUAL EXCAVATION EXCEEDED DESIGN, BUT DRAWINGS ARE NOT AVAILABLE)
- FENCE
- APPROXIMATE CENTERLINE OF SURFACE DRAINAGE CHANNEL/SWALE
- MARSH/WETLAND
- APPROXIMATE LOCATION OF WOODED AREAS WEST OF SITE 32/33

NOTES:

1. SOURCE: BASE MAP FROM "GROUNDWATER INVESTIGATION REPORT AND FOCUSED FEASABILITY STUDY" REV. 0, JULY 1999, PREPARED BY RMT.
RMT SITES SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLUOR DANIEL GTI.
2. THE DESIGN EXCAVATION BOUNDARY WAS PROVIDED BY USFWS.
3. APPROXIMATE EXTENT OF MARSH/WETLANDS ESTIMATED FROM SITE TOPOGRAPHIC MAP.
4. LOCATION OF ALL WOODED AREAS NOT SHOWN.

PA/SI REPORT AUS OU CRAB ORCHARD NWR MARION, ILLINOIS		PROJECT NO. 2320000026.00
URS Corporation		
DRN. BY: djd 8/21/99 DSGN. BY: ja CHKD. BY: mch	Sites 32/33 Approximate Soil Excavation of the PCB OU	FIG. NO. 13-3

File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG13-3US.DWG Last edited: 06/29/01 @ 09:39 a.m. @ WCC-ST.LOUIS

33MWC-15
33MWC-36
33MWC-02
33MWC-00
33MWC-39
33MWC-17
33MWC-18
33MWC-27
33MWC-09
33MWC-19
APPROX. FENCE LOCATION AROUND FORMER AREA 9 LANDFILL
32-063
33MWC-28
33MWC-38
33MWC-30
33MWC-06
33MWC-05
33MWC-10
33MWC-24
CONCRETE SLAB
33MWC-13
33MWC-14
33-341
33-342
I-1-1
I-1-2
I-1-3
I-1-88
I-1-11
I-1-12
I-1-25
I-1-23
I-1-36A
I-1-57
I-1-33
I-1-21
I-1-19
I-1-20
33MWC-07
33-340
33MWC-21
33MWC-16
INTERMITTENT STREAM
33MWC-11
33MWC-03
33MWC-33
33MWC-12
PRIMEX MAIN ENTRANCE ROAD
WOODED AREA

LEGEND

- 33MWC-02 SHALLOW MONITORING WELL
- FENCE
- MARSH/WETLAND
- APPROXIMATE LOCATION OF WOODED AREAS WEST OF SITE 32/33

NOTES:

1. SOURCE: BASE MAP FROM "GROUNDWATER INVESTIGATION REPORT AND FOCUSED FEASIBILITY STUDY" REV. 0, JULY 1999, PREPARED BY RMT. RMT CITES SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLUOR DANIEL GTI.
2. APPROXIMATE EXTENT OF MARSH/WETLANDS ESTIMATED FROM SITE TOPOGRAPHIC MAP.
3. LOCATION OF ALL WOODED AREAS NOT SHOWN.
4. LOCATION OF ALL WOODED AREAS NOT SHOWN

0 300' 600'
SCALE: 1"= 300'

PA/SI REPORT – AUS OU CRAB ORCHARD NWR MARION, ILLINOIS	PROJECT NO. 2320000026.00
URS Corporation	
DRN. BY: djd 8/21/99 DSGN. BY: ja CHKD. BY: mch	Area 9 RMT Monitoring Wells FIG. NO. 13-4

File: E:\2320000026.00\PA-SI REPORT-AUS OU\CRABFIG13-4LS.DWG Last edited: 06/29/01 ● 09:56 a.m. ● WCC-ST.LOUIS

AUS–ØAØ9–IOP LOAD LINE I

EAST SWALE

CENTER SWALE

CONCRETE SLAB

APPROX. FENCE LOCATION AROUND FORMER AREA 9 LANDFILL

LOCATION OF SUMPS AS IDENTIFIED BY OLIN.

APPROXIMATE WATERLINE (LOCATION VARIES)

SUMP–LIKE FEATURES NOTED DURING FIELD RECONNAISSANCE

INTERMITTENT STREAM

CRAB ORCHARD LAKE

WEST SWALE

LOCATION OF SUMPS AS IDENTIFIED BY OLIN.

WOODED AREA

HWY 148

PRIMEX MAIN ENTRANCE ROAD

ØA09–001 ØA09–002 ØA09–003 ØA09–004A ØA09–004B ØA09–004C ØA09–005 ØA09–006 ØA09–007 ØA09–008 ØA09–009 ØA09–010 ØA09–011 ØA09–012 ØA09–013 ØA09–014 ØA09–015 ØA09–016 ØA09–017 ØA09–018 ØA09–019 ØA09–020 ØA09–021 ØA09–W01

I–1–1 I–1–2 I–1–3 I–1–6 I–1–11 I–1–12 I–1–21 I–1–26 I–1–28 I–1–33 I–1–36A I–1–57

LEGEND

- APPROXIMATE DESIGN LIMITS OF PCB OU REMEDIAL ACTION SOIL EXCAVATION (NOTE: ACTUAL EXCAVATION EXCEEDED DESIGN, BUT DRAWINGS ARE NOT AVAILABLE)
- FENCE
- APPROXIMATE CENTERLINE OF SURFACE DRAINAGE CHANNEL/SWALE
- MARSH/WETLAND
- APPROXIMATE LOCATION OF WOODED AREAS WEST OF SITE 32/33
- EXISTING MONITORING WELLS
- SOIL BORINGS/MONITORING WELLS
- HAND AUGER LOCATIONS
- AREA WHERE PCB OU REMEDIATION BOUNDARIES ARE IN QUESTION

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 Drinking Water Quality Human Health	h10

SCALE: 1"=200' (APPROXIMATE)

NOTES:

1. SOURCE: BASE MAP FROM "GROUNDWATER INVESTIGATION REPORT AND FOCUSED FEASABILITY STUDY" REV. 0, JULY 1999, PREPARED BY RMT. RMT SITES SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLOUR DANIEL GTI.
2. APPROXIMATE EXTENT OF MARSH/WETLANDS ESTIMATED FROM SITE TOPOGRAPHIC MAP.
3. LOCATION OF ALL WOODED AREAS NOT SHOWN.
4. DASHED BUILDING OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES.
5. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.
6. 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.

Revision No.	Description	Date	By	App.

REVISIONS

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

AUS–ØAØ9 Sample Locations and Detections of Organic Compounds in Soils and Groundwater

Date: 1/05/01	Project Number: 23200000026.00	Figure Number: 13–5
Drawn by: DJD	Design by: MAM	Checked by: CMW

URS

File: E:\23200000026.00\Pa-si REPORT-AUS OU\AUS-0A09_13-5.dwg Last edited 09/15/01 @ 2:11 p.m. @ WCC-ST_LOUIS

NOTES:

1. SOURCE: BASE MAP FROM "GROUNDWATER INVESTIGATION REPORT AND FOCUSED FEASABILITY STUDY" REV. 0, JULY 1999, PREPARED BY RMT. RMT SITES SOURCE: BASE MAP FROM "1998 TCE INVESTIGATION, WORKPLAN AND PILOT STUDY FOR THE PCB OPERABLE UNIT AT THE CRAB ORCHARD NATIONAL WILDLIFE REFUGE SUPERFUND SITE, MARION, ILLINOIS" REV. 1, MAY 1998, PREPARED BY FLOUR DANIEL GTI.
2. APPROXIMATE EXTENT OF MARSH/WETLANDS ESTIMATED FROM SITE TOPOGRAPHIC MAP.
3. LOCATION OF ALL WOODED AREAS NOT SHOWN.
4. DASHED BUILDING OUTLINES SHOW APPROXIMATE LOCATIONS OF FORMER STRUCTURES.
5. DATA QUALIFIERS FOR ANALYTICAL RESULTS ARE NOT INDICATED. REFER TO THE QCSR FOR DATA QUALIFIERS.

LEGEND

- APPROXIMATE DESIGN LIMITS OF PCB OU REMEDIAL ACTION SOIL EXCAVATION (NOTE: ACTUAL EXCAVATION EXCEEDED DESIGN, BUT DRAWINGS ARE NOT AVAILABLE)
- FENCE
- APPROXIMATE CENTERLINE OF SURFACE DRAINAGE CHANNEL/SWALE
- MARSH/WETLAND
- APPROXIMATE LOCATION OF WOODED AREAS WEST OF SITE 32/33
- EXISTING MONITORING WELLS
- SOIL BORINGS/MONITORING WELLS
- HAND AUGER LOCATIONS
- AREA WHERE PCB OU REMEDIATION BOUNDARIES ARE IN QUESTION

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

AUS-0A09-002	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6120	
Arsenic	MG/KG	6.6	h1,h5,h7
Barium	MG/KG	106	h5
Boron	MG/KG	18.1	b3,e1
Calcium	MG/KG	1430	
Chromium	MG/KG	14	e1,h5
Cobalt	MG/KG	4.5	
Copper	MG/KG	6	
Iron	MG/KG	13030	e1
Lead	MG/KG	13.4	
Magnesium	MG/KG	1260	
Manganese	MG/KG	1280	e1
Nickel	MG/KG	6.8	
Potassium	MG/KG	394	
Selenium	MG/KG	1.5	e1,e5,h5
Vanadium	MG/KG	19.3	
Zinc	MG/KG	37.4	
Other Parameters			
TOC	MG/KG	16700	

AUS-0A09-008	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5760	
Arsenic	MG/KG	4.4	h1,h5,h7
Barium	MG/KG	121	h5
Boron	MG/KG	6	
Calcium	MG/KG	1330	
Chromium	MG/KG	12.3	h5
Copper	MG/KG	8.5	b1
Iron	MG/KG	10100	e1
Lead	MG/KG	12.5	
Magnesium	MG/KG	1250	
Manganese	MG/KG	576	
Nickel	MG/KG	7.1	h5
Potassium	MG/KG	362	
Vanadium	MG/KG	14.8	
Zinc	MG/KG	43.6	b1

AUS-0A09-010	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7120	
Arsenic	MG/KG	10.1	e1,h1,h5,h7
Barium	MG/KG	72.5	
Calcium	MG/KG	2300	
Chromium	MG/KG	10.1	e1,h5
Copper	MG/KG	9.4	
Iron	MG/KG	15600	e1
Lead	MG/KG	14.7	
Magnesium	MG/KG	1340	
Manganese	MG/KG	1980	e1
Nickel	MG/KG	6.5	
Potassium	MG/KG	341	
Selenium	MG/KG	1.2	e1,e5,h5
Vanadium	MG/KG	22.4	
Zinc	MG/KG	28.8	

AUS-0A09-015	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5030	
Arsenic	MG/KG	8.4	h1,h5,h7
Barium	MG/KG	79.8	
Boron	MG/KG	2	e5
Calcium	MG/KG	31400	b1
Chromium	MG/KG	8.2	e1,h5
Cobalt	MG/KG	4.6	
Copper	MG/KG	8.9	
Iron	MG/KG	11900	e1
Lead	MG/KG	22.4	
Magnesium	MG/KG	1720	b1
Manganese	MG/KG	851	e1
Mercury	MG/KG	0.09	b1,e5,h6
Nickel	MG/KG	6	h5
Potassium	MG/KG	331	
Vanadium	MG/KG	21.2	
Zinc	MG/KG	38.6	

AUS-0A09-018	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	13800	
Arsenic	MG/KG	5	h1,h5,h7
Barium	MG/KG	87.7	h5
Beryllium	MG/KG	0.39	
Boron	MG/KG	3	e5
Calcium	MG/KG	69800	b1
Chromium	MG/KG	18.2	e1,h5
Cobalt	MG/KG	5.3	
Copper	MG/KG	12.9	b1
Iron	MG/KG	16200	e1
Lead	MG/KG	18.6	
Magnesium	MG/KG	4110	b1
Manganese	MG/KG	159	e1
Mercury	MG/KG	0.019	e5
Nickel	MG/KG	12.4	h5
Potassium	MG/KG	1150	b1
Selenium	MG/KG	0.42	e5,h5
Sodium	MG/KG	79.7	
Vanadium	MG/KG	25.5	
Zinc	MG/KG	89.4	b1

AUS-0A09-017	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	14300	
Antimony	MG/KG	0.24	
Arsenic	MG/KG	8.3	h1,h5,h7
Barium	MG/KG	173	h5
Beryllium	MG/KG	0.45	
Calcium	MG/KG	7710	b1
Chromium	MG/KG	19.1	e1,h5
Cobalt	MG/KG	5.3	
Copper	MG/KG	18.5	b1
Iron	MG/KG	19900	b1,e1
Lead	MG/KG	17.9	
Magnesium	MG/KG	3160	b1
Manganese	MG/KG	593	e1
Mercury	MG/KG	0.011	e5
Nickel	MG/KG	14.5	h5
Potassium	MG/KG	968	b1
Sodium	MG/KG	81.6	
Vanadium	MG/KG	32.8	
Zinc	MG/KG	196	b1,e1

AUS-0A09-001	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5130	
Arsenic	MG/KG	3	h1,h5
Barium	MG/KG	91.7	h5
Calcium	MG/KG	2530	b1
Chromium	MG/KG	9.1	e1,h5
Copper	MG/KG	7.6	
Iron	MG/KG	7030	e1
Lead	MG/KG	9.5	
Magnesium	MG/KG	1280	
Manganese	MG/KG	260	e1
Nickel	MG/KG	5.2	
Potassium	MG/KG	478	
Selenium	MG/KG	0.69	e5,h5
Vanadium	MG/KG	12	
Zinc	MG/KG	47.9	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A09-W01	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6070	
Arsenic	MG/KG	9.2	h1,h5,h7
Barium	MG/KG	139	h5
Calcium	MG/KG	1590	
Chromium	MG/KG	34.6	b3,e1,h5,h6
Cobalt	MG/KG	5.8	
Copper	MG/KG	4.7	
Iron	MG/KG	9580	e1
Lead	MG/KG	16.7	
Magnesium	MG/KG	794	
Manganese	MG/KG	1570	e1
Mercury (duplicate)	MG/KG	0.06	e5
Nickel	MG/KG	4.6	
Potassium	MG/KG	239	
Selenium	MG/KG	1.7	e1,e5,h5
Silver	MG/KG	2.1	b3,e1,h5,h6
Vanadium	MG/KG	19.9	
Zinc	MG/KG	18.6	
Other Parameters			
Perchlorate	UG/KG	ND	

AUS-0A09-W01-GW-00	Units	Result	Screening Codes
Metals			
Barium	UG/L	11.3	
Calcium	UG/L	243000	
Chromium	UG/L	3.2	
Magnesium	UG/L	192000	
Manganese	UG/L	22	
Nickel	UG/L	2.8	
Sodium	UG/L	572000	
Other Parameters			
Nitrogen, Ammonia (as N)	MG/L	ND	
Nitrogen, Nitrate-Nitrite	MG/L	0.058	
Perchlorate	UG/L	ND	

AUS-0A09-002	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5260	
Arsenic	MG/KG	4	h1,h5,h7
Barium	MG/KG	51.2	h5
Boron	MG/KG	1.6	e1
Cadmium	MG/KG	0.22	b1
Calcium	MG/KG	7220	b1
Chromium	MG/KG	7.6	e1,h5
Copper	MG/KG	6.6	
Iron	MG/KG	10500	e1
Lead	MG/KG	9	
Magnesium	MG/KG	1360	
Manganese	MG/KG	501	e1
Nickel	MG/KG	4.6	
Potassium	MG/KG	220	
Vanadium	MG/KG	12.5	
Zinc	MG/KG	27.5	
Other Parameters			
Perchlorate	UG/KG	ND	
TOC	MG/KG	12700	

AUS-0A09-005	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	10000	
Antimony	MG/KG	0.55	h5
Arsenic	MG/KG	10	e1,h1,h5,h7
Barium	MG/KG	66.2	h5
Beryllium	MG/KG	0.39	
Cadmium	MG/KG	2.3	b1,h5
Calcium	MG/KG	82000	b1
Chromium	MG/KG	15.6	e1,h5
Copper	MG/KG	18.4	b1
Iron	MG/KG	19100	e1
Lead	MG/KG	103	b1
Magnesium	MG/KG	6470	b1
Manganese	MG/KG	466	e1
Mercury	MG/KG	0.27	b1,e5,h6
Nickel	MG/KG	6.5	
Potassium	MG/KG	488	
Silver	MG/KG	1.9	b1
Vanadium	MG/KG	17	
Zinc	MG/KG	175	b1,e1

AUS-0A09-006	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	660	
Antimony	MG/KG	3.7	b1,e5
Arsenic	MG/KG	4.9	h1,h5,h7
Barium	MG/KG	62.6	h5
Boron	MG/KG	2.4	e1
Cadmium	MG/KG	0.48	b1,h5
Calcium	MG/KG	47700	b1
Chromium	MG/KG	9	e1,h5
Copper	MG/KG	24.1	b1
Iron	MG/KG	9730	e1
Lead	MG/KG	18.4	
Magnesium	MG/KG	6070	b1
Manganese	MG/KG	336	e1
Mercury	MG/KG	0.094	b1,e5
Nickel	MG/KG	7.9	h5
Potassium	MG/KG	424	
Vanadium	MG/KG	12.1	
Zinc	MG/KG	293	b1,e1

AUS-0A09-003	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	14000	
Arsenic	MG/KG	6.3	h1,h5,h7
Barium	MG/KG	75	
Beryllium	MG/KG	0.54	
Boron	MG/KG	3.1	e1
Calcium	MG/KG	63200	b1
Chromium	MG/KG	11.4	e1,h5
Copper	MG/KG	10.1	
Iron	MG/KG	14900	e1
Lead	MG/KG	15.6	
Magnesium	MG/KG	2780	b1
Manganese	MG/KG	291	e1
Nickel	MG/KG	9.6	h5
Potassium	MG/KG	595	
Selenium	MG/KG	0.66	e5,h5
Vanadium	MG/KG	22.2	
Zinc	MG/KG	64.2	

AUS-0A09-019	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	14000	
Arsenic	MG/KG	6.3	h1,h5,h7
Barium	MG/KG	74.2	h5
Beryllium	MG/KG	0.54	
Boron	MG/KG	3.1	e1
Calcium	MG/KG	63200	b1
Chromium	MG/KG	11.4	e1,h5
Copper	MG/KG	10.1	
Iron	MG/KG	14900	e1
Lead	MG/KG	15.6	
Magnesium	MG/KG	2780	b1
Manganese	MG/KG	291	e1
Nickel	MG/KG	9.6	h5
Potassium	MG/KG	595	
Selenium	MG/KG	0.66	e5,h5
Vanadium	MG/KG	22.2	
Zinc	MG/KG	64.2	

AUS-0A09-014	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	8310	
Arsenic	MG/KG	8.2	h1,h5,h7
Barium	MG/KG	141	h5
Calcium	MG/KG	14100	b1
Chromium	MG/KG	11.4	e1,h5
Copper	MG/KG	11.1	b1
Iron	MG/KG	16800	e1
Lead	MG/KG	15.6	b1
Magnesium	MG/KG	2780	b1
Manganese	MG/KG	291	e1
Nickel	MG/KG	9.6	h5
Potassium	MG/KG	595	
Selenium	MG/KG	0.66	e5,h5
Vanadium	MG/KG	22.2	
Zinc	MG/KG	64.2	

AUS-0A09-011	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	7890	
Arsenic	MG/KG	8.5	h1,h5,h7
Barium	MG/KG	67.1	h5
Boron	MG/KG	1.7	e1
Cadmium	MG/KG	2.1	b1,h5
Calcium	MG/KG	1760	b1
Chromium	MG/KG	12.7	e1,h5
Copper	MG/KG	71.1	b1,e1
Iron	MG/KG	14600	e1
Lead	MG/KG	29.6	b1
Magnesium	MG/KG	1410	
Manganese	MG/KG	332	e1
Nickel	MG/KG	5.2	
Potassium	MG/KG	319	
Silver	MG/KG	0.91	b1
Vanadium	MG/KG	24.6	
Zinc	MG/KG	66.5	b1

AUS-0A09-012	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4900	
Arsenic	MG/KG	22.2	b1,e1,h1,h5,h7
Barium	MG/KG	115	h5
Boron	MG/KG	3.5	e1
Cadmium	MG/KG	1.4	b1,h5
Calcium	MG/KG	62300	b1
Chromium	MG/KG	9.1	e1,h5
Cobalt	MG/KG	8.8	
Copper	MG/KG	37.9	b1,e1
Iron	MG/KG	11400	e1
Lead	MG/KG	28.4	b1
Magnesium	MG/KG	3410	b1
Manganese	MG/KG	2470	e1
Mercury	MG/KG	0.12	b1,e5,h6
Nickel	MG/KG	9.5	h5
Potassium	MG/KG	400	
Vanadium	MG/KG	17.5	
Zinc	MG/KG	137	b1,h5

AUS-0A09-020	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6850	
Antimony	MG/KG	0.56	b1
Arsenic	MG/KG	5.7	h1,h5,h7
Barium	MG/KG	75.8	
Beryllium	MG/KG	0.27	
Boron	MG/KG	1.8	e1
Calcium	MG/KG	78000	b1
Chromium	MG/KG	14	e1,h5
Cobalt	MG/KG	4.1	
Copper	MG/KG	10.5	
Iron	MG/KG	12000	e1
Lead	MG/KG	60.2	b1
Magnesium	MG/KG	2970	b1
Manganese	MG/KG	501	e1
Mercury	MG/KG	0.026	e5
Nickel	MG/KG	11.2	h5
Potassium	MG/KG	668	b1
Sodium	MG/KG	95.8	
Vanadium	MG/KG	15.8	
Zinc	MG/KG	83.4	b1

AUS-0A09-021	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	6160	
Arsenic	MG/KG	6.2	h1,h5,h7
Barium	MG/KG	58.2	
Beryllium	MG/KG	0.32	
Boron	MG/KG	9.4	e3,e4
Calcium	MG/KG	107000	b1
Chromium	MG/KG	8.8	e1,h5
Cobalt	MG/KG	2.8	
Copper	MG/KG	7.4	
Iron	MG/KG	9700	e1
Lead	MG/KG	69.9	b1
Magnesium	MG/KG	19700	b1
Manganese	MG/KG	298	e1
Mercury	MG/KG	0.074	b1,e5
Nickel	MG/KG	7.2	h5
Potassium	MG/KG	1040	b1
Sodium	MG/KG	169	b1
Vanadium	MG/KG	14.3	
Zinc	MG/KG	70.3	b1

AUS-0A09-016	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	9260	
Arsenic	MG/KG	3.7	h1,h5,h7
Barium	MG/KG	71.5	
Cadmium	MG/KG	0.39	b1
Calcium	MG/KG	14000	b1
Chromium	MG/KG	8.1	e1,h5
Copper	MG/KG	9.2	
Iron	MG/KG	8660	e1
Lead	MG/KG	14.2	
Magnesium	MG/KG	2370	b1
Manganese	MG/KG	179	e1
Nickel	MG/KG	8.9	h5
Potassium	MG/KG	715	b1
Selenium	MG/KG	0.61	e5,h5
Vanadium	MG/KG	13.6	
Zinc	MG/KG	147	b1,e1

AUS-0A09-015	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	9500	
Arsenic	MG/KG	10	e1,h1,h5,h7
Barium	MG/KG	146	h5
Cadmium	MG/KG	3.8	b1,h5,h6
Calcium	MG/KG	8570	b1
Chromium (Total)	MG/KG	25.8	b3,e1,h5
Copper	MG/KG	166	b3,e1
Iron	MG/KG	11800	e1
Lead	MG/KG	41.1	b1
Magnesium	MG/KG	2100	b1
Manganese	MG/KG	130	e1
Mercury	MG/KG	0.30	b3,e5,h6
Nickel	MG/KG	11	h5
Potassium	MG/KG	461	
Selenium	MG/KG	0.91	e5,h5
Vanadium	MG/KG	18.3	
Zinc	MG/KG	119	b3,e1,h5

AUS-0A09-022	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	5260	
Arsenic	MG/KG	4	h1,h5,h7
Barium	MG/KG	51.2	h5
Boron	MG/KG	1.6	e1
Cadmium	MG/KG	0.22	b1
Calcium	MG/KG	7220	b1
Chromium	MG/KG	7.6	e1,h5
Copper	MG/KG	6.6	
Iron	MG/KG	10500	e1
Lead	MG/KG	9	
Magnesium	MG/KG	1360	
Manganese	MG/KG	501	e1
Nickel	MG/KG	4.6	
Potassium	MG/KG	220	
Vanadium	MG/KG	12.5	
Zinc	MG/KG	27.5	
Other Parameters			
Perchlorate	UG/KG	ND	
TOC	MG/KG	12700	

AUS-0A09-017	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	14300	
Antimony	MG/KG	0.24	
Arsenic	MG/KG	8.3	h1,h5,h7
Barium	MG/KG	173	h5
Beryllium	MG/KG	0.45	
Calcium	MG/KG	7710	b1
Chromium	MG/KG	19.1	e1,h5
Cobalt	MG/KG	5.3	
Copper	MG/KG	18.5	b1
Iron	MG/KG	19900	b1,e1
Lead	MG/KG	17.9	
Magnesium	MG/KG	3160	b1
Manganese	MG/KG	593	e1
Mercury	MG/KG	0.011	e5
Nickel	MG/KG	14.5	h5
Potassium	MG/KG	968	b1
Sodium	MG/KG	81.6	
Vanadium	MG/KG	32.8	
Zinc	MG/KG	196	b1,e1

AUS-0A09-018	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	13800	
Arsenic	MG/KG	5	h1,h5,h7
Barium	MG/KG	87.7	h5
Beryllium	MG/KG	0.39	
Boron	MG/KG	3	e5
Calcium	MG/KG	69800	b1
Chromium	MG/KG	18.2	e1,h5
Cobalt	MG/KG	5.3	
Copper	MG/KG	12.9	b1
Iron	MG/KG	16200	e1
Lead	MG/KG	18.6	
Magnesium	MG/KG	4110	b1
Manganese	MG/KG	159	e1
Mercury	MG/KG	0.019	e5
Nickel	MG/KG	12.4	h5
Potassium	MG/KG	1150	b1
Selenium	MG/KG	0.42	e5,h5
Sodium	MG/KG	79.7	
Vanadium	MG/KG	25.5	
Zinc	MG/KG	89.4	b1

AUS-0A09-022	Units	Result: 0 - 6 in	Reference Code
Metals			
Aluminum	MG/KG	4900	
Arsenic	MG/KG	22.2	b1,e1,h1,h5,h7
Barium	MG/KG	115	h5
Boron	MG/KG	3.5	e1
Cadmium	MG/KG	1.4	b1,h5
Calcium	MG/KG	62300	b1
Chromium	MG/KG	9.1	e1,h5
Cobalt	MG/KG	8.8	
Copper	MG/KG	37.9	b1,e1
Iron	MG/KG	11400	e1
Lead	MG/KG	28.4	b1
Magnesium	MG/KG	3410	b1
Manganese	MG/KG	2470	e1
Mercury	MG/KG	0.12	b1,e5,h6
Nickel	MG/KG	9.5	h5
Potassium	MG/KG	400	
Vanadium	MG/KG	17.5	
Zinc	MG/KG	137	b1,h5

Revision No.	Description	Date	By	App.

REVISIONS

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

AUS–ØA09 Sample Locations and Detections of Inorganic Compounds in Soils and Groundwater

Date: 1/05/01	Project Number: 232000026.00	Figure Number: 13–6
Drawn by: DJD	Design by: MAM	Checked by: CMW

URS

AUS–ØA09–IOP LOAD LINE I

File: E:\232000026.00\PA-SI REPORT-AUS OU\AUS-0A09_13-6.DWG Last edited: 05/01/01 @ 1:10 p.m. @ WCC-ST LOUIS

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN IL

RETURN COMPLETED FORM TO: UST Coordinator, Division of Fire Prevention
Office of State Fire Marshal
[redacted]
P.O. Box 3803
Springfield, IL 62708-3803

I.D. Number: 7021799

STATE USE ONLY

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—
(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and
(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: **1.** gasoline, used oil, or diesel fuel, and **2.** industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:
1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? **1.** Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. **2.** Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
OLIN CORPORATION

Street Address
P.O. DRAWER G RT. 148 S.

County
WILLIAMSON

City: MARION | State: IL. | ZIP Code: 62959

Area Code: (618) | Phone Number: 985-8211

Type of Owner (*Mark all that apply* ☒)
- ☒ Current
- ☐ Former
- ☐ State or Local Gov't
- ☐ Federal Gov't (GSA facility I.D. no. _____)
- ☒ Private or Corporate
- ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
OLIN CORP.-ORDNANCE PRODUCTS-ORDILL

Street Address or State Road, as applicable
RT. 148 S.

County
WILLIAMSON

City (nearest): MARION | State: IL. | ZIP Code: 62959

Indicate number of tanks at this location: 5

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐) | Job Title | Area Code | Phone Number
ARTHUR HEINZ, JR. | DIRECTOR | (618) | 985-8211

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative: ARTHUR HEINZ, JR., DIRECTOR
Signature: Art Heinz for
Date Signed: 5/5/86

CONTINUE ON REVERSE SIDE

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)	Tank No. I-1	Tank No. I-2	Tank No. I-3	Tank No. I-4	Tank No. I-5
1. Status of Tank (Mark all that apply ☒)					
Currently in Use				X	
Temporarily Out of Use					
Permanently Out of Use	X	X	X		X
Brought into Use after 5/8/86					
2. Estimated Age (Years)	15	15	15	19	14
3. Estimated Total Capacity (Gallons)	9000	1065	550	10000	10000
4. Material of Construction (Mark one ☒)					
Steel	X	X	X	X	X
Concrete					
Fiberglass Reinforced Plastic					
Unknown					
Other, Please Specify					
5. Internal Protection (Mark all that apply ☒)					
Cathodic Protection					
Interior Lining (e.g., epoxy resins)					
None	X	X	X	X	X
Unknown					
Other, Please Specify					
6. External Protection (Mark all that apply ☒)					
Cathodic Protection					
Painted (e.g., asphaltic)					
Fiberglass Reinforced Plastic Coated					
None	X	X	X	X	X
Unknown					
Other, Please Specify					
7. Piping (Mark all that apply ☒)					
Bare Steel	X	X	X	X	X
Galvanized Steel					
Fiberglass Reinforced Plastic					
Cathodically Protected					
Unknown					
Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume (Mark all that apply ☒)					
a. Empty					X
b. Petroleum					
Diesel					
Kerosene					
Gasoline (including alcohol blends)	X	X	X		
Used Oil					
Other, Please Specify				#2 FUEL OIL	#2 FUEL OIL
c. Hazardous Substance					
Please Indicate Name of Principal CERCLA Substance					
OR					
Chemical Abstract Service (CAS) No.					
Mark box ☒ if tank stores a mixture of substances					
d. Unknown					
9. Additional Information (for tanks permanently taken out of service)					
a. Estimated date last used (mo/yr)	6 / 84	6 / 84	6 / 84	/	1 / 8
b. Estimated quantity of substance remaining (gal.)	800	25	25		0
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)					

1021 197

Notification for Underground Hazardous Waste Storage Tanks

Illinois Environmental Protection Agency
Division of Land Pollution Control
Underground Hazardous Waste Storage Tank Registration
2200 Churchill Road
Springfield, Illinois 62706

MAY 08 1986

STATE USE ONLY
I.D. Number

Date Received

GENERAL INFORMATION

Notification is required by State law for all underground tanks that have been used to store hazardous waste since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Ill. Rev. Stat., Ch. 111 1/2, par. 1022.12.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored hazardous waste. It is expected that the information you provide will be based on reasonably available records, or, in the absence of records, your knowledge, belief, or recollection.

Who Must Notify? Owners of underground tanks that store or have stored hazardous waste must notify the IEPA of the existence of their tank(s). Owner means (a) in the case of an underground tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground tank used for the storage of hazardous waste, and (b) in the case of any underground tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of hazardous waste, and (2) whose volume (including connected underground piping) is 10% or more beneath ground.

What Tanks Are Excluded? Tanks removed from the ground by May 8, 1986 are not subject to notification. Other tanks excluded from notification are: (1) surface impoundments, pits, ponds or lagoons; (2) storm water or waste water collection systems; (3) flow-through process tanks; and (4) storage tanks situated in an underground area (such as a basement, cellar, mine-working, drift, shaft or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Regulated? The notification requirements apply to underground storage tanks that contain hazardous waste. The term hazardous waste is defined in Section 3j of the Illinois Environmental Protection Act.

Where To Notify? Completed forms should be returned to the address indicated above.

When To Notify? (1) Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. (2) Owners who install or replace underground storage tanks after July 1, 1986 shall register the tank with the IEPA prior to installation of the tank. Notification as a hazardous waste generator, storage and/or treatment facility per P.L. 94-580 may also be required.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must be completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
OLIN CORPORATION

Street Address
P.O. DRAWER G RT. 148 S.

County
WILLIAMSON

City | State | Zip Code
MARION | IL. | 62959

Area Code | Phone Number
(618) 985-8211

II. LOCATION OF TANK(S)

Facility Name or Company Site Identifier, as applicable
OLIN CORP.-ORDNANCE PRODUCTS-ORDILL

Street Address or State Road, as applicable
RT. 148 S.

County
WILLIAMSON

City (nearest) | State | Zip Code
MARION | IL. | 62959

Federal I.D. # | State Site Code
IL8143609487 | 1998620013

Type of Owner (Mark all that apply ☒)
☒ Current ☐ State or Local Gov't. ☒ Private or Corporate
☐ Former ☐ Federal Gov't (GSA facility I.D. No. _____) ☐ Ownership uncertain

Indicate number of tanks at this location 0

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐) | Job Title | Area Code | Phone Number
ARTHUR HEINZ, JR. | DIRECTOR | (618) | 985-8211

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative
ARTHUR HEINZ, JR. DIRECTOR

Signature for Art Heinz

Date Signed 5/5/86

IL 532-1461
LPC 225 3/86

VI. DESCRIPTION OF UNDERGROUND HAZARDOUS WASTE STORAGE TANKS *(Complete for each tank at this location)*

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3. . .)		Tank No.	Tank No.	Tank No.	Tank No.	Tank No.
1. Status of Tank *(Mark all that apply ☒)*	Currently in Use					
	Temporarily Out of Use					
	Permanently Out of Use					
	Brought into Use after 5/8/86					
2. Estimated Age (Years)						
3. Estimated Total Capacity (Gallons)						
4. Material of Construction *(Mark one ☒)*	Steel					
	Concrete					
	Fiberglass Reinforced Plastic					
	Unknown					
	Other, Please Specify					
5. Internal Protection *(Mark all that apply ☒)*	Cathodic Protection					
	Interior Lining (e.g., epoxy resin)					
	None					
	Unknown					
	Other, Please Specify					
6. External Protection *(Mark all that apply ☒)*	Cathodic Protection					
	Painted (e.g., asphaltic)					
	Fiberglass Reinforced Plastic Coated					
	None					
	Unknown					
	Other, Please Specify					
7. Piping *(Mark all that apply ☒)*	Bare Steel					
	Galvanized Steel					
	Fiberglass Reinforced Plastic					
	Cathodically Protected					
	Unknown					
	Other, Please Specify					
8. Hazardous Waste Currently or Last Stored *(Provide all applicable information)*						
a. Hazardous By Characteristics (Identify EPA Hazardous Waste Number)						
b. Hazardous By Listing (Identify EPA Hazardous Waste Number)						
c. Unknown						
9. Additional Information (for tanks permanently taken out of service)						
a. Estimated date last used (mo./yr.)						
b. Estimated quantity of substance remaining (gal.)						
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)						
d. Was tank closed in accordance with an IEPA approved closure plan (Yes, No, N/A)						

This Agency is authorized to require this information under Section 22.12 of the Environmental Protection Act (Ill. Rev. Stat. 1983, ch. 111½, par. 1001 et seq.) as amended by P.A. 84-1072. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

OFFICE OF THE ILLINOIS STATE FIRE MARSHAL
Division of Petroleum and Chemical Safety
1035 Stevenson Drive
Springfield, Illinois 62703-4259

FOR OFFICE USE ONLY
Facility # 7-021799
Permit # 4614-92 REM

FILE COPY

Application for Permit to REMOVE
Underground Storage Tanks for Petroleum and Hazardous Substances

To be completed and filed with the Division of Petroleum and Chemical Safety, 1035 Stevenson Drive, Springfield, Illinois 62703-4259 (217/785-5878) or (217/785-1020)

RECEIVED
MAY 7 1992
DIV OF PETROLEUM & CHEMICAL SAFETY

1) (Owner of tanks) - Corporation, partnership or other business entity: (Must Be Mailing Address)

Olin Corporation
Name
P.O. Box 278
Street Address
Marion, IL 62959
City State Zip
R.R. Hudson (618) 985-8211
Contact Person Phone

2) (Facility) - name and address where tanks are located:

Olin Corporation
Name
P.O. Box 278 - I Area
Street Address
Marion, IL 62959 Williamson
City State Zip County
R.R. Hudson (618) 985-8211
Contact Person Phone

3) (Contractor) - person, firm or company performing work:

G.A. White
Name
R.R. #2 Box 433
Street Address
Marion, IL 62959 Williamson
State Zip County
(618) 993-3236 371-22-0996
Phone Registration No.

Facility Registration I.D. Number
7021799

Write 30 days
ESDA

You must notify ESDA 1-800-782-7860 within 24 hours of leaks or contaminated soil. Removal must be in accordance with acceptable closure requirements and procedure such as API Bulletin 1604. A site assessment must be conducted to determine if a release has occurred.

FOR OFFICE USE ONLY

Permission to remove underground storage tank(s) is hereby granted. Such removal shall not commence until AS DIRECTED
A seventy-two hour (3 working day) notice to this office is required to confirm final date of removal for our Inspector to be on site.

05-07-92 W. Dale Tanke
Approval Date Approved

11-07-92
Permit Expires

4) Removal of Tanks:

a) Number and size of tanks being removed: 1 @ 10,000 gal.

b) Total number of all tanks removed: 1

c) Reason for removal of tanks: Tank location is needed for a recycling operation

d) If tank is leaking, give ESDA incident number: 921122

e) What products were stored in each tank? #2 Fuel Oil

f) If tanks contain products other than petroleum products, please indicate here: -

g) Date each tank was last used? January 1985

h) A written notice of removal of tanks shall be given to the Office of the State Fire Marshal at least 30 days prior to the removal, giving location, number and size of tanks. This application will constitute that 30 day written notice. The 30 day period commences with this application appropriately completed and the fee received in our office.

(Over)

IESDA

7021799

RECEIVED
APR 29 1992
DIV. OF PETROLEUM & CHEMICAL SAFETY

Date: 04 / 28 / 92
Time: 1608
Recv'd by: CM/ JZ

Incident Number 9 2 1 1 2 2

Notify: ILLINOIS EMERGENCY SERVICES AND DISASTER AGENCY
1-800/782-7860 or 217/782-7860

1. Caller: CURTIS DEMILLE
2. Call back phone#: 618/985-8211 X449
3. Caller represents: OLIN CORPORATION
4. Type of incident: [ ] Fire [X] Leak or Spill
   [ ] Explosion [ ] Water Involvement
   [ ] Gas or Vapor cloud [ ] Other
5. Incident Location:
   Street I AREA, RTE 148 SOUTH
   City MARION [ ] In [ ] Near
   County WILLIAMSON 62959
   Milepost [ ] RR [ ] River [ ] Highway
   Sec. Twp. Range
6. Area Involved: [ ] Highway [ ] Rail [X] Fixed Facility
   [ ] Waterway [ ] Air [ ] Other
7. Material (s) Involved: #2 FUEL OIL
   [ ] Gas [X] Liquid [ ] Semi-Solid [ ] Solid
   [ ] Pesticide [ ] Radioactive
   CAS #:
   UN/NA #:
   Is this a 302 (a) Extremely Hazardous Substance?
   [ ] Yes [ ] No [ ] Unknown
   Is this a RCRA Hazardous Waste?
   [ ] Yes [ ] No [ ] Unknown
   If Yes, is this a RCRA regulated facility?
   [ ] Yes [ ] No
8. Container: [ ] Truck [ ] RR car [ ] Drum
   [ ] Aboveground tank [ ] Pipeline
   [X] Underground tank [ ] Other
   container size: 1-10,000GAL.
9. Amount released: UNK
   Rate of release: UNK / min.
10. Cause of release: UNK
11. Estimated spill extent: UNK
    [ ] square feet [ ] square yards
12. [ ] Occurred Date: / / Time:
    [X] Discovered Date: 04/ 27/ 92 Time:

14. On Scene Contact:
    On Scene Phone#:
15. No. injured: NO [ ] Haz-mat related
    Where taken:
16. Public health risks and/or precautions taken, including # evacuated: NO
17. Assistance needed from State Agencies:
    ADV. SFM
18. Containment/cleanup actions and plans:
    UNK
19. Weather: [ ] sunny [ ] overcast [ ] night
    [ ] ptly. cldy. [ ] rain [ ] snow
    Temp. F wind dir. speed mph.
20. Responsible Party: OLIN CORPORATION
    Contact person: CURTIS DEMILLE
    Phone # 618/985-8211 X449
    Mailing address: I AREA, RTE 148 SOUTH
    MARION, IL. 62959

Notifications: 1627 ADV. IEPA/ RALPH FOSTER
1728PAGED SFM 1738 1748.
1800 MCCASLIN TO CALL BACK ASAP
1845 MCCASLIN CALLED BACK AND BRIEFED
04/29/92 FAX TO IEPA AND SFM

13. Emergency units contacted

	On scene
[ ] Fire	[ ] Fire
[ ] Sheriff	[ ] Sheriff
[ ] Police	[ ] Police
[X] ~~ESDA~~ - IEMA	[ ] ESDA
[ ] Other	[ ] Other

IL Notification for Underground Storage Tanks

- A separate form must be used for each site.
- If you have more than five tanks, photocopy pages 1-5 and attach to this notification form.
- Please type, or print in ink; the signature under "certification" (section IX) must be signed in Ink.

OFFICE USE ONLY

ID NUMBER

DATE RECEIVED
MAY 11 1994
DIV. OF PETROLEUM &

Facility I.D. # (if known) 7021799 Owner I.D. # (if known) _____

TYPE OF NOTIFICATION

☐ New Facility ☒ Amended (Changes/Corrections/Additional Tanks) Mark all that apply:

___ Owner Address Change (this facility only)
___ Owner Address Change (all facilities owned)
___ New Owner
___ Tank(s) Removed (Permit # _____)
___ Tanks Relined (Permit # _____)
___ Tanks Installed (Permit # _____)
___ Tanks Upgraded/Repaired (Permit # _____)
___ Abandonment Notice (Permit # _____)
X Other NEVER BILLED FOR TANK REGISTRATION (PER J.SQUIRES, 5/2/94)

I. Ownership of Tank(s)

OLIN CORPORATION
Owner Name (Corp., Individual., Public Agency or other Entity)

ROUTE 148 SOUTH P. O. BOX 278
Mailing Address

MARION IL 62959
City State Zip

WILLIAMSON
County

CURTIS DEMILLE 618-985-8211
Contact Name (Area Code) Phone

II. Location of Tank(s)
(if same as Section I, Mark box) ☒

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable (exact address)

City State Zip

County

Contact Name (Area Code) Phone

III. TYPE OF OWNERSHIP (mark all that apply)

☒ Current Owner of Tanks
Date ~~Purchased~~ INSTALLED -/-/72
☐ Former Owner
☐ Ownership Uncertain _____
☐ Other _____

IV. TYPE OF FACILITY

Type of Facility: (Circle correct code)

A. Service Station
B. Bulk Plant
C. Petroleum Distributor
D. Convenience Store
E. Auto Dealer
F. Commercial/Retail
(G.) Industrial/Manufacturing
H. Private Institution
I. Residence (Non-Farm)
J. Farm
K. Airport
L. Marina
M. City/Town
N. County
O. State
P. Federal (Military)
Q. Federal (Non-Military)
R. School District
S. Port District
T. Utility District
U. Fire Dept.
V. Other Special Service Districts
W. Other _____ (Please Specify)

V. Description of Underground Storage Tanks (Complete entire column for each tank)

Tank Identification Number	Tank No. ~~5~~ I-12	Tank No. ___	Tank No. ___	Tank No. ___	Tank No. ___
1. Status of Tanks	I-5				
Currently in use	☐	☐	☐	☐	☐
Temporarily out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Permanently out of use (Section 2 must be completed)	☒ XX	☐	☐	☐	☐
Removed (Section 3 must be completed)	☐	☐	☐	☐	☐
Abandoned in place (Section 4 must be completed)	☐	☐	☐	☐	☐
2. Tanks Permanently & Temporarily Out of Use					
Estimated date last used	1 /- /85	/ /	/ /	/ /	/ /
3. Tanks Removed					
Date tank(s) removed	/ /	/ /	/ /	/ /	/ /
Estimated date last used	/ /	/ /	/ /	/ /	/ /
4. Abandoned in Place					
Date tanks filled	/ /	/ /	/ /	/ /	/ /
Tank filled with:					
Inert materials (sand, etc.)	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other (please specify)					
5. Age of Tank ESTIMATE					
Date tank installed	-/- /72	/ /	/ /	/ /	/ /
Date product placed in tank	-/- /72	/ /	/ /	/ /	/ /
6. Estimated Total Capacity (gallons)	10,000				
7. Substances Currently or Last Stored:					
Petroleum					
Diesel	☐	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline	☐	☐	☐	☐	☐
Used oil	☐	☐	☐	☐	☐
Other (Please specify)					
Petroleum Use (if applicable):					
Heating oil (consumptive use on premises)	☒ XX	☐	☐	☐	☐
Back-up generator	☐	☐	☐	☐	☐
Other (please specify)					
Hazardous Substance:					
Name of principal CERCLA substance					
Chemical Abstract Service (CAS No)					

VI. Description of Underground Storage Tanks (Complete entire column for each tank)

Tank Identification Number	Tank No. 5	Tank No. ___	Tank No. ___	Tank No. ___	Tank No. ___
1. Material of Construction (mark all that apply)					
Asphalt coated or bare steel	XX	☐	☐	☐	☐
Cathodically protected steel	☐	☐	☐	☐	☐
Dielectric coated steel	☐	☐	☐	☐	☐
Composite (steel with fiberglass)	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Lined interior	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Steel STI-P3	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
2. Piping Materials (mark all that apply)					
Bare steel	XX	☐	☐	☐	☐
Galvanized steel	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Cathodically protected	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Dielectric coating	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
3. Piping Type (mark all that apply)					
European suction	☐	☐	☐	☐	☐
American suction	XX	☐	☐	☐	☐
Pressure	☐	☐	☐	☐	☐
Gravity feed	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____

Tank Identification Number	Tank No. 5		Tank No.___		Tank No.___		Tank No.___		Tank No.___	
4. Release Detection (Mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Manual tank gauging	☐		☐		☐		☐		☐	
Inventory controls	XX		☐		☐		☐		☐	
Automatic tank gauging	☐		☐		☐		☐		☐	
Vapor monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Groundwater monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring double-walled tank/piping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring /secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tank tightness testing	☐		☐		☐		☐		☐	
Automatic line leak detector		☐		☐		☐		☐		☐
Line tightness testing		☐		☐		☐		☐		☐
Automatic shut-off device		☐		☐		☐		☐		☐
Continuous alarm system		☐		☐		☐		☐		☐
No requirements (european suction)		☐		☐		☐		☐		☐
Other (please specify)	OUT OF SERVICE									
5. Corrosion Protection (mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Cathodic protection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Impressed current	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exterior coating	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interior lining	☐		☐		☐		☐		☐	
Other (please specify)	NONE	NONE								
6. Spill & Overfill Prevention (Mark all that apply)										
Overfill device	☐		☐		☐		☐		☐	
Automatic shut-off	☐		☐		☐		☐		☐	
Overfill Alarm	☐		☐		☐		☐		☐	
Ball float valve	☐		☐		☐		☐		☐	
Spill containment device	☐		☐		☐		☐		☐	
Other (Please specify)	NONE									

VII. Certification of Compliance (Complete for all new, upgraded and relined tanks at this location)

Installation (mark all that apply)					
Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
Installer certified or licensed by implementing agency	☐	☐	☐	☐	☐
Installer registered by implementing agency	☐	☐	☐	☐	☐
Installer is the owner of the tank(s)	☐	☐	☐	☐	☐
Installation inspected by a registered engineer	☐	☐	☐	☐	☐
Installation inspected & approved by implementing agency	☐	☐	☐	☐	☐
Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
Another method allowed by state agency (please specify)	_____	_____	_____	_____	_____

OATH: I certify the information that is provided in section VII is true to the best of my knowledge, and certify that the installation was performed in accordance with all applicable state and federal laws and regulations. **(THIS SECTION MAY ONLY BE COMPLETED BY THE CONTRACTOR. SEPARATE OATH MUST BE SUBMITTED FOR EACH ACTIVITY PERFORMED BY DIFFERENT CONTRACTOR.)**

Tank No. _____ Permit No. _____

Contractor: _____ (Name) _____ (Signature (must be original)) _____ (Date)

_____ (Position) _____ (Company)

VIII. Financial Responsibility

Mark all that apply:

- ☒ Self-Insurance
- ☐ Guarantee
- ☐ Certificate of Deposit
- ☐ Commercial Insurance
- ☐ Surety Bond
- ☐ Trust Fund
- ☐ Risk Retention Group
- ☐ Letter of Credit
- ☐ Other Method Allowed

(please specify) _____

IX. Certification (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

R.R. HUDSON, MANAGER OF ADMINISTRATION — Name and official title of owner or owner's authorized representative (print)

Signature (must be original)

5/10/94 — Date Signed

Office of the Illinois
State Fire Marshal

General Office
217-785-0969
FAX
217-782-1062

Divisions
ARSON INVESTIGATION
217-782-6855
BOILER and PRESSURE VESSEL SAFETY
217-782-2696
FIRE PREVENTION
217-785-4714
MANAGEMENT SERVICES
217-782-9889
INFIRS
217-785-1016
PERSONNEL
217-785-1009
PERSONNEL STANDARDS and EDUCATION
217-782-4542
PETROLEUM and CHEMICAL SAFETY
217-785-5878
PUBLIC INFORMATION
217-785-1021

CERTIFIED MAIL - RECEIPT REQUESTED #Z 760 968 951

May 1, 1995

Olin Corporation - I Area
PO Box 278
Marion, IL 62959

In Re: Facility No. 7-021799
IEMA Incident No. 92-1122
Olin Ordnance - I Area
PO Box 278
Marion, WILLIAMSON CO., IL

Dear Mr. Hudson:

The Reimbursement Eligibility and Deductible Application, received on 4-20-95 for the above referenced occurrence has been reviewed. The following determinations have been made based upon this review.

It has been determined that you are eligible to seek payment of costs in excess of $10,000. The costs must be in response to the occurrence referenced above and associated with the following tanks:

Eligible Tanks

Tank 5, 10,000 gallon heating oil

You must contact the Illinois Environmental Protection Agency to receive a packet of Agency billing forms for submitting your request for payment.

An owner or operator is eligible to access the Underground Storage Tank Fund if the eligibility requirements are satisfied:

1. Neither the owner nor the operator is the United States Government;

2. The tank does not contain fuel which is exempt from the Motor Fuel Tax Law;

3. The costs were incurred as a result of a confirmed release of any of the following substances:

   "Fuel", as defined in Section 1.10 of the Motor Fuel Tax Law

   Aviation fuel

   Heating oil

   Kerosene

   Used oil, which has been refined from crude oil used in a motor vehicle, as defined in Section 1.3 of the Motor Fuel Tax Law.

4. The owner or operator registered the tank and paid all fees in accordance with the statutory and regulatory requirements of the Gasoline Storage Act.

5. The owner or operator notified the Illinois Emergency Management Agency of a confirmed release, the costs were incurred after the notification and the costs were a result of a release of a substance listed in this Section. Costs of corrective action or indemnification incurred before providing that notification shall not be eligible for payment.

6. The costs have not already been paid to the owner or operator under a private insurance policy, other written agreement, or court order.

7. The costs were associated with "corrective action".

This constitutes the final decision as it relates to your eligibility and deductibility. We reserve the right to change the deductible determination should additional information that would change the determination become available. An underground storage tank owner or operator may appeal the decision to the Illinois Pollution Control Board (Board), pursuant to Section 57.9 (c) (2). An owner or operator who seeks to appeal the decision shall file a petition for a hearing before the Board within 35 days of the date of mailing of the final decision (35 Illinois Administrative Code 105.102(a) (2)).

For information regarding the filing of an appeal, please contact:

Dorothy Gunn, Clerk
Illinois Pollution Control Board
State of Illinois Center
100 West Randolph, Suite 11-500
Chicago, Illinois 60601
(312)814-3620

The following tanks are also listed for this site:

Tank 1, 9,000 gallon gasoline
Tank 2, 1,065 gallon gasoline
Tank 3, 550 gallon gasoline
Tank 4, 10,000 gallon heating oil

Your application indicates that there has not been a release from these tanks. You may be eligible to seek payment of corrective action costs associated with these tanks if it is determined that there has been a release from one or more of these tanks. Once it is determined that there has been a release from one or more of these tanks you may submit a separate application for an eligibility determination to seek corrective action costs associated with this/these tanks.

If you have any questions regarding the eligibility or deductibility determinations, please contact our Office at (217)785-1020 or (217)785-5878 between 3:00 - 4:00 p.m.

Sincerely,

James I. McCaslin
Director
Division of Petroleum and Chemical Safety

JIM:gmb

cc: IEPA
Facility File

OFFICE OF THE ILLINOIS STATE FIRE MARSHAL
Division of Petroleum and Chemical Safety
1035 Stevenson Drive
Springfield, Illinois 62703-4259
(217)785-1020 or (217)785-5878

RECEIVED
OCT 24 1995
DIV. OF PETROLEUM & CHEMICAL SAFETY

FOR OFFICE USE ONLY
Facility # M-021799
Control # 2300-95 Ro

APPLICATION for Permit for REMOVAL of Underground Storage Tanks. Complete and file at the above address.

(1) OWNER OF TANKS - Corporation, partnership, or other business entity: (Must be mailing address)

OLIN Corporation
Name
P.O. 278
Street Address
Marion IL 62959
City State Zip
Joe Candio 618-993-9449
Contact Person Phone

((2) FACILITY - Facility ID # 7021799
(Name and address where tanks are located:)

OLIN Corporation
Name
Hwy 148 South.
Street Address
Marion IL 62959 Williamso.
City State Zip County
Joe Candio 618-993-9449.
Contact Person Phone

(3) TANK(S): Check whichever applies and fill in the appropriate blanks for the tank(s) to be removed. Attach additional sheet(s) if more space is needed.

# of Tanks	Capacity in gallons	Product to be stored	Date tank last used	# of Tanks	Capacity in gallons	Product to be stored	Date tank last used
1	10,000	N/A	1/85				

Use this space for explanation for (3) above: UST used to store Heating Oil

(4) CONTAMINATED SITE (complete this section for sites where a release has been reported):

IEMA Incident # _____

FILE COPY

Reminder: Releases or suspected releases must be reported to IEMA at (800)782-7860 within 24 hours.

(5) REASON FOR REMOVAL:

UST is no longer being used

FOR OFFICE USE ONLY

Permission to remove underground storage tank(s) is hereby granted. Such removal shall not commence until 11-23-95.
A seventy-two hour (3 working day) notice to this office is required to confirm final date of removal for our Inspector to be on site.

11-7-95 — Approval Date
W. Dale Tamke — Approved
5-7-96 — Permit Expires

(6) NOTICE PRIOR TO REMOVAL - A 30 day written notice to the Office of the State Fire Marshal is required prior to removal. The notice begi on the date a properly completed Application and fee are received by this Office.

In the event of a reported release, the Office of the State Fire Marshal shall waive the 30 day notice requirement. (Incident number must be entered in #4 above).

(Complete the back side)

OFFICE OF THE STATE FIRE MARSHAL
DIVISION OF PETROLEUM AND CHEMICAL SAFETY
1035 STEVENSON DRIVE
SPRINGFIELD, ILLINOIS 62703-4259

FACILITY # 7-021749
PERMIT # 2300-95 Rem
DATE REMOVED 12/5/95
IEMA #

LOG OF UNDERGROUND STORAGE TANK REMOVAL

OWNER

NAME: Olin Corp
ADDRESS: P.O. Box 278
CITY: Marion
STATE: IL ZIP: 62959
PHONE: 618-993-9449

FACILITY

NAME: Olin Corp
ADDRESS: Hwy 148 S.
CITY: Marion
COUNTY: Williamson ZIP: 62959
PHONE: 618-983-9449

STATUS: MINOR_____ SIGNIFICANT_____ MAJOR_____ APPEARS TO BE NO RELEASE_____

AREA OF CONTAMINATION: TANK FLOOR_____ WALLS_____ PIPE TRENCH_____ OTHER_____

GROUND WATER CONTAMINATED: YES____ NO____ ANY WATER WELLS IN AREA? YES____ NO____

NUMBER OF TANKS REMOVED:_____

SIZE OF EACH TANK REMOVED: _____M _____M _____M _____M _____M _____M _____M _____M

PRODUCT STORED: _____ _____ _____ _____ _____ _____ _____ _____

DOES THIS TANK APPEAR TO HAVE LEAKED? (Y OR N) _____ _____ _____ _____ _____ _____ _____ _____

NUMBER OF TANKS TO REMAIN IN GROUND:_____

SIZE OF EACH TANK:_____M _____M _____M _____M _____M _____M _____M _____M _____M

PRODUCT STORED: _____ _____ _____ _____ _____ _____ _____ _____ _____

COMMENTS: Did not witness

REMOVAL CONTRACTOR:

NAME: WSI Inc.
ADDRESS: 6414 D Rd
CITY: Waterloo STATE: IL
PHONE: 618-939-4570 ZIP: 62298
REGISTRATION #: IL 1408

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JAN 10 1996
DIV. OF PETROLEUM & CHEMICAL SAFETY

Wayne Sensep
STORAGE TANK SAFETY SPECIALIST

IL Notification for Underground Storage Tanks

- A separate form must be used for each site.
- If you have more than five tanks, photocopy pages 1-5 and attach to this notification form.
- Please type, or print in ink; the signature under "certification" (section IX) must be signed in Ink.

OFFICE USE ONLY

ID NUMBER 7-021799

DATE RECEIVED RECEIVED DEC 26 1995 DIV. OF PETROLEUM & CHEMICAL SAFETY

Facility I.D. # (if known) 7021799 Owner I.D. # (if known) _____

TYPE OF NOTIFICATION

☐ New Facility ☑ Amended (Changes/Corrections/Additional Tanks) Mark all that apply:

___ Owner Address Change (this facility only)
___ Owner Address Change (all facilities owned)
___ New Owner
✓ Tank(s) Removed (Permit # ~~2300-95~~)
___ Other _____

___ Tanks Relined (Permit # _____)
___ Tanks Installed (Permit # _____)
___ Tanks Upgraded/Repaired (Permit # _____)
___ Abandonment Notice (Permit # _____)

I. Ownership of Tank(s)

OLIN CORPORATION
Owner Name (Corp., Individual., Public Agency or other Entity)

ROUTE 148 SOUTH P. O. BOX 278
Mailing Address

MARION, IL 62959
City State Zip

WILLIAMSON
County

JOE CANDIO 618-985-8211
Contact Name (Area Code) Phone

II. Location of Tank(s)

(if same as Section I, Mark box) [X]

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable (exact address)

City State Zip

County

Contact Name (Area Code) Phone

III. TYPE OF OWNERSHIP (mark all that apply)

☒ Current Owner of Tanks
Date ~~Purchased~~ -/-/72

☐ Former Owner

☐ Ownership Uncertain _____

☐ Other _____

IV. TYPE OF FACILITY

Type of Facility: (Circle correct code)

A. Service Station
B. Bulk Plant
C. Petroleum Distributor
D. Convenience Store
E. Auto Dealer
F. Commercial/Retail
G. Industrial/Manufacturing
H. Private Institution
I. Residence (Non-Farm)
J. Farm
K. Airport
L. Marina
M. City/Town
N. County
O. State
P. Federal (Military)
Q. Federal (Non-Military)
R. School District
S. Port District
T. Utility District
U. Fire Dept.
V. Other Special Service Districts
W. Other _____ (Please Specify)

V. Description of Underground Storage Tanks (Complete entire column for each tank)					
Tank Identification Number	Tank No. 5 I-I-12	Tank No.___	Tank No.___	Tank No.___	Tank No.___
1. Status of Tanks					
Currently in use	☐	☐	☐	☐	☐
Temporarily out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Permanently out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Removed (Section 3 must be completed)	☒	☐	☐	☐	☐
Abandoned in place (Section 4 must be completed)	☐	☐	☐	☐	☐
2. Tanks Permanently & Temporarily Out of Use					
Estimated date last used	/ /	/ /	/ /	/ /	/ /
3. Tanks Removed					
Date tank(s) removed	12/6/95	/ /	/ /	/ /	/ /
Estimated date last used	1/-/85	/ /	/ /	/ /	/ /
4. Abandoned in Place					
Date tanks filled	/ /	/ /	/ /	/ /	/ /
Tank filled with:					
Inert materials (sand, etc.)	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other (please specify)					
5. Age of Tank ESTIMATE					
Date tank installed	-/-/72	/ /	/ /	/ /	/ /
Date product placed in tank	-/-/72	/ /	/ /	/ /	/ /
6. Estimated Total Capacity (gallons)	10,000				
7. Substances Currently or Last Stored:					
Petroleum					
Diesel	☐	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline	☐	☐	☐	☐	☐
Used oil	☐	☐	☐	☐	☐
Other (Please specify)					
Petroleum Use (if applicable):					
Heating oil (consumptive use on premises)	☒	☐	☐	☐	☐
Back-up generator	☐	☐	☐	☐	☐
Other (please specify)					
Hazardous Substance:					
Name of principal CERCLA substance					
Chemical Abstract Service (CAS No)					

VI. Description of Underground Storage Tanks (Complete entire column for each tank)

Tank Identification Number	Tank No. 5	Tank No.	Tank No.	Tank No.	Tank No.
1. Material of Construction (mark all that apply)					
Asphalt coated or bare steel	XX	☐	☐	☐	☐
Cathodically protected steel	☐	☐	☐	☐	☐
Dielectric coated steel	☐	☐	☐	☐	☐
Composite (steel with fiberglass)	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Lined interior	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Steel STI-P3	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
2. Piping Materials (mark all that apply)					
Bare steel	XX	☐	☐	☐	☐
Galvanized steel	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Cathodically protected	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Dielectric coating	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
3. Piping Type (mark all that apply)					
European suction	☐	☐	☐	☐	☐
American suction	XX	☐	☐	☐	☐
Pressure	☐	☐	☐	☐	☐
Gravity feed	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____

Tank Identification Number	Tank No. 5		Tank No.		Tank No.		Tank No.		Tank No.	
4. Release Detection (Mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Manual tank gauging	☐		☐		☐		☐		☐	
Inventory controls	☒ XX		☐		☐		☐		☐	
Automatic tank gauging	☐		☐		☐		☐		☐	
Vapor monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Groundwater monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring double-walled tank/piping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring /secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tank tightness testing	☐		☐		☐		☐		☐	
Automatic line leak detector		☐		☐		☐		☐		☐
Line tightness testing		☐		☐		☐		☐		☐
Automatic shut-off device		☐		☐		☐		☐		☐
Continuous alarm system		☐		☐		☐		☐		☐
No requirements (european suction)		☐		☐		☐		☐		☐
Other (please specify)	OUT OF SERVICE									
5. Corrosion Protection (mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Cathodic protection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Impressed current	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exterior coating	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interior lining	☐		☐		☐		☐		☐	
Other (please specify)	NONE	NONE								
6. Spill & Overfill Prevention (Mark all that apply)										
Overfill device	☐		☐		☐		☐		☐	
Automatic shut-off	☐		☐		☐		☐		☐	
Overfill Alarm	☐		☐		☐		☐		☐	
Ball float valve	☐		☐		☐		☐		☐	
Spill containment device	☐		☐		☐		☐		☐	
Other (Please specify)	NONE									

VII. Certification of Compliance (Complete for all new, upgraded and relined tanks at this location)

Installation (mark all that apply)					
Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
Installer certified or licensed by implementing agency	☐	☐	☐	☐	☐
Installer registered by implementing agency	☐	☐	☐	☐	☐
Installer is the owner of the tank(s)	☐	☐	☐	☐	☐
Installation inspected by a registered engineer	☐	☐	☐	☐	☐
Installation inspected & approved by implementing agency	☐	☐	☐	☐	☐
Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
Another method allowed by state agency (please specify)	_____	_____	_____	_____	_____

OATH: I certify the information that is provided in section VII is true to the best of my knowledge, and certify that the installation was performed in accordance with all applicable state and federal laws and regulations. **(THIS SECTION MAY ONLY BE COMPLETED BY THE CONTRACTOR. SEPARATE OATH MUST BE SUBMITTED FOR EACH ACTIVITY PERFORMED BY DIFFERENT CONTRACTOR.)**

Tank No. _____ Permit No. _____

Contractor: _____ (Name) _____ (Signature (must be original)) _____ (Date)

_____ (Position) _____ (Company)

VIII. Financial Responsibility

Mark all that apply:

- [XX] Self-Insurance
- ☐ Guarantee
- ☐ Certificate of Deposit
- ☐ Commercial Insurance
- ☐ Surety Bond
- ☐ Trust Fund
- ☐ Risk Retention Group
- ☐ Letter of Credit
- ☐ Other Method Allowed

(please specify) _____

IX. Certification (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

STEVEN D. PRESTON, MANAGER, ADMINISTRATION — Name and official title of owner or owner's authorized representative (print)

Steven Preston — Signature (must be original)

12/20/95 — Date Signed

OFFICE OF THE ILLINOIS STATE FIRE MARSHAL
Division of Petroleum and Chemical Safety
1035 Stevenson Drive
Springfield, Illinois 62703-4259
(217)785-1020 or (217)785-5878

FOR OFFICE USE ONLY
Facility # 7-021799
Control # 1237-96 REM

APPLICATION for Permit for **REMOVAL** of Underground Storage Tanks. Complete and file at the above address.

(1) OWNER OF TANKS - Corporation, partnership, or other business entity: (Must be mailing address)

Olin Corporation
Name
P.O. Box 278
Street Address
Marion, IL
City State Zip
Ron Hliwa 618-985-8211
Contact Person (Lea-Wa) Phone Ext 477

((2) FACILITY - Facility ID # 7-021799
(Name and address where tanks are located:)

Olin Corporation (Ordill Area, IL 148
Name P.O. Box 278 Elvor-Daniel Site)
Street Address
Marion, IL Williamson
City State Zip County
Robert Hammack 618-997-6789
Contact Person Phone

(3) TANK(S): Check whichever applies and fill in the appropriate blanks for the tank(s) to be removed. Attach additional sheet(s) if more space is needed.

# of Tanks	Capacity in gallons	Product to be stored	Date tank last used	# of Tanks	Capacity in gallons	Product to be stored	Date tank last used
1	10,000	Fuel Oil or Diesel	Unknown				
2	9,000	Gas	"				
3	1,000	"	"				
4	500	"	"				

Use this space for explanation for (3) above: Tanks abandoned at some unknown time - Only one has dispensor.

(4) CONTAMINATED SITE (complete this section for sites where a release has been reported):

IEMA Incident # _____

Reminder: Releases or suspected releases must be reported to IEMA at (800)782-7860 within 24 hours.

(5) REASON FOR REMOVAL:

No Longer Used.

RECEIVED
JUN 24 1996
DIV. OF PETROLEUM & CHEMICAL SAFETY

FOR OFFICE USE ONLY

Permission to remove underground storage tank(s) is hereby granted. Such removal shall not commence until 7-24-96.
A seventy-two hour (3 working day) notice to this office is required to confirm final date of removal for our inspector to be on site.

6-28-96 — Approval Date
W. Dale Tanke — Approved
12-28-96 — Permit Expires

FILE COPY

(6) NOTICE PRIOR TO REMOVAL - A 30 day written notice to the Office of the State Fire Marshal is required prior to removal. The notice begi on the date a properly completed Application and fee are received by this Office.

In the event of a reported release, the Office of the State Fire Marshal shall waive the 30 day notice requirement. (Incident number must be entered in #4 above).

(Complete the back side)

IL Notification for Underground Storage Tanks

- A separate form must be used for each site.
- If you have more than five tanks, photocopy pages 1-5 and attach to this notification form.
- Please type, or print in ink; the signature under "certification" (section IX) must be signed in Ink.

OFFICE USE ONLY

ID NUMBER 7-0021799

DATE RECEIVED

RECEIVED

JAN 26 1999

DIV. OF PETROLEUM & CHEMICAL SAFETY

Facility I.D. # (if known) 7021799 Owner I.D. # (if known) _____

TYPE OF NOTIFICATION

☐ New Facility ☒ Amended (Changes/Corrections/Additional Tanks) Mark all that apply:

_____ Owner Address Change (this facility only)
_____ Owner Address Change (all facilities owned)
_____ New Owner
X Tank(s) Removed (Permit # 1237-96)
_____ Tanks Relined (Permit # _____)
_____ Tanks Installed (Permit # _____)
_____ Tanks Upgraded/Repaired (Permit # _____)
_____ Abandonment Notice (Permit # _____)
X Other tanks removed as part of Superfund clean-up

I. Ownership of Tank(s)

PRIMEX Technologies, Inc.
Owner Name (Corp., Individual., Public Agency or other Entity)

8820 Route 148
Mailing Address

Marion IL 62959
City State Zip

Williamson
County

Glenn S. Heil (618) 993-9219
Contact Name (Area Code) Phone

II. Location of Tank(s)

(if same as Section I, Mark box) ☒

Facility Name or Company Site Identifier, as applicable

Street Address or State Road, as applicable (exact address)

City State Zip

County

Contact Name (Area Code) Phone

III. TYPE OF OWNERSHIP (mark all that apply)

☐ Current Owner of Tanks
Date Purchased / /
☐ Former Owner
☐ Ownership Uncertain _____
☒ Other Tenant of facility; tanks removed

IV. TYPE OF FACILITY

Type of Facility: (Circle correct code)

A. Service Station
B. Bulk Plant
C. Petroleum Distributor
D. Convenience Store
E. Auto Dealer
F. Commercial/Retail
(G.) Industrial/Manufacturing
H. Private Institution
I. Residence (Non-Farm)
J. Farm
K. Airport
L. Marina
M. City/Town
N. County
O. State
P. Federal (Military)
Q. Federal (Non-Military)
R. School District
S. Port District
T. Utility District
U. Fire Dept.
V. Other Special Service Districts
W. Other _____ (Please Specify)

V. Description of Underground Storage Tanks (Complete entire column for each tank)

Tank Identification Number	Tank No. I-1	Tank No. I-2	Tank No. I-3	Tank No. I-4	Tank No. ___
1. Status of Tanks					
Currently in use	☐	☐	☐	☐	☐
Temporarily out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Permanently out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Removed (Section 3 must be completed)	☒	☒	☒	☒	☐
Abandoned in place (Section 4 must be completed)	☐	☐	☐	☐	☐
2. Tanks Permanently & Temporarily Out of Use					
Estimated date last used	/ /	/ /	/ /	/ /	/ /
3. Tanks Removed					
Date tank(s) removed	08/15/96	08/15/96	08/15/96	08/15/96	/ /
Estimated date last used	06/01/84	06/01/84	06/01/84	12/01/95	/ /
4. Abandoned in Place					
Date tanks filled	/ /	/ /	/ /	/ /	/ /
Tank filled with:					
Inert materials (sand, etc.)	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other (please specify)					
5. Age of Tank					
Date tank installed	-/-/72	-/-/72	-/-/72	-/-/67	/ /
Date product placed in tank	-/-/72	-/-/72	-/-/72	-/-/67	/ /
6. Estimated Total Capacity (gallons)	9000	1065	550	10,000	
7. Substances Currently or Last Stored:					
Petroleum					
Diesel	☐	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline	☒	☒	☒	☐	☐
Used oil	☐	☐	☐	☐	☐
Other (Please specify)					
Petroleum Use (if applicable):					
Heating oil (consumptive use on premises)	☐	☐	☐	☒	☐
Back-up generator	☐	☐	☐	☐	☐
Other (please specify)					
Hazardous Substance:					
Name of principal CERCLA substance					
Chemical Abstract Service (CAS No)					

VI. Description of Underground Storage Tanks (Complete entire column for each tank)

Tank Identification Number	Tank No.___	Tank No.___	Tank No.___	Tank No.___	Tank No.___
1. Material of Construction (mark all that apply)					
Asphalt coated or bare steel	☐	☐	☐	☐	☐
Cathodically protected steel	☐	☐	☐	☐	☐
Dielectric coated steel	☐	☐	☐	☐	☐
Composite (steel with fiberglass)	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Lined interior	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Steel STI-P3	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
2. Piping Materials (mark all that apply)					
Bare steel	☐	☐	☐	☐	☐
Galvanized steel	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Cathodically protected	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Dielectric coating	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
3. Piping Type (mark all that apply)					
European suction	☐	☐	☐	☐	☐
American suction	☐	☐	☐	☐	☐
Pressure	☐	☐	☐	☐	☐
Gravity feed	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____

Tank Identification Number	Tank No.___		Tank No.___		Tank No.___		Tank No.___		Tank No.___	
4. Release Detection (Mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Manual tank gauging	☐		☐		☐		☐		☐	
Inventory controls	☐		☐		☐		☐		☐	
Automatic tank gauging	☐		☐		☐		☐		☐	
Vapor monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Groundwater monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring double-walled tank/piping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring /secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tank tightness testing	☐		☐		☐		☐		☐	
Automatic line leak detector		☐		☐		☐		☐		☐
Line tightness testing		☐		☐		☐		☐		☐
Automatic shut-off device		☐		☐		☐		☐		☐
Continuous alarm system		☐		☐		☐		☐		☐
No requirements (european suction)		☐		☐		☐		☐		☐
Other (please specify)	_____		_____		_____		_____		_____	
5. Corrosion Protection (mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Cathodic protection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Impressed current	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exterior coating	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interior lining	☐		☐		☐		☐		☐	
Other (please specify)	_____		_____		_____		_____		_____	
6. Spill & Overfill Prevention (Mark all that apply)										
Overfill device	☐		☐		☐		☐		☐	
Automatic shut-off	☐		☐		☐		☐		☐	
Overfill Alarm	☐		☐		☐		☐		☐	
Ball float valve	☐		☐		☐		☐		☐	
Spill containment device	☐		☐		☐		☐		☐	
Other (Please specify)	_____		_____		_____		_____		_____	

No.
oing

VII. Certification of Compliance (Complete for all new, upgraded and relined tanks at this location)

Installation (mark all that apply)					
Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
Installer certified or licensed by implementing agency	☐	☐	☐	☐	☐
Installer registered by implementing agency	☐	☐	☐	☐	☐
Installer is the owner of the tank(s)	☐	☐	☐	☐	☐
Installation inspected by a registered engineer	☐	☐	☐	☐	☐
Installation inspected & approved by implementing agency	☐	☐	☐	☐	☐
Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
Another method allowed by state agency (please specify)	_____	_____	_____	_____	_____

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JAN 29 1999
DIV OF PETROLEUM CHEMICAL SAFETY

OATH: I certify the information that is provided in section VII is true to the best of my knowledge, and certify that the installation was performed in accordance with all applicable state and federal laws and regulations. **(THIS SECTION MAY ONLY BE COMPLETED BY THE CONTRACTOR. SEPARATE OATH MUST BE SUBMITTED FOR EACH ACTIVITY PERFORMED BY DIFFERENT CONTRACTOR.)**

Tank No. _____ Permit No. _____

Contractor: _____ (Name) _____ (Signature (must be original)) _____ (Date)

_____ (Position) _____ (Company)

VIII. Financial Responsibility

Mark all that apply:

☐ Self-Insurance ☐ Guarantee ☐ Certificate of Deposit

☐ Commercial Insurance ☐ Surety Bond ☐ Trust Fund

☐ Risk Retention Group ☐ Letter of Credit ☐ Other Method Allowed

(please specify) _____

IX. Certification (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

Joseph S. McGraw Vicepresident PRIMEX Technologies — Name and official title of owner or owner's authorized representative (print)

Signature (must be original)

1/20/99 — Date Signed

7021730

Notification for Underground Hazardous Waste Storage Tanks

Illinois Environmental Protection Agency
Division of Land Pollution Control
Underground Hazardous Waste Storage Tank Registration
2200 Churchill Road
Springfield, Illinois 62706

MAY 08 1986

STATE USE ONLY
I.D. Number

Date Received

GENERAL INFORMATION

Notification is required by State law for all underground tanks that have been used to store hazardous waste since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Ill. Rev. Stat., Ch. 111 1/2, par. 1022.12.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored hazardous waste. It is expected that the information you provide will be based on reasonably available records, or, in the absence of records, your knowledge, belief, or recollection.

Who Must Notify? Owners of underground tanks that store or have stored hazardous waste must notify the IEPA of the existence of their tank(s). Owner means (a) in the case of an underground tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground tank used for the storage of hazardous waste, and (b) in the case of any underground tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of hazardous waste, and (2) whose volume (including connected underground piping) is 10% or more beneath ground.

What Tanks Are Excluded? Tanks removed from the ground by May 8, 1986 are not subject to notification. Other tanks excluded from notification are: (1) surface impoundments, pits, ponds or lagoons; (2) storm water or waste water collection systems; (3) flow-through process tanks; and (4) storage tanks situated in an underground area (such as a basement, cellar, mine-working, drift, shaft or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Regulated? The notification requirements apply to underground storage tanks that contain hazardous waste. The term hazardous waste is defined in Section 3j of the Illinois Environmental Protection Act.

Where To Notify? Completed forms should be returned to the address indicated above.

When To Notify? (1) Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. (2) Owners who install or replace underground storage tanks after July 1, 1986 shall register the tank with the IEPA prior to installation of the tank. Notification as a hazardous waste generator, storage and/or treatment facility per P.L. 94-580 may also be required.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must be completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
OLIN CORPORATION

Street Address
P.O. DRAWER G

County
WILLIAMSON

City: MARION | State: IL. | Zip Code: 62959

Area Code: (618) | Phone Number: 985-8211

Type of Owner (Mark all that apply ☒)
☒ Current ☐ Former
☐ State or Local Gov't. ☐ Federal Gov't (GSA facility I.D. No. _____)
☒ Private or Corporate Ownership ☐ uncertain

II. LOCATION OF TANK(S)

Facility Name or Company Site Identifier, as applicable
OLIN CORP.-ORDNANCE PRODUCTS-TEST RANGE

Street Address or State Road, as applicable
TOWNSHIP 9N, RANGE 2E, 3RD. P.M.

County
WILLIAMSON

City (nearest): MARION, | State: IL. | Zip Code: 62959

Federal I.D. #: ILD000802801 | State Site Code: 1998620011

Indicate number of tanks at this location 0

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐): ARTHUR HEINZ, JR.
Job Title: DIRECTOR
Area Code: (618) Phone Number: 985-8211

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative: ARTHUR HEINZ, JR. DIRECTOR
Signature: Art Heinz
Date Signed: 5/5/86

IL 532-1461
IPC 225 3788

Owner Name (from Section I) OLIN CORP. Location (from Section II) OLIN CORP. Page No. 2 of 2 Pages.

VI. DESCRIPTION OF UNDERGROUND HAZARDOUS WASTE STORAGE TANKS (*Complete for each tank at this location*)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3. . .)		**Tank No.**	**Tank No.**	**Tank No.**	**Tank No.**	**Tank No.**
1. Status of Tank	Currently in Use					
(Mark all that apply ☒)	Temporarily Out of Use					
	Permanently Out of Use					
	Brought into Use after 5/8/86					
2. Estimated Age (Years)						
3. Estimated Total Capacity (Gallons)						
4. Material of Construction	Steel					
(Mark one ☒)	Concrete					
	Fiberglass Reinforced Plastic					
	Unknown					
	Other, Please Specify					
5. Internal Protection	Cathodic Protection					
(Mark all that apply ☒)	Interior Lining (e.g., epoxy resin)					
	None					
	Unknown					
	Other, Please Specify					
6. External Protection	Cathodic Protection					
(Mark all that apply ☒)	Painted (e.g., asphaltic)					
	Fiberglass Reinforced Plastic Coated					
	None					
	Unknown					
	Other, Please Specify					
7. Piping	Bare Steel					
(Mark all that apply ☒)	Galvanized Steel					
	Fiberglass Reinforced Plastic					
	Cathodically Protected					
	Unknown					
	Other, Please Specify					
8. Hazardous Waste Currently or Last Stored *(Provide all applicable information)*						
a. Hazardous By Characteristics (Identify EPA Hazardous Waste Number)						
b. Hazardous By Listing (Identify EPA Hazardous Waste Number)						
c. Unknown						
9. Additional Information (for tanks permanently taken out of service)						
a. Estimated date last used (mo./yr.)						
b. Estimated quantity of substance remaining (gal.)						
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)						
d. Was tank closed in accordance with an IEPA approved closure plan (Yes, No, N/A)						

This Agency is authorized to require this information under Section 22.12 of the Environmental Protection Act (Ill. Rev. Stat. 1983, ch. 111½ par. 1001 et seq.) as amended by P.A. 84-1072. Disclosure of this information is required. Failure to do so may result in a civil penalty up to $10,000.00 and an additional civil penalty up to $1,000.00 for each day the failure continues, a fine up to $1,000.00 and imprisonment up to one year. This form has been approved by the Forms Management Center.

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN **IL**

RETURN COMPLETED FORM TO: UST Coordinator, Division of Fire Prevention
Office of State Fire Marshal
[redacted]
P.O. Box 3803
Springfield, IL 62708-3803

I.D. Number — STATE USE ONLY — 1021730

Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

The primary purpose of this notification program is to locate and evaluate underground tanks that store or have stored petroleum or hazardous substances. It is expected that the information you provide will be based on reasonably available records, or, in the absence of such records, your knowledge, belief, or recollection.

Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—

(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and

(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: **1.** gasoline, used oil, or diesel fuel, and **2.** industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:

1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? 1. Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. **2.** Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
OLIN CORPORATION

Street Address
P.O. DRAWER G

County
WILLIAMSON

City: MARION | State: IL. | ZIP Code: 62959

Area Code: (618) | Phone Number: 985-8211

Type of Owner *(Mark all that apply ☒)*

- ☒ Current
- ☐ Former
- ☐ State or Local Gov't
- ☐ Federal Gov't (GSA facility I.D. no. _____)
- ☒ Private or Corporate
- ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
OLIN CORP.-ORDNANCE PRODUCTS-TEST RANGE

Street Address or State Road, as applicable
TOWNSHIP 9N, RANGE 2E, 3RD. P.M.

County
WILLIAMSON

City (nearest): MARION | State: IL. | ZIP Code: 62959

Indicate number of tanks at this location: 1

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐): ARTHUR HEINZ, JR.

Job Title: DIRECTOR

Area Code: (618) | Phone Number: 985-8211

IV. TYPE OF NOTIFICATION

☐ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative	Signature	Date Signed
ARTHUR HEINZ, JR., DIRECTOR	B. Hudson for Art Heinz	5/6/86

CONTINUE ON REVERSE SIDE

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)		Tank No. T.R.-1	Tank No.	Tank No.	Tank No.	Tank No.
1. Status of Tank *(Mark all that apply ☒)*	Currently in Use	X				
	Temporarily Out of Use					
	Permanently Out of Use					
	Brought into Use after 5/8/86					
2. Estimated Age (Years)		8				
3. Estimated Total Capacity (Gallons)		10000				
4. Material of Construction *(Mark one ☒)*	Steel	X				
	Concrete					
	Fiberglass Reinforced Plastic					
	Unknown					
	Other, Please Specify					
5. Internal Protection *(Mark all that apply ☒)*	Cathodic Protection					
	Interior Lining (e.g., epoxy resins)					
	None	X				
	Unknown					
	Other, Please Specify					
6. External Protection *(Mark all that apply ☒)*	Cathodic Protection					
	Painted (e.g., asphaltic)					
	Fiberglass Reinforced Plastic Coated					
	None	X				
	Unknown					
	Other, Please Specify					
7. Piping *(Mark all that apply ☒)*	Bare Steel	X				
	Galvanized Steel					
	Fiberglass Reinforced Plastic					
	Cathodically Protected					
	Unknown					
	Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume *(Mark all that apply ☒)*	**a. Empty**					
	b. Petroleum					
	Diesel					
	Kerosene					
	Gasoline (including alcohol blends)					
	Used Oil					
	Other, Please Specify	#2FUEL OIL				
	c. Hazardous Substance					
	Please Indicate Name of Principal CERCLA Substance					
	OR Chemical Abstract Service (CAS) No.					
	Mark box ☒ if tank stores a mixture of substances					
	d. Unknown					
9. Additional Information (for tanks permanently taken out of service)	**a.** Estimated date last used (mo/yr)	/	/	/	/	/
	b. Estimated quantity of substance remaining (gal.)					
	c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)					

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN **IL**

RETURN COMPLETED FORM TO: UST Coordinator, Division of Fire Prevention
Office of State Fire Marshal
[redacted]
P.O. Box 3803
Springfield, IL 62708-3803

STATE USE ONLY
I.D. Number 7-021730
Date Received

GENERAL INFORMATION

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

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Who Must Notify? Section 9002 of RCRA, as amended, requires that, unless exempted, owners of underground tanks that store regulated substances must notify designated State or local agencies of the existence of their tanks. Owner means—
(a) in the case of an underground storage tank in use on November 8, 1984, or brought into use after that date, any person who owns an underground storage tank used for the storage, use, or dispensing of regulated substances, and
(b) in the case of any underground storage tank in use before November 8, 1984, but no longer in use on that date, any person who owned such tank immediately before the discontinuation of its use.

What Tanks Are Included? Underground storage tank is defined as any one or combination of tanks that (1) is used to contain an accumulation of "regulated substances," and (2) whose volume (including connected underground piping) is 10% or more beneath the ground. Some examples are underground tanks storing: **1.** gasoline, used oil, or diesel fuel, and **2.** industrial solvents, pesticides, herbicides or fumigants.

What Tanks Are Excluded? Tanks removed from the ground are not subject to notification. Other tanks excluded from notification are:
1. farm or residential tanks of 1,100 gallons or less capacity used for storing motor fuel for noncommercial purposes;
2. tanks used for storing heating oil for consumptive use on the premises where stored;
3. septic tanks;
4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
6. storm water or waste water collection systems;
7. flow-through process tanks;
8. liquid traps or associated gathering lines directly related to oil or gas production and gathering operations;
9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

Where To Notify? Completed notification forms should be sent to the address given at the top of this page.

When To Notify? **1.** Owners of underground storage tanks in use or that have been taken out of operation after January 1, 1974, but still in the ground, must notify by May 8, 1986. **2.** Owners who bring underground storage tanks into use after May 8, 1986, must notify within 30 days of bringing the tanks into use.

Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
OLIN CORPORATION

Street Address
P.O. DRAWER G

County
WILLIAMSON

City: MARION, State: ILLINOIS ZIP Code: 62959

Area Code: (618) Phone Number: 985-8211

Type of Owner *(Mark all that apply ☒)*

- [X] Current
- [ ] Former
- [ ] State or Local Gov't
- [ ] Federal Gov't (GSA facility I.D. no. _____)
- [X] Private or Corporate
- [ ] Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here [ ])

Facility Name or Company Site Identifier, as applicable
OLIN CORP.-ORDNANCE PRODUCTS-TEST RANGE

Street Address or State Road, as applicable
TOWNSHIP 9N, RANGE 2E, 3RD P.M.

County
WILLIAMSON

City (nearest): MARION, State: ILLINOIS ZIP Code: 62959

Indicate number of tanks at this location: 2

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands [ ]

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here [ ]): ARTHUR HEINZ, JR.
Job Title: DIRECTOR
Area Code: (618) Phone Number: 985-8211

IV. TYPE OF NOTIFICATION

[X] Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative: ARTHUR HEINZ, JR., DIRECTOR
Signature: Arthur Heinz Jr
Date Signed: 5/15/86

CONTINUE ON REVERSE SIDE

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)	Tank No. TR-2	Tank No.	Tank No.	Tank No.	Tank No.
1. Status of Tank (Mark all that apply ☒)					
Currently in Use	X				
Temporarily Out of Use					
Permanently Out of Use					
Brought into Use after 5/8/86	X				
2. Estimated Age (Years)	0				
3. Estimated Total Capacity (Gallons)	560				
4. Material of Construction (Mark one ☒)					
Steel	X				
Concrete					
Fiberglass Reinforced Plastic					
Unknown					
Other, Please Specify					
5. Internal Protection (Mark all that apply ☒)					
Cathodic Protection					
Interior Lining (e.g., epoxy resins)					
None	X				
Unknown					
Other, Please Specify					
6. External Protection (Mark all that apply ☒)					
Cathodic Protection	X				
Painted (e.g., asphaltic)	X				
Fiberglass Reinforced Plastic Coated					
None					
Unknown					
Other, Please Specify					
7. Piping (Mark all that apply ☒)					
Bare Steel					
Galvanized Steel	X				
Fiberglass Reinforced Plastic					
Cathodically Protected					
Unknown					
Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume (Mark all that apply ☒)					
a. Empty					
b. Petroleum					
Diesel					
Kerosene					
Gasoline (including alcohol blends)					
Used Oil					
Other, Please Specify	#2 FUEL OIL				
c. Hazardous Substance					
Please Indicate Name of Principal CERCLA Substance					
OR					
Chemical Abstract Service (CAS) No.					
Mark box ☒ if tank stores a mixture of substances					
d. Unknown					
9. Additional Information (for tanks permanently taken out of service)					
a. Estimated date last used (mo/yr)	/	/	/	/	/
b. Estimated quantity of substance remaining (gal.)					
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)					

OFFICE OF THE ILLINOIS STATE FIRE MARSHAL
Division of Petroleum and Chemical Safety
1035 Stevenson Drive
Springfield, Illinois 62703-4259

FOR OFFICE USE ONLY
Facility # 7-021730
Permit # 3620-92 RE,M

FILE COPY

Application for Permit to REMOVE Underground Storage Tanks for Petroleum and Hazardous Substances

To be completed and filed with the Division of Petroleum and Chemical Safety, 1035 Stevenson Drive, Springfield, Illinois 62703-4259 (217/785-5878) or (217/785-1020)

RECEIVED
FEB 14 1992
DIV. OF PETROLEUM & CHEMICAL SAFETY

1) (Owner of tanks) - Corporation, partnership or other business entity: (Must Be Mailing Address)

Olin Corporation
Name
PO Box 278
Street Address
Marion IL 62959
City State Zip
R.R. Hudson (618) 985-8211
Contact Person Phone

2) (Facility) - name and address where tanks are located:

Olin Corporation
Name
PO Box 278 - Test Range
Street Address
Marion IL 62959 Williamson
City State Zip County
R.R. Hudson (618) 985-8211
Contact Person Phone

Facility Registration I.D. Number
~~F.R. 1 (Tank designation)~~ 7021730

3) (Contractor) - person, firm or company performing work:

G.A. White
Name
RR #2 Box 433
Street Address
Marion IL. 62959 Wlm.
State Zip County
618-993-3236 371-22-0996
Phone Registration No.

FOR OFFICE USE ONLY

Permission to remove underground storage tank(s) is hereby granted. Such removal shall not commence until 03-14-92. A seventy-two hour (3 working day) notice to this office is required to confirm final date of removal for our inspector to be on site.

02-14-92 W. Dale Tanke
Approval Date Approved

08-14-92
Permit Expires

You must notify ESDA 1-800-782-7860 within 24 hours of leaks or contaminated soil. Removal must be in accordance with acceptable closure requirements and procedure such as API Bulletin 1604. A site assessment must be conducted to determine if a release has occurred.

4) Removal of Tanks:

a) Number and size of tanks being removed: 1 @ 10,000 gal

b) Total number of all tanks removed: 1

c) Reason for removal of tanks: Change in heating source - Change from Boiler to Heat Pump

d) If tank is leaking, give ESDA incident number:

e) What products were stored in each tank? Fuel Oil

f) If tanks contain products other than petroleum products, please indicate here:

g) Date each tank was last used? JAN. 3, 1992

h) A written notice of removal of tanks shall be given to the Office of the State Fire Marshal at least 30 days prior to the removal, giving location, number and size of tanks. This application will constitute that 30 day written notice. The 30 day period commences with this application appropriately completed and the fee received in our office.

(Over)

REMOVAL NOTICE – PERMIT #

Notification for Underground Storage Tanks

FORM APPROVED
OMB NO. 2050-0049
APPROVAL EXPIRES 6-30-88

FOR TANKS IN **IL**

DIVISION PETROLEUM/CHEMICAL SAFETY
ILLINOIS STATE FIRE MARSHAL
1035 STEVENSON DRIVE
SPRINGFIELD, IL 62703-4259

STATE USE ONLY

I.D. Number 1-021730

Date Received MAR 24 1992

Notification is required by Federal law for all underground tanks that have been used to store regulated substances since January 1, 1974, that are in the ground as of May 8, 1986, or that are brought into use after May 8, 1986. The information requested is required by Section 9002 of the Resource Conservation and Recovery Act, (RCRA), as amended.

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3. septic tanks;

4. pipeline facilities (including gathering lines) regulated under the Natural Gas Pipeline Safety Act of 1968, or the Hazardous Liquid Pipeline Safety Act of 1979, or which is an intrastate pipeline facility regulated under State laws;
5. surface impoundments, pits, ponds, or lagoons;
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9. storage tanks situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

RECEIVED
MAR 24 1992
DIV OF PETROLEUM & CHEMICAL SAFETY

What Substances Are Covered? The notification requirements apply to underground storage tanks that contain regulated substances. This includes any substance defined as hazardous in section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), with the exception of those substances regulated as hazardous waste under Subtitle C of RCRA. It also includes petroleum, e.g., crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute).

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Penalties: Any owner who knowingly fails to notify or submits false information shall be subject to a civil penalty not to exceed $10,000 for each tank for which notification is not given or for which false information is submitted.

INSTRUCTIONS

Please type or print in ink all items except "signature" in Section V. **This form must by completed for each location containing underground storage tanks.** If more than 5 tanks are owned at this location, photocopy the reverse side, and staple continuation sheets to this form.

Indicate number of continuation sheets attached: 0

I. OWNERSHIP OF TANK(S)

Owner Name (Corporation, Individual, Public Agency, or Other Entity)
OLIN CORPORATION

Street Address (mailing address)
P.O. BOX 278

County
WILLIAMSON

City: MARION | State: IL | ZIP Code: 62959

Area Code: 618 | Phone Number: 985-8211

Type of Owner (*Mark all that apply* ☒)

- ☒ Current
- ☐ Former
- ☐ State or Local Gov't
- ☐ Federal Gov't (GSA facility I.D. no. _____)
- ☒ Private or Corporate
- ☐ Ownership uncertain

II. LOCATION OF TANK(S)

(If same as Section 1, mark box here ☐)

Facility Name or Company Site Identifier, as applicable
OLIN CORPORATION - TEST RANGE

Street Address or State Road, as applicable (exact street addre
SKYLINE DRIVE

County
WILLIAMSON

City (nearest): MARION | State: IL | ZIP Code: 62959

Indicate number of tanks at this location (Remaining In Ground): 1

Mark box here if tank(s) are located on land within an Indian reservation or on other Indian trust lands ☐

III. CONTACT PERSON AT TANK LOCATION

Name (If same as Section I, mark box here ☐): M.W. FINKE
Job Title: DIRECTOR, MCA OPERATIONS
Area Code: 618 | Phone Number: 985-8211

IV. TYPE OF NOTIFICATION

☒ Mark box here only if this is an amended or subsequent notification for this location.

V. CERTIFICATION (Read and sign after completing Section VI.)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete.

Name and official title of owner or owner's authorized representative	Signature (must be original)	Date Signed
M.W. FINKE, DIRECTOR, MCA OPERATIONS	M.W. Finke	3/19/92

CONTINUE ON REVERSE SIDE

VI. DESCRIPTION OF UNDERGROUND STORAGE TANKS (Complete for each tank at this location.)

Tank Identification No. (e.g., ABC-123), or Arbitrarily Assigned Sequential Number (e.g., 1,2,3...)		Tank No. TR-1	Tank No. TR-2	Tank No.	Tank No.	Tank No.
1. Status of Tank (Mark all that apply ☒)	Currently in Use	☐	☒	☐	☐	☐
	Temporarily Out of Use	☐	☐	☐	☐	☐
	Permanently Out of Use	☒	☐	☐	☐	☐
	Brought into Use after 5/8/86	☐	☐	☐	☐	☐
2. Estimated Age (Years)		14	6			
3. Estimated Total Capacity (Gallons)		10,000	560			
4. Material of Construction (Mark one ☒)	Steel	☒	☒	☐	☐	☐
	Concrete	☐	☐	☐	☐	☐
	Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify					
5. Internal Protection (Mark all that apply ☒)	Cathodic Protection	☐	☐	☐	☐	☐
	Interior Lining (e.g., epoxy resins)	☐	☐	☐	☐	☐
	None	☒	☒	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify					
6. External Protection (Mark all that apply ☒)	Cathodic Protection	☐	☒	☐	☐	☐
	Painted (e.g., asphaltic)	☐	☒	☐	☐	☐
	Fiberglass Reinforced Plastic Coated	☐	☐	☐	☐	☐
	None	☒	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify					
7. Piping (Mark all that apply ☒)	Bare Steel	☒	☐	☐	☐	☐
	Galvanized Steel	☐	☒	☐	☐	☐
	Fiberglass Reinforced Plastic	☐	☐	☐	☐	☐
	Cathodically Protected	☐	☐	☐	☐	☐
	Unknown	☐	☐	☐	☐	☐
	Other, Please Specify					
8. Substance Currently or Last Stored in Greatest Quantity by Volume (Mark all that apply ☒)	a. Empty	☐	☐	☐	☐	☐
	b. Petroleum					
If For Heating, Mark Exact Use:	Diesel	☐	☐	☐	☐	☐
( ) Heating Premises ONLY	Kerosene	☐	☐	☐	☐	☐
	Gasoline (including alcohol blends)	☐	☐	☐	☐	☐
( ) Back-Up Generator	Used Oil	☐	☐	☐	☐	☐
(X) Other HEAT FOR THERMAL TREATMENT OPERATION	Other, Please Specify	#2 FUEL OIL	#2 FUEL OIL			
Above Pertains To Tank Nos. TR-2	c. Hazardous Substance	☐	☐	☐	☐	☐
Please Indicate Name of Principal CERCLA Substance						
OR Chemical Abstract Service (CAS) No.		68476-30-2	68476-30-2			
Mark box ☒ if tank stores a mixture of substances		☐	☐	☐	☐	☐
	d. Unknown	☐	☐	☐	☐	☐
9. Additional Information (for tanks permanently & temporarily taken out of service) DATE TANK(S) REMOVED?		3/92 12/91	/ /	/ /	/ /	/ /
a. Estimated date last used (mo/yr)						
b. Estimated quantity of substance remaining (gal.)		0				
c. Mark box ☒ if tank was filled with inert material (e.g., sand, concrete)		☐	☐	☐	☐	☐

Facility # 1-021/30
Permit # 3620-92 REM

Copy sent to IEPA
3-25-92 gv

OFFICE OF THE STATE FIRE MARSHAL
DIVISION OF PETROLEUM AND CHEMICAL SAFETY
1035 STEVENSON DRIVE
SPRINGFIELD, ILLINOIS 62703-4259

CONFIDENTIAL

Log Of Underground Storage Tank Removal

Name and address of Facility

OLIN CORPORATION
Street P.O. BOX 278 TEST RANGE
City MARION Zip 62959
County WILLIAMSON
Phone 618 1985-8211

Name and address of Owner(s)

OLIN CORPORATION
Street P.O. BOX 278
City MARION State IL
Zip 62959 Phone 618 1985-8211

ESDA Incident No.: _____

Date Removed 03-17-92 Status: Minor ___ Significant ___ Major ___

Area of Contamination: Tank Floor ___ Walls ___ Pipe Trench ___ Other ___

Ground Water Contaminated: Yes ___ No ___ Remarks: _____

Number of Tanks removed: 1

Size of Each Tank removed:	10,000 M	___ M	___ M	___ M	___ M	___ M	___ M	___ M
Product Stored:	NO 2 HEATING OIL						

Number of Tanks to Remain in ground: 1

	500 M	___ M	___ M	___ M	___ M	___ M	___ M	___ M
Product Stored:	DIESEL						

Name and address of Removal Contractor

G.A. White
Registration # 371-22-0996
Street RR #2 BOX 433
City MARION State IL
Phone 618 993-3236 Zip 62959

RECEIVED
MAR 25 1992
DIV. OF PETROLEUM & CHEMICAL SAFETY

Ron Aaron
Storage Tank Safety Specialist

IL

Notification for Underground Storage Tanks

- A separate form must be used for each site.
- If you have more than five tanks, photocopy pages 1-5 and attach to this notification form.
- Please type, or print in ink; the signature under "certification" (section IX) must be signed in Ink.

OFFICE USE ONLY

ID NUMBER 7-021730

DATE RECEIVED

RECEIVED

JAN 13 1997

DIV OF PETROLEUM & CHEMICAL SAFETY

Facility I.D. # (if known) 7021730 Owner I.D. # (if known) _____

TYPE OF NOTIFICATION

[ ] New Facility [X] Amended (Changes/Corrections/Additional Tanks) Mark all that apply:

_____ Owner Address Change (this facility only)
_____ Owner Address Change (all facilities owned)
X New Owner
_____ Tank(s) Removed (Permit # _____)
_____ Tanks Relined (Permit # _____)
_____ Tanks Installed (Permit # _____)
_____ Tanks Upgraded/Repaired (Permit # _____)
_____ Abandonment Notice (Permit # _____)
_____ Other _____

I. Ownership of Tank(s)

Primex Technologies, Inc.
Owner Name (Corp., Individual., Public Agency or other Entity)

Route 148 South P. O. Box 278
Mailing Address

Marion, IL 62959
City State Zip

Williamson
County

Warren Brown (618)993-9478
Contact Name (Area Code) Phone

II. Location of Tank(s)

(if same as Section I, Mark box) [ ]

Primex Technologies, Inc. - Test Range
Facility Name or Company Site Identifier, as applicable

Township 9N, Range 2E, 3RD P.M.
Street Address or State Road, as applicable (exact address)

Marion, IL 62959
City State Zip

Williamson
County

Warren Brown (618)993-9478
Contact Name (Area Code) Phone

III. TYPE OF OWNERSHIP (mark all that apply)

[X] Current Owner of Tanks
Date Purchased 1 / 1 / 97 (approximate)

[ ] Former Owner

[ ] Ownership Uncertain _____

[ ] Other _____

IV. TYPE OF FACILITY

Type of Facility: (Circle correct code)

A. Service Station
B. Bulk Plant
C. Petroleum Distributor
D. Convenience Store
E. Auto Dealer
F. Commercial/Retail
G. Industrial/Manufacturing
H. Private Institution
I. Residence (Non-Farm)
J. Farm
K. Airport
L. Marina
M. City/Town
N. County
O. State
P. Federal (Military)
Q. Federal (Non-Military)
R. School District
S. Port District
T. Utility District
U. Fire Dept.
V. Other Special Service Districts
W. Other _____ (Please Specify)

No change to tank.

Certification of Compliance (Complete for all new, upgraded and relined tanks at this location)

Installation (mark all that apply)					
Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
Installer certified or licensed by implementing agency	☐	☐	☐	☐	☐
Installer registered by implementing agency	☐	☐	☐	☐	☐
Installer is the owner of the tank(s)	☐	☐	☐	☐	☐
Installation inspected by a registered engineer	☐	☐	☐	☐	☐
Installation inspected & approved by implementing agency	☐	☐	☐	☐	☐
Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
Another method allowed by state agency (please specify)	_____	_____	_____	_____	_____

OATH: I certify the information that is provided in section VII is true to the best of my knowledge, and certify that the installation was performed in accordance with all applicable state and federal laws and regulations. **(THIS SECTION MAY ONLY BE COMPLETED BY THE CONTRACTOR. SEPARATE OATH MUST BE SUBMITTED FOR EACH ACTIVITY PERFORMED BY DIFFERENT CONTRACTOR.)**

Tank No. _____ Permit No. _____

Contractor: _____ (Name) _____ (Signature (must be original)) _____ (Date)

_____ (Position) _____ (Company)

VIII. Financial Responsibility

Mark all that apply:

☐ Self-Insurance ☐ Guarantee ☐ Certificate of Deposit

☐ Commercial Insurance ☐ Surety Bond ☐ Trust Fund

☐ Risk Retention Group ☐ Letter of Credit ☐ Other Method Allowed

(please specify) _____

IX. Certification (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

Terry L. Swartout Director of Operations	T L Swartout	1/7/97
Name and official title of owner or owner's authorized representative (print)	Signature (must be original)	Date Signed

T.O.U. 12-18-98

IL Notification for Underground Storage Tanks

- A separate form must be used for each site.
- If you have more than five tanks, photocopy pages 1-5 and attach to this notification form.
- Please type, or print in ink; the signature under "certification" (section IX) must be signed in Ink.

OFFICE USE ONLY

ID NUMBER RECEIVED 7021730

DATE RECEIVED DEC 28 1998

OFFICE OF PETROLEUM & CHEMICAL SAFETY

Facility I.D. # (if known) 7-021730 Owner I.D. # (if known) _____

TYPE OF NOTIFICATION

☐ New Facility ☒ Amended (Changes/Corrections/Additional Tanks) Mark all that apply:

_____ Owner Address Change (this facility only)
_____ Owner Address Change (all facilities owned)
_____ New Owner
_____ Tank(s) Removed (Permit # _____)
_____ Tanks Relined (Permit # _____)
_____ Tanks Installed (Permit # _____)
_____ Tanks Upgraded/Repaired (Permit # _____)
_____ Abandonment Notice (Permit # _____)
X Other TEMPORARILY OUT OF USE

I. Ownership of Tank(s)

PRIMEX TECHNOLOGIES INC.
Owner Name (Corp., Individual., Public Agency or other Entity)

RTE. 148 SOUTH
Mailing Address

MARION IL 62959
City State Zip

WILLIAMSON
County

WARREN BROWN (618) 993-9206
Contact Name (Area Code) Phone

II. Location of Tank(s)

(If same as Section I, Mark box) ☐

PRIMEX TECH. INC. - TEST RANGE
Facility Name or Company Site Identifier, as applicable

TOWNSHIP 9N, RANGE 2E, 3RD PM
Street Address or State Road, as applicable (exact address)

MARON IL 62959
City State Zip

WILLIAMSON
County

WARREN BROWN (618) 993-9206
Contact Name (Area Code) Phone

III. TYPE OF OWNERSHIP (mark all that apply)

☒ Current Owner of Tanks
Date Purchased / /
☐ Former Owner
☐ Ownership Uncertain _____
☐ Other _____

IV. TYPE OF FACILITY

Type of Facility: (Circle correct code)

A. Service Station
B. Bulk Plant
C. Petroleum Distributor
D. Convenience Store
E. Auto Dealer
F. Commercial/Retail
(G. Industrial/Manufacturing)
H. Private Institution
I. Residence (Non-Farm)
J. Farm
K. Airport
L. Marina
M. City/Town
N. County
O. State
P. Federal (Military)
Q. Federal (Non-Military)
R. School District
S. Port District
T. Utility District
U. Fire Dept.
V. Other Special Service Districts
W. Other _____ (Please Specify)

V. Description of Underground Storage Tanks (Complete entire column for each tank)					
Tank Identification Number	Tank No. 2	Tank No.	Tank No.	Tank No.	Tank No.
1. Status of Tanks					
Currently in use	☐	☐	☐	☐	☐
Temporarily out of use (Section 2 must be completed)	☒	☐	☐	☐	☐
Permanently out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Removed (Section 3 must be completed)	☐	☐	☐	☐	☐
Abandoned in place (Section 4 must be completed)	☐	☐	☐	☐	☐
2. Tanks Permanently & Temporarily Out of Use Estimated date last used	12/18/98	/ /	/ /	/ /	/ /
3. Tanks Removed					
Date tank(s) removed	/ /	/ /	/ /	/ /	/ /
Estimated date last used	/ /	/ /	/ /	/ /	/ /
4. Abandoned in Place					
Date tanks filled	/ /	/ /	/ /	/ /	/ /
Tank filled with:					
Inert materials (sand, etc.)	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other (please specify)					
5. Age of Tank					
Date tank installed	/ /	/ /	/ /	/ /	/ /
Date product placed in tank	/ /	/ /	/ /	/ /	/ /
6. Estimated Total Capacity (gallons)	560				
7. Substances Currently or Last Stored:					
Petroleum					
Diesel	☒	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline	☐	☐	☐	☐	☐
Used oil	☐	☐	☐	☐	☐
Other (Please specify)					
Petroleum Use (if applicable):					
Heating oil (consumptive use on premises)	☐	☐	☐	☐	☐
Back-up generator	☒	☐	☐	☐	☐
Other (please specify)					
Hazardous Substance:					
Name of principal CERCLA substance					
Chemical Abstract Service (CAS No)					

VII. Certification of Compliance (Complete for all new, upgraded and relined tanks at this location)

Installation (mark all that apply)					
Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
Installer certified or licensed by implementing agency	☐	☐	☐	☐	☐
Installer registered by implementing agency	☐	☐	☐	☐	☐
Installer is the owner of the tank(s)	☐	☐	☐	☐	☐
Installation inspected by a registered engineer	☐	☐	☐	☐	☐
Installation inspected & approved by implementing agency	☐	☐	☐	☐	☐
Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
Another method allowed by state agency (please specify)	_____	_____	_____	_____	_____

OATH: I certify the information that is provided in section VII is true to the best of my knowledge, and certify that the installation was performed in accordance with all applicable state and federal laws and regulations. **(THIS SECTION MAY ONLY BE COMPLETED BY THE CONTRACTOR. SEPARATE OATH MUST BE SUBMITTED FOR EACH ACTIVITY PERFORMED BY DIFFERENT CONTRACTOR.)**

Tank No. _____ Permit No. _____

Contractor: _____ (Name) _____ (Signature (must be original)) _____ (Date)

_____ (Position) _____ (Company)

VIII. Financial Responsibility

Mark all that apply:

☐ Self-Insurance ☐ Guarantee ☐ Certificate of Deposit

☐ Commercial Insurance ☐ Surety Bond ☐ Trust Fund

☐ Risk Retention Group ☐ Letter of Credit ☐ Other Method Allowed

(please specify) _____

IX. Certification (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

GRANT C. GUTHMAN — Name and official title of owner or owner's authorized representative (print)

Grant C. Guthman — Signature (must be original)

12-21-98 — Date Signed

OFFICE OF THE ILLINOIS STATE FIRE MARSHAL
Division of Petroleum and Chemical Safety
1035 Stevenson Drive
Springfield, Illinois 62703-4259
(217)785-1020 or (217)785-5878

FOR OFFICE USE ONLY	
Facility #	7-021730
Permit #	00112-1999REM
Request Rec'd	11/10/1998
Amended Date	
Approval Date	01/07/1999dt
Permit Expires	07/07/1999
Commencement Date	12/10/1998

Permit for REMOVAL of Underground Storage Tank(s) and Piping for Petroleum and Hazardous Substances.

Permission to remove underground storage tank(s) or piping is hereby granted. Such removal shall not commence until. The contractor the permit was issued to or an employee of that contractor (this does not include a subcontractor) shall establish a date certain to perform the UST activity by contacting the Office of the State Fire Marshal, Division of Petroleum and Chemical Safety, by telephone at the Springfield office between 8:30 a.m. and 12:00 p.m., at which time a mutually agreed upon date and time for the UST activity shall be scheduled. **THIS PERMIT IS VALID FOR SIX MONTHS FROM THE APPROVAL DATE.**

(1) OWNER OF TANKS - Corporation, partnership, or other business entity:	(2) FACILITY - name and address where tanks are located:
Primex Technologies Inc Rt 148 S Po Box 278 Marion, IL 62959 Contact: Brown Warren (618) 993-9478	Primex Technologies Test Range Skyline Drive Marion, Williamson Co., IL Contact: Brown Warren (618) 993-9478

(3) REMOVAL OF TANKS:

(a) ***Number and size of tanks being removed:*** (TK # 2) 560 gal

(b) ***Product stored in each tank:*** (TK # 2) Fuel Oil

(c) ***Reason of tanks being removed:*** Upgrade for new regulations.

(d) ***If tank(s) is leaking, indicate IEMA incident number:***

(e) ***Date each tank was last used:*** TK # 2 (UNKNOWN)

(4) **Owner must notify this Office when completion of tank removal has occurred, on the Notification Form for Underground Storage Tank Form. Please note a form has been forwarded to the name and address shown in Item 1 (All pages of this form must be completed).**

(5) SPECIAL CONTINGENCIES:

(6) PERSON, FIRM OR COMPANY PERFORMING WORK:

Burkey Excavating
15481 Hwy 127
Murphysboro, IL 62966

Contact Person: Sam Burkey
Phone: (618) 687-3040

Contractor Registration # IL-1662 Exp. 03/11/1999

Sincerely,

W. Dale Tanke

W. Dale Tanke, Storage Tank Safety Engineer

cc: Storage Tank Safety Specialist - Manis
Fire Department
Office Associate - CT
Division File
(Rev. - 1/98)

WDT:

IL Notification for Underground Storage Tanks

- A separate form must be used for each site.
- If you have more than five tanks, photocopy pages 1-5 and attach to this notification form.
- Please type, or print in ink; the signature under "certification" (section IX) must be signed in Ink.

OFFICE USE ONLY

ID NUMBER 7-021730

DATE RECEIVED

RECEIVED

MAR 01 1999

DIV. OF PETROLEUM
CHEMICAL SAFETY

Facility I.D. # (if known) 7-021730 Owner I.D. # (if known)

TYPE OF NOTIFICATION

☐ New Facility ☐ Amended (Changes/Corrections/Additional Tanks) Mark all that apply:

___ Owner Address Change (this facility only)
___ Owner Address Change (all facilities owned)
___ New Owner
X Tank(s) Removed (Permit # 00112-1999 REM)
___ Other

___ Tanks Relined (Permit #)
___ Tanks Installed (Permit #)
___ Tanks Upgraded/Repaired (Permit #)
___ Abandonment Notice (Permit #)

I. Ownership of Tank(s)

PRIMEX TECHNOLOGIES INC.
Owner Name (Corp., Individual., Public Agency or other Entity)

RTE 148 SOUTH, P.O. BOX 278
Mailing Address

MARION IL 62959
City State Zip

WILLIAMSON
County

WARREN BROWN (618) 993-9206
Contact Name (Area Code) Phone

II. Location of Tank(s)

(if same as Section I, Mark box) ☐

PRIMEX TECH. INC. - TEST RANGE
Facility Name or Company Site Identifier, as applicable

SKYLINE DRIVE
Street Address or State Road, as applicable (exact address)

MARION IL 62959
City State Zip

WILLIAMSON
County

WARREN BROWN (618) 993-9206
Contact Name (Area Code) Phone

III. TYPE OF OWNERSHIP (mark all that apply)

☒ Current Owner of Tanks
Date Purchased ___/___/___
☐ Former Owner
☐ Ownership Uncertain
☐ Other

IV. TYPE OF FACILITY

Type of Facility: (Circle correct code)

A. Service Station
B. Bulk Plant
C. Petroleum Distributor
D. Convenience Store
E. Auto Dealer
F. Commercial/Retail
G. Industrial/Manufacturing
H. Private Institution
I. Residence (Non-Farm)
J. Farm
K. Airport
L. Marina
M. City/Town
N. County
O. State
P. Federal (Military)
Q. Federal (Non-Military)
R. School District
S. Port District
T. Utility District
U. Fire Dept.
V. Other Special Service Districts
W. Other ___ (Please Specify)

V. Description of Underground Storage Tanks (Complete entire column for each tank)					
Tank Identification Number	Tank No. 2	Tank No. ___	Tank No. ___	Tank No. ___	Tank No. ___
1. Status of Tanks					
Currently in use	☐	☐	☐	☐	☐
Temporarily out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Permanently out of use (Section 2 must be completed)	☐	☐	☐	☐	☐
Removed (Section 3 must be completed)	☒	☐	☐	☐	☐
Abandoned in place (Section 4 must be completed)	☐	☐	☐	☐	☐
2. Tanks Permanently & Temporarily Out of Use					
Estimated date last used	/ /	/ /	/ /	/ /	/ /
3. Tanks Removed					
Date tank(s) removed	2/23/99	/ /	/ /	/ /	/ /
Estimated date last used	12/18/98	/ /	/ /	/ /	/ /
4. Abandoned in Place					
Date tanks filled	/ /	/ /	/ /	/ /	/ /
Tank filled with:					
Inert materials (sand, etc.)	☐	☐	☐	☐	☐
Water	☐	☐	☐	☐	☐
Unknown	☐	☐	☐	☐	☐
Other (please specify)					
5. Age of Tank					
Date tank installed	5/13/86	/ /	/ /	/ /	/ /
Date product placed in tank	5/13/86	/ /	/ /	/ /	/ /
6. Estimated Total Capacity (gallons)	560				
7. Substances Currently or Last Stored:					
Petroleum					
Diesel	☒	☐	☐	☐	☐
Kerosene	☐	☐	☐	☐	☐
Gasoline	☐	☐	☐	☐	☐
Used oil	☐	☐	☐	☐	☐
Other (Please specify)					
Petroleum Use (if applicable):					
Heating oil (consumptive use on premises)	☒	☐	☐	☐	☐
Back-up generator	☐	☐	☐	☐	☐
Other (please specify)					
Hazardous Substance:					
Name of principal CERCLA substance					
Chemical Abstract Service (CAS No)					

VI. Description of Underground Storage Tanks (Complete entire column for each tank)

Tank Identification Number	Tank No.___	Tank No.___	Tank No.___	Tank No.___	Tank No.___
1. Material of Construction (mark all that apply)					
Asphalt coated or bare steel	☐	☐	☐	☐	☐
Cathodically protected steel	☐	☐	☐	☐	☐
Dielectric coated steel	☐	☐	☐	☐	☐
Composite (steel with fiberglass)	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Lined interior	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Steel STI-P3	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
2. Piping Materials (mark all that apply)					
Bare steel	☐	☐	☐	☐	☐
Galvanized steel	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐
Cathodically protected	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐
Dielectric coating	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____
3. Piping Type (mark all that apply)					
European suction	☐	☐	☐	☐	☐
American suction	☐	☐	☐	☐	☐
Pressure	☐	☐	☐	☐	☐
Gravity feed	☐	☐	☐	☐	☐
Other (please specify)	_____	_____	_____	_____	_____

Tank Identification Number	Tank No.___		Tank No.___		Tank No.___		Tank No.___		Tank No.___	
4. Release Detection (Mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Manual tank gauging	☐		☐		☐		☐		☐	
Inventory controls	☐		☐		☐		☐		☐	
Automatic tank gauging	☐		☐		☐		☐		☐	
Vapor monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Groundwater monitoring	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring double-walled tank/piping	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interstitial monitoring /secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tank tightness testing	☐		☐		☐		☐		☐	
Automatic line leak detector		☐		☐		☐		☐		☐
Line tightness testing		☐		☐		☐		☐		☐
Automatic shut-off device		☐		☐		☐		☐		☐
Continuous alarm system		☐		☐		☐		☐		☐
No requirements (european suction)		☐		☐		☐		☐		☐
Other (please specify)	_____		_____		_____		_____		_____	
5. Corrosion Protection (mark all that apply)	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping	Tank	Piping
Cathodic protection	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Impressed current	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Secondary containment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Exterior coating	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fiberglass reinforced plastic	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Double-walled	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Interior lining	☐		☐		☐		☐		☐	
Other (please specify)	_____		_____		_____		_____		_____	
6. Spill & Overfill Prevention (Mark all that apply)										
Overfill device	☐		☐		☐		☐		☐	
Automatic shut-off	☐		☐		☐		☐		☐	
Overfill Alarm	☐		☐		☐		☐		☐	
Ball float valve	☐		☐		☐		☐		☐	
Spill containment device	☐		☐		☐		☐		☐	
Other (Please specify)	_____		_____		_____		_____		_____	

VII. Certification of Compliance (Complete for all new, upgraded and relined tanks at this location)

Installation (mark all that apply)					
Installer certified by tank and piping manufacturers	☐	☐	☐	☐	☐
Installer certified or licensed by implementing agency	☐	☐	☐	☐	☐
Installer registered by implementing agency	☐	☐	☐	☐	☐
Installer is the owner of the tank(s)	☐	☐	☐	☐	☐
Installation inspected by a registered engineer	☐	☐	☐	☐	☐
Installation inspected & approved by implementing agency	☐	☐	☐	☐	☐
Manufacturer's installation checklists have been completed	☐	☐	☐	☐	☐
Another method allowed by state agency (please specify)	_____	_____	_____	_____	_____

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DIV. OF PETROLEUM CHEMICAL SAFETY

OATH: I certify the information that is provided in section VII is true to the best of my knowledge, and certify that the installation was performed in accordance with all applicable state and federal laws and regulations. **(THIS SECTION MAY ONLY BE COMPLETED BY THE CONTRACTOR. SEPARATE OATH MUST BE SUBMITTED FOR EACH ACTIVITY PERFORMED BY DIFFERENT CONTRACTOR.)**

Tank No. _____ Permit No. _____

Contractor: _____ (Name) _____ (Signature (must be original)) _____ (Date)

_____ (Position) _____ (Company)

VIII. Financial Responsibility

Mark all that apply:

☐ Self-Insurance ☐ Guarantee ☐ Certificate of Deposit

☐ Commercial Insurance ☐ Surety Bond ☐ Trust Fund

☐ Risk Retention Group ☐ Letter of Credit ☐ Other Method Allowed

(please specify) _____

IX. Certification (Read and sign after completing all sections)

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete.

GRANT C. GUTHMAN, PROJ. ENGR	[signature]	2-23-99
Name and official title of owner or owner's authorized representative (print)	Signature (must be original)	Date Signed

OFFICE OF THE STATE FIRE MARSHAL
DIVISION OF PETROLEUM AND CHEMICAL SAFETY
1035 STEVENSON DRIVE
SPRINGFIELD, ILLINOIS 62703-4259

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FACILITY # 7-021730
PERMIT # 00112-99REM
DATE REMOVED 2/23/99
IEMA #

LOG OF UNDERGROUND STORAGE TANK REMOVAL

OWNER	FACILITY
NAME: PRIMEX TECHNOLOGIES INC	NAME: PRIMEX TECHNOLOGIES TEST RANGE
ADDRESS: RT 148 S PO BOX 278	ADDRESS: SKYLINE DRIVE
CITY: MARION	CITY: MARION
STATE: IL ZIP: 62959	COUNTY: WILLIAMSON ZIP: 62959
PHONE: (618) 993-9478	PHONE: (618) 993-9478

STATUS: MINOR_____ SIGNIFICANT_____ MAJOR_____ APPEARS TO BE NO RELEASE ✓

AREA OF CONTAMINATION: TANK FLOOR N/A WALLS_____ PIPE TRENCH_____ OTHER_____

GROUND WATER CONTAMINATED: YES_____ NO ✓ ANY WATER WELLS IN AREA? YES_____ NO ✓

NUMBER OF TANKS REMOVED: 1

SIZE OF EACH TANK REMOVED:	#2 560 ~~M~~	M	M	M	M	M	M	M
PRODUCT STORED:	FUEL OIL							
DOES THIS TANK APPEAR TO HAVE LEAKED? (Y OR N)	N							

NUMBER OF TANKS TO REMAIN IN GROUND: NONE

SIZE OF EACH TANK:	N/A M	M	M	M	M	M	M	M
PRODUCT STORED:								

COMMENTS:

REMOVAL CONTRACTOR:

NAME: BURKEY EXCAVATING

ADDRESS: 15481 HWY 127

CITY: MURPHYSBORO STATE: IL

PHONE: (618) 687-3040 ZIP: 62966

REGISTRATION #: IL-1662

STORAGE TANK SAFETY SPECIALIST