Draft
Site Inspection Report
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Revision 0

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

April 9, 2015

Contract No. W912QR-04-D-0039
Delivery Order: 0004

Prepared for:

US Army Corps of Engineers®

United States Army Corps of Engineers
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This Site Inspection (SI) report documents the SI activities conducted at CC RVAAP-72 Facility-Wide Underground Storage Tanks at the former Ravenna Army Ammunition Plant in Portage and Trumbull counties, Ohio. The purpose of the SI was to determine the presence or absence of contamination and whether the Facility-Wide Underground Storage Tanks Area of Concern (AOC) warrented further investigation pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

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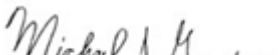
CONTRACTOR'S STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Environmental Chemical Corporation has completed the *Draft Site Inspection Report at the CC RVAAP-72 Facility-Wide Underground Storage Tanks Revision 0 at the Former Ravenna Army Ammunition Plant, Ravenna, Portage and Trumbull Counties, Ohio*. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principals and procedures, utilizing justified and valid assumptions, was verified. This included review of project data quality objectives, technical assumptions, methods, procedures, and materials used. The appropriateness of the data used, level of data obtained, and reasonableness of the results, including whether the product meets the customer's needs, are consistent with law and existing United States Army Corps of Engineers policy.



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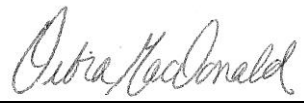

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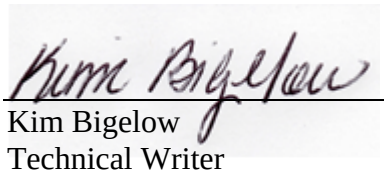

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TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF FIGURES (continued)

LIST OF FIGURES (continued)

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

ºF	Degrees Fahrenheit
µg/kg	Microgram per kilogram
AOC	Area of concern
bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene, and total xylenes
BUSTR	Bureau of Underground Storage Tank Regulations (State of Ohio)
CC	Army Environmental Compliance-Related Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	Centimeter
CR	Compliance Restoration
DRO	Diesel range organics
DSB	Deep soil boring
ECC	Environmental Chemical Corporation
EM	Electromagnetic
ER	Equipment rinsate
FD	Field duplicate
ft	Foot (feet)
FWCUG	Facility-Wide Cleanup Goal
FWSAP	Facility-Wide Sampling and Analysis Plan
FWUST	Facility-Wide Underground Storage Tank
GPR	Ground penetrating radar
GRO	Gasoline range organics
HRR	Historical Records Review
ID	Identification
IDW	Investigation-derived waste
J	Estimated
km	Kilometer
m	Meter
Max	Maximum
MEC	Munitions and explosives of concern
mg/kg	Milligram per kilogram
MTBE	Methyl tertiary-butyl ether

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

NA	Not available
ND	Not detected
NFA	No further action
No.	Number
NR	Not reported
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
P.E.	Professional Engineer
P.G.	Professional Geologist
PMP	Project Management Professional
QC	Quality control
RI	Remedial Investigation
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SB	Soil boring
SI	Site Inspection
SorW	Source water
SRC	Site-related chemical
SVOC	Semivolatile organic compound
TAL	Target Analyte List
TB	Trip blank
TCR	Target Cancer Risk
THQ	Target Hazard Quotient
TPH	Total petroleum hydrocarbon
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound
WOE	Weight-of-evidence

EXECUTIVE SUMMARY

Environmental Chemical Corporation (ECC) was contracted by the United States Army Corps of Engineers (USACE)-Louisville District to complete a Site Inspection (SI) at the Compliance Restoration (CR) Site CC (Army Environmental Compliance-Related Cleanup Program) RVAAP-72 Facility-Wide Underground Storage Tank (FWUST) area of concern (AOC) at the former Ravenna Army Ammunition Plant (RVAAP), in Portage and Trumbull counties, Ohio. This SI was completed under Contract Number (No.) W912QR-04-D-0039, Delivery Order No. 0004, Modification No. 1. This AOC includes all 58 documented former petroleum (e.g., gasoline, fuel oil, diesel, etc.) underground storage tanks (USTs) located at the former RVAAP that were installed to support former RVAAP operations. USTs that were used to store waste products from RVAAP operations or USTs associated, owned, and/or maintained by Ohio Army National Guard are not part of this AOC.

This SI was completed in accordance with the *Final Site Inspection/Remedial Investigation Work Plan at Compliance Restoration Sites* (ECC 2012), and the United States Environmental Protection Agency's (USEPA) *Interim Final Guidance for Performing Site Inspections under CERCLA* (USEPA 1992).

This SI was conducted at 15 of the 58 former UST locations, which are included in CC RVAAP-72 FWUST, based on the findings of the *Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at CR Sites (9 Areas of Concern)* (Science Applications International Corporation [SAIC] 2011a). The other 43 of the 58 USTs under CC RVAAP-72 FWUSTs have no further action (NFA) documentation and/or records of soil sampling results less than the State of Ohio Bureau of Underground Storage Tank Regulations (BUSTR) criteria. These 15 former UST locations (listed below) were recommended for subsurface soil sampling, because no records of soil sampling were found during the Historical Records Review (HRR) (SAIC 2011a). Soil sampling documentation is necessary to demonstrate compliance with BUSTR closure requirements.

- RV-4
- RV-5
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89
- CC-RVAAP-72-01
- CC-RVAAP-72-02
- CC-RVAAP-72-03
- CC-RVAAP-72-04
- CC-RVAAP-72-05
- CC-RVAAP-72-06
- CC-RVAAP-72-08

At 7 of these 15 former UST locations (listed below), there is also no documentation or physical evidence of UST removal. Geophysical methods were used at these former UST locations, during this SI to search for anomalies indicative of a UST remaining in-place.

- RV-4
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89

In addition to the 15 former UST locations listed above, the Ohio Environmental Protection Agency (Ohio EPA) requested additional sampling for hexavalent chromium at 9 former NFA USTs in a comment letter received on September 4, 2011. Therefore this SI was expanded to include investigation for hexavalent chromium at 9 of the 43 former NFA UST locations, under CC RVAAP-72 FWUSTs, which were determined to be NFA USTs based on the findings of the *Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern*) (SAIC 2011a). The Ohio EPA requested that subsurface soil samples be collected at these 9 former NFA UST locations and only be analyzed for hexavalent chromium, since potassium dichromate was once used in these former UST locations to prevent corrosion when they were not in use.

These 9 former NFA UST locations were recommended for subsurface soil sampling and hexavalent chromium analysis by Ohio EPA:

- RV-13
- RV-14
- RV-15
- RV-16
- RV-17
- RV-18
- RV-19
- RV-37
- RV-97

As the 15 former UST locations without records of soil sampling and the 9 former NFA UST locations at which Ohio EPA requested hexavalent chromium sampling were all below ground surface, no surface soil contamination is expected; therefore, this SI focuses on investigating the subsurface soil.

All subsurface soil samples were collected as discrete samples, with exception of the composite subsurface soil sample collected between 7 and 13 feet (ft) below ground surface (bgs). At each former UST location or co-located cluster of former UST locations, 3 or more soil borings were advanced within the inferred UST excavation cavity or around the former UST location identified in the HRR (SAIC 2011a). Subsurface soil samples were collected at a depth below

fill material in the UST cavity excavation, if encountered, or a targeted depth determined from depth and size of the former UST. Subsurface soil samples were collected at intervals based upon field screening, observation of staining, or petroleum odor to increase the likelihood of identifying potential contamination. Soil samples were also collected based upon field screening at soil borings located around the former UST cavity excavation. At 7 of the former UST locations geophysical survey results were used to locate soil borings. Multiple subsurface soil samples within the inferred or around UST excavation cavity and below the former UST were collected to increase the likelihood of identifying potential contamination.

This sampling strategy was conducted in accordance with BUSTR soil sampling guidance for using highly biased sample locations to identify potential contamination from a UST. No surface soils were sampled as part of this SI since a potential release of petroleum-related chemicals from the former UST locations would have impacted surrounding subsurface soil only.

Sediment and surface water are not present at this AOC, and groundwater is being evaluated on a facility-wide basis (RVAAP-66 Facility-Wide Groundwater). Therefore, sediment, surface water, and groundwater samples were not collected during this SI.

The objectives of this SI were as follows.

The primary objective of this SI was to determine the presence of potential contamination in subsurface soil at the 15 former CC RVAAP-72 USTs without records of soil sampling and the 9 former NFA CC RVAAP-72 UST locations at which Ohio EPA requested hexavalent chromium sampling. A secondary objective was to gather geophysical evidence of USTs remaining in-place at 7 former UST locations. In order to determine the presence of potential contamination, the following steps were included as part of this SI:

- Collect discrete subsurface soil samples for laboratory analysis at the selected CC RVAAP-72 FWUSTs.

- Identify whether site-related chemicals (SRCs) are present in the subsurface soil at the select CC RVAAP-72 USTs. SRCs are identified following the process outlined in the *Facility-Wide Human Health Cleanup Goals for Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC 2010).

- Compare the analytical results from the subsurface soil samples with the State of Ohio BUSTR criteria for petroleum related compounds (polycyclic aromatic hydrocarbon [PAH] compounds; benzene, toluene, ethylbenzene, and xylenes [BTEX]; methyl tertiary-butyl ether [MTBE]; two total petroleum hydrocarbon [TPH] diesel range organics [DRO] carbon chain compounds (C10-C20, C20-C34); and one TPH gasoline range organic (GRO) carbon chain compound [C6-C12]). For the purposes of this SI, potential contamination at CC RVAAP-72 is defined by an exceedance of the BUSTR Soil Class 1 Action Levels for petroleum related compounds (Ohio Department of Commerce 2014).

- Compare the maximum reported concentrations of the SRCs, without BUSTR criteria, to the most stringent Resident Receptor Facility-Wide Cleanup Goals (FWCUGs), between the adult and the child receptor, using the Target Cancer Risk (TCR) level of 10^{-6} and the Target Hazard Quotient (THQ) for non-carcinogenic risks of THQ = 0.1. For the purposes of this SI, potential contamination at CC RVAAP-72 for these compounds is defined by an exceedance of the most stringent Resident Receptor FWCUG.

- Complete a weight-of-evidence (WOE) approach to further evaluate the SRCs reported at concentrations exceeding the most stringent Resident Receptor FWCUG using the TCR level of 10^{-6} or the THQ for non-carcinogenic risks at THQ = 0.1 and BUSTR criteria.

- Provide a recommendation for either further investigation under CERCLA, in the form of a remedial investigation or a recommendation for further investigation under BUSTR if potential contamination has been identified, or No Further Action (NFA) if no potential contamination has been identified at the CC RVAAP-72 FWUSTs.

- Perform a non-intrusive geophysical survey at 7 former UST locations to determine if USTs were removed from CC RVAAP-72 FWUSTs.

- Provide a recommendation for no further investigation to locate USTs if no geophysical survey anomalies are reported, indicating USTs were removed.

- Provide a recommendation for further action if a geophysical survey anomaly interpreted as a UST is reported, to confirm or complete UST removal.

The subsurface soil sampling was conducted at 24 of the CC RVAAP-72 USTs following the BUSTR guidance to collect samples biased towards areas where potential contamination would be located. At the 15 former CC RVAAP-72 USTs, for which no records of soil sampling at the time of UST removal were found, subsurface soil samples were collected and analyzed for PAH compounds, BTEX, MTBE, two TPH DRO carbon chain compounds, one TPH GRO carbon chain compound, and metals. Seven subsurface soil samples were also collected and analyzed for the RVAAP full-suite analytes, which included volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), Target Analyte List (TAL) metals, explosives, polychlorinated biphenyls (PCBs), pesticides, and propellants, as required by the former RVAAP-Wide Sampling and Analysis Plan (SAIC 2011b). At the 9 former NFA USTs, subsurface soil samples were collected and analyzed for hexavalent chromium. A summary of subsurface soil samples collected during this SI is as follows:

- Seventy-two discrete subsurface soil samples were collected from multiple borings at each of the 15 CC RVAAP-72 USTs, for which no records of soil sampling at the time of UST removal were found. Sample collection depth was determined by the known or suspected depth of the former UST and by field screening.

- Thirty-two discrete subsurface soil samples were collected from multiple borings at each of the 9 additional NFA CC RVAAP-72 UST locations from which Ohio EPA requested

hexavalent chromium data. Sample collection depth was determined by the known or suspected depth of the UST.

- Twelve subsurface soil samples were collected as a composite between 7 and 13 ft bgs to characterize the subsurface soil to 13 ft bgs at each of the 15 CC RVAAP-72 UST locations for which no records of soil sampling at the time of UST removal were found.

The analytical results from the SI samples were used to determine if potential contamination was present by first identifying the SRCs. Per the RVAAP's *Facility-Wide Human Health Risk Assessment Manual* (USACE 2005), a chemical detected at a concentration greater than the established background value, is not an essential nutrient, and has not been screened out through a frequency of detection, is identified as an SRC. An SRC may, or may not be, related to the former operations at the site. The resulting maximum detected concentration of each petroleum-related SRC identified in this SI was compared to the BUSTR criteria. The resulting maximum detected concentrations for non-petroleum related compounds were compared to the most stringent FWCUG for the Resident Receptor (between the adult and child receptors) using the TCR level of 10^{-6} or the THQ for non-carcinogenic risks of THQ = 0.1 for each SRC to determine the presence of potential contamination.

The SRCs that exceeded the most stringent value (between adult and child receptors) Resident Receptor FWCUG, using a TCR level of 10^{-6} or the THQ = 0.1 for non-carcinogenic risks or Soil Class 1 Action Levels were then evaluated using a WOE approach. The WOE evaluation considers the SRCs that exceed their Resident Receptor FWCUGs, as described above, to determine if the chemical should be identified as potential contamination.

A summary of the SI results for the 15 former UST locations with no previous records of soil sampling and the 9 former NFA UST locations from which Ohio EPA requested hexavalent chromium sampling is as follows.

Geophysical Survey Results

The results of the geophysical survey at seven former UST locations reported only one anomaly that could be interpreted as a UST. Other anomalies were found such as vent pipes, conduits, and evidence of past excavations; and these results were used to locate soil borings to increase the likelihood of finding potential contamination associated with the former UST locations.

- Two anomalies were reported at the former UST RV-46 location, which is located next to the former Bolton Manor (Building EE-102). Former UST RV-46 was reported to be a 1,500-gallon tank used to store No. 2 fuel oil for heating the former Bolton Manor.

- At former UST RV-46 location, a large magnetic anomaly, approximately 2 ft by 3 ft, was located by electromagnetic (EM) survey. Ground penetrating radar (GPR) survey confirmed this anomaly was an object in place with an irregular surface, but it could not be confirmed as a UST.

- At former UST RV-46 location, a second anomaly was identified during the GPR survey that had the proper dimensions and features of a UST, but did not have any magnetic return. This feature was interpreted as a concrete UST approximately 7.5 ft in width and 8.8 ft in length.

Subsurface Soil Results

The following SRCs were identified at the former 15 UST locations: 5 petroleum-related VOCs (1,2-dichloroethane, benzene, ethylbenzene, toluene, and xylenes), 2 non-petroleum related VOCs (chloroform and carbon tetrachloride), 19 SVOCs (primarily PAH compounds), 2 TPH DRO carbon chain compounds, 1 TPH GRO carbon chain compound, 1 herbicide, and 10 TAL metals.

- One VOC (carbon tetrachloride) was reported in the subsurface soil sample collected between 5 and 6 ft bgs at the former UST location RV-5 (at former Building 1048 Fire Station) at an estimated (J) concentration of 14,000 J micrograms per kilogram (µg/kg) which exceeds the Residential Regional Screening Level (610 µg/kg) for this compound. A WOE evaluation determined that carbon tetrachloride was not related to the historical activities and use of former UST RV-5, which was used to store gasoline. As stated in the HRR (SAIC 2011a), *The acreage where carbon tetrachloride was reported by former employees to have been discharged is not accurately defined but is assumed to be less than 1 acre northwest of former Building 1048. Interviewees noted an approximately 8-ft by 8-ft metal storage shed, used to store carbon tetrachloride and possibly other chemicals, was located adjacent to the fire station.* Carbon tetrachloride is related to the aboveground use of fire extinguishers containing this compound and is not related to the use of former UST RV-5 to store gasoline. Carbon tetrachloride has been addressed by the CC RVAAP-69 remedial investigation.

- Two TAL metals (arsenic and manganese) were reported at concentrations exceeding both the background value and the most stringent Resident Receptor FWCUG in the subsurface soil samples collected at the three of former UST locations.

  - At former UST location RV-4, manganese (soil boring SB1, 5-6 ft bgs) was reported at an estimated concentration of 3,400 J milligrams per kilogram (mg/kg), which exceeded the background value (3,030 mg/kg), and Resident Receptor FWCUG (293 mg/kg).

  - At former UST location CC-RVAAP-72-05 (the Atlas Scrap Yard), arsenic was reported at an estimated concentration of 22 J mg/kg which exceeds background (19.8 mg/kg) and the Resident Receptor FWCUGs (0.425 mg/kg) in one sample collected (SB4 from 8 to 9 ft bgs).

  - At former UST location CC-RVAAP-72-08, arsenic was reported at a concentration of 20 mg/kg, which exceeds background (19.8 mg/kg) and the Resident Receptor FWCUGs (0.425 mg/kg) in one sample collected (SB4 from 7 to 13 ft bgs).

A WOE evaluation determined that arsenic and manganese were not related to the historical activities and use at the former UST locations RV-4, CC-RVAAP-72-05, and CC-RVAAP-72-08 to store gasoline, kerosene, and No. 2 fuel oil, respectively.

There were no reported exceedances of the BUSTR Soil Action Levels Class 1 in any of the subsurface soil samples collected from the UST locations.

- Subsurface soil samples collected from the former UST RV-46 location near the anomalies reported by the geophysical surface had the maximum reported concentrations of two TPH DRO carbon chain compounds reported at CC RVAAP-72. Other former UST locations with confirmed UST removal have petroleum compounds with non-detect results for TPH compounds or PAHs at anthropogenic background levels. The reported concentrations in samples obtained from former UST RV-46 were less than BUSTR Soil Action Levels Class 1.

- At the 9 former NFA USTs sampled for hexavalent chromium at Ohio EPA's request, all subsurface soil sample results for hexavalent chromium were either non-detect or less than the most stringent Resident Receptor FWCUG.

- Therefore, no potential contaminants related to site operations were identified in the subsurface soil at CC RVAAP-72 FWUSTs.

The conclusions of this SI are as follows:

- No potential contaminants were identified in the subsurface soil sampled at the CC RVAAP-72 FWUSTs.

- The results of this SI indicate that the subsurface soil is not contaminated; therefore, soil is not a source of groundwater contamination at the CC RVAAP-72 FWUSTs.

- At the UST RV-46 location, the geophysical surveys determined the presence of a subsurface concrete anomaly (7.5 ft in width and 8.8 ft in length) interpreted to be UST-46.

Further action is warranted at the location of the former UST RV-46 EM and GPR anomalies to confirm or complete UST removal from the site in accordance with BUSTR UST closure requirements.

The results of this SI indicate that NFA is warranted for subsurface soil at CC RVAAP-72 FWUSTs.

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1.0 INTRODUCTION

Environmental Chemical Corporation (ECC) was contracted by the United States Army Corps of Engineers (USACE)–Louisville District to complete a Site Inspection (SI) for Compliance Restoration (CR) Site CC (Army Environmental Compliance-Related Cleanup Program) RVAAP-72 Facility-Wide Underground Storage Tank (FWUST) Areas of Concern (AOCs) at the former Ravenna Army Ammunition Plant (RVAAP) in Portage and Trumbull counties, Ohio. The location of the former RVAAP is provided in Figure 1-1 and the location of the CR sites at the former RVAAP is shown in Figure 1-2. This SI was completed and this document was prepared by ECC under Contract Number (No.) W912QR-04-D-0039, Delivery Order No. 0004, Modification No. 1.

Planning and performance of all elements of this contract are in accordance with the requirements of the *Ohio Environmental Protection Agency Director's Final Findings and Orders for RVAAP* (Ohio Environmental Protection Agency [Ohio EPA] 2004). The Director's Final Findings and Orders require conformance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan to complete this SI for AOC CC RVAAP-72.

This SI for CC RVAAP-72 was conducted in accordance with the United States Environmental Protection Agency's (USEPA) *Interim Final Guidance for Performing Site Inspections Under CERCLA* (USEPA 1992), as well as the *Final Site Inspection and Remedial Investigation Work Plan at Compliance Restoration Sites (Revision 0) Ravenna Army Ammunition Plant, Ravenna, Ohio* (ECC 2012).

This SI was conducted at 15 of the 58 former underground storage tanks (USTs) shown in Figure 1-3, which are under CC RVAAP-72, based on the findings of the *Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern)* (Science Applications International Corporation [SAIC] 2011a). The remaining 43 of the 58 USTs under CC RVAAP-72 have no further action (NFA) documentation and/or records of soil sampling results less than State of Ohio Bureau of Underground Storage Tank Regulations (BUSTR) criteria. These 15 USTs (listed below) were recommended for subsurface soil sampling because no records of soil sampling were found during the Historical Records Review (HRR) (SAIC 2011a) to demonstrate compliance with BUSTR closure sampling requirements.

- RV-4
- RV-5
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89
- CC-RVAAP-72-01
- CC-RVAAP-72-02

- CC-RVAAP-72-03
- CC-RVAAP-72-04
- CC-RVAAP-72-05
- CC-RVAAP-72-06
- CC-RVAAP-72-08

At 7 of these 15 former UST locations (listed below) with no records of soil sampling locations, there is also no documentation or physical evidence of UST removal. Therefore, geophysical methods were used during this SI to search for anomalies indicative of a UST remaining in-place at these locations.

- RV-4
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89

This SI was also conducted at 9 of the 43 former UST locations, under CC RVAAP-72, which were determined to be NFA USTs based on the findings of the *Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at CR Sites (9 Areas of Concern*) (SAIC 2011a). Ohio Environmental Protection Agency (Ohio EPA) requested additional sampling for hexavalent chromium at 9 former NFA USTs in a comment letter received on September 4, 2011, as potassium dichromate was once used in these USTs to prevent corrosion when they were not in use. Potassium dichromate solutions contain hexavalent chromium.

These 9 former NFA USTs were recommended for subsurface soil sampling by Ohio EPA only for hexavalent chromium:

- RV-13
- RV-14
- RV-15
- RV-16
- RV-17
- RV-18
- RV-19
- RV-37
- RV-97

As the 15 former UST locations with no records of soil sampling and the 9 former NFA UST locations at which Ohio EPA requested hexavalent chromium sampling were all less than the ground surface, no surface soil contamination is expected; therefore, this SI focuses on investigating the subsurface soil.

This SI includes the following components:

- Site descriptions and operational histories
- Waste characteristics and management practices
- Summary of field investigation and pre-mobilization activities
- Summary of ground penetrating radar (GPR) and electromagnetic (EM) surveys
- Summary of waste characteristics and management practices
- Comparison of investigation results with the most recent BUSTR Soil Action Levels Class 1 criteria for petroleum-related compounds and comparison of non-petroleum related investigation results with the most recent Facility-Wide Cleanup Goals (FWCUGs)
- Exposure pathways evaluation for surface soil, subsurface soil, air, surface water, and groundwater
- Conclusions
- References

1.1 PURPOSE AND SCOPE

ECC is submitting this SI report to the USACE–Louisville District in accordance with the Performance Work Statement, Contract No.W912QR-04-D-0039, Delivery Order No. 0004 under a firm-fixed price Performance-Based Acquisition to provide environmental investigation and remediation services at 14 CR sites at the former RVAAP, Portage and Trumbull counties, (Figures 1-1 and 1-2). The Delivery Order was issued by the USACE-Louisville District on August 15, 2011.

Environmental work at the former RVAAP under the Installation Restoration Program began in 1989, with 32 environmental AOCs. The United States Army Center for Health Promotion and Preventive Medicine collected environmental samples at each AOC and performed a Relative Risk Site Evaluation, which prioritized each AOC into one of three groups: low, medium, and high priorities. Environmental restoration work has proceeded primarily by addressing the highest priority sites first. In 1998, the number of environmental AOCs was increased from 32 to 51. Relative risk rankings were conducted to further prioritize those additional environmental AOCs. Since 1998, new environmental AOCs have been added. This SI discusses one of these AOCs: CC RVAAP-72 FWUST.

Historical information for CC RVAAP-72 AOC is presented in the *Final Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern) at the Ravenna Army Ammunition Plant, Ravenna, Ohio*, dated

December 22, 2011 (SAIC 2011a). The HRR (SAIC 2011a) followed the USEPA guidance document that establishes the minimum requirements for conducting an Abbreviated Preliminary Assessment, as outlined in *Improving Site Assessment: Abbreviated Preliminary Assessments* (USEPA 1999).

1.2 FACILITY DESCRIPTION

The facility, consisting of 21,683 acres, is located in northeastern Ohio within Portage and Trumbull counties, approximately 4.8 kilometers (km) (3 miles) east/northeast of the city of Ravenna and approximately 1.6 km (1 mile) northwest of the city of Newton Falls. The facility, previously known as the RVAAP, was used as a load, assemble, and pack facility for munitions production. As of September 2013, administrative accountability for the entire acreage of the facility has been transferred to the United States Property and Fiscal Office for Ohio and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp Ravenna). References in this document to the former RVAAP relate to previous activities at the facility as related to former munitions production activities or to activities being conducted under the restoration/cleanup program.

1.3 DEMOGRAPHY AND LAND USE

The facility consists of 21,683 acres in northeastern Ohio, approximately 37 km (23 miles) east-northeast of Akron and 30 miles (48.3 km) west-northwest of Youngstown. The facility occupies east-central Portage County and southwestern Trumbull County. The 2010 United States Census Bureau reports that the populations of Portage and Trumbull counties are 161,419 and 210,312, respectively. Population centers closest to the facility are Ravenna, with a population of 11,724, and Newton Falls, with a population of 4,795.

The facility is located in a rural area and is not close to any major industrial or developed areas. Approximately 55 percent of Portage County, in which the majority of the facility is located, consists of either woodland or farmland acreage. The closest major recreational area, the Michael J. Kirwan Reservoir (also known as West Branch Reservoir), is south of the facility.

The facility is licensed to the OHARNG for use as a military training site. Training and related activities at Camp Ravenna include field operations and bivouac training, convoy training, equipment maintenance; C-130 aircraft drop zone operations, helicopter operations, and storage of heavy equipment.

1.4 FACILITY ENVIRONMENTAL SETTING

This section describes the physical features, topography, geology, hydrogeology, and environmental characteristics of the facility. Due to the number of former UST locations that are the subject of this SI report and their wide geographic distribution across the facility, the descriptions below also pertain generally to the UST locations in terms of topography, hydrogeology, and soil type. The environmental setting specific to each of the 24 former USTs is included in Chapter 6.0.

1.4.1 Physiographic Setting

The facility is located within the Southern New York Section of the Appalachian Plateaus physiographic province (United States Geological Survey 1968). This province is characterized by elevated uplands underlain primarily by Mississippian and Pennsylvanian-age bedrock units that are horizontal or gently dipping. The province is characterized by rolling topography with incised streams having dendritic drainage patterns. The Southern New York Section has been modified by glaciation, which rounded ridges, filled major valleys, and blanketed many areas with glacially-derived unconsolidated deposits (e.g., sand, gravel, and finer-grained outwash deposits). As a result of glacial activity, old stream drainage patterns were disrupted in many locales, and extensive wetland areas developed.

1.4.2 Surface Features and Topography

The topography is gently undulating with an overall decrease in ground elevation from a topographic high of approximately 1,220 feet (ft) (372 meters [m]) above mean sea level in the far western portion of the facility to low areas at approximately 930 ft (283 m) above mean sea level in the far eastern portion of the facility.

USACE mapped the facility topography in February 1998 using a 2-ft (60.1-centimeter [cm]) contour interval with an accuracy of 0.02 ft (0.61 centimeters [cm]). USACE based the topographic information on aerial photographs taken during the spring of 1997. The USACE survey is the basis for the topographical information illustrated in figures included in this report.

1.4.3 Soil and Geology

1.4.3.1 Regional Geology

The regional geology the facility consists of horizontal to gently dipping bedrock strata of Mississippian and Pennsylvanian-age overlain by unconsolidated glacial deposits of varying thicknesses. The local bedrock and unconsolidated surficial deposits are described in the following subsections.

1.4.3.2 Soil and Glacial Deposits

Bedrock at the facility is overlain by surficial deposits of Wisconsin-age Lavery Till in the western portion of the facility and the younger Hiram Till and associated outwash deposits in the eastern two-thirds of the facility (Figure 1-4). Unconsolidated glacial deposits vary considerably in thickness across the facility, from nonexistent in some of the eastern portions of the facility to an estimated 150 ft (46 m) in the south-central portion.

Thin surface glacial deposits have been completely removed as a consequence of human activities at locations such as Ramsdell Quarry. Bedrock is present at or near the ground surface in locations such as at Load Line 1 and the Erie Burning Grounds (USACE 2001).

Where surficial glacial sediments remain, their distribution and character indicate their origin as ground moraine. These tills consist of laterally discontinuous assemblages of yellow-brown, brown, and gray silty clays to clayey silts, with sand and rock fragments. Lacustrine sediment from bodies of glacial-age standing water has also been encountered in the form of deposits of uniform light gray silt greater than 50 ft (15 m) thick in some areas (USACE 2001).

Soil at the facility is generally derived from the Wisconsin-age silty clay glacial till. Distributions of soil types are discussed and mapped in the *Soil Survey of Portage County, Ohio*, which describes soil as nearly level to gently sloping and poor to moderately well drained (United States Department of Agriculture [USDA] 1978). Much of the native soil at the facility was disturbed during construction activities in former production and operational areas of the facility.

The soil classification types (USDA 2010) present at the facility are shown in Figure 1-5 and Figure 1-6 and described in Table 1-1. The primary soil types present at the 15 former UST locations for CC RVAAP-72 FWUSTs are shown in Figures 1-7, 1-8, 1-9, and 1-10. Soils present beneath the former 9 NFA UST locations are shown in Figure 1-11.

1.4.3.3 Bedrock Geology

The Sharon Sandstone Member (informally referred to as the Sharon Conglomerate) of the Pennsylvanian Pottsville Formation is the primary bedrock beneath the facility (Figure 1-12). The Sharon Sandstone Member, the lowest unit of the Pottsville Formation, is a highly porous, loosely cemented, permeable, cross-bedded, frequently fractured and weathered, orthoquartzite sandstone, which is locally conglomeratic. Thin shale lenses occur in the upper portion of the unit (Winslow and White 1966).

In the western portion of the facility, the upper members of the Pottsville Formation, including the Sharon Shale, Connoquenessing Sandstone (also known as the Massillon Sandstone), Mercer Shale, and uppermost Homewood Sandstone, have been observed (Figure 1-12). The regional dip of the Pottsville Formation, as measured in the west portion of the facility is between 1.5 and 3.5 m per 1.6 km (5 and 11.5 ft per mile) to the south.

The Sharon Shale is a gray to black sandy to micaceous shale containing thin coal, underclay, and sandstone lenses. The Mercer Member of the Pottsville Formation consists of silty to carbonaceous shale with abundant thin, discontinuous sandstone lenses in the upper portion. Regionally, the Mercer also has been noted to contain interbeds of coal.

The Homewood Sandstone Member is the uppermost unit of the Pottsville Formation. It typically occurs as a caprock on bedrock highs in the subsurface, and ranges from well-sorted, coarse-grained, white quartzose sandstone to a tan, poorly sorted, clay-bonded, micaceous, medium- to fine-grained sandstone. Thin shale layers are prevalent in the Homewood Member as indicated by a darker gray shade of color.

1.4.4 Hydrogeology

1.4.4.1 Regional Hydrogeology

Sand and gravel aquifers are present in the buried-valley and outwash deposits in Portage County, as described in the *Phase I Remedial Investigation Report for High Priority Areas of Concern at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1998). Generally, these saturated zones are too thin and localized to provide large quantities of water for industrial or public water supplies; however, yields are sufficient for residential water supplies. Lateral extent and continuity of these aquifers are unknown. Recharge of these units is derived from surface water infiltration of precipitation and surface streams. Specific groundwater recharge and discharge areas at the facility have not been delineated. The regional potentiometric surface at the facility for unconsolidated surficial deposits and minor bedrock aquifers are presented in Figures 1-13 and 1-14, respectively (Environmental Quality Management 2013).

The thickness of the unconsolidated surficial deposits at the facility ranges from thin to absent in the eastern and northeastern portion of the facility to an estimated 150 ft (46 m) in the central portion of the facility. The water table (Figure 1-13) is encountered within the unconsolidated zone in many areas of the facility. Because of the heterogeneous nature of the surficial deposits, groundwater flow patterns are difficult to determine. Aquifer recharge from precipitation likely occurs via infiltration along root zones, desiccation cracks, and partings within the soil column. Laterally, local groundwater flow directions likely follow topographic contours and stream drainage patterns (Figure 1-13), with preferential flow along pathways (e.g., sand seams, channel deposits, or other stratigraphic discontinuities) having higher permeabilities than surrounding clay or silt-rich material.

Beneath the facility, the principal bedrock aquifer is the Sharon Conglomerate (Figure 1-15) (Environmental Quality Management 2013). Depending on overburden thickness, the Sharon Conglomerate bedrock aquifer ranges from an unconfined to a leaky artesian aquifer hydraulically. According to one source, well yields from onsite supply wells completed in the Sharon Conglomerate range from 30 to 400 gallons per minute (United States Army Toxic and Hazardous Materials Agency 1978). Yields of 5 -200 gallons per minute have also been reported for onsite bedrock wells completed in the Sharon Conglomerate (Kammer 1982).

Other local bedrock aquifers include the Homewood Sandstone (Figure 1-14), which is generally thinner and only capable of well yields less than 10 gallons per minute, and the Connoquenessing Sandstone. Wells completed in the Connoquenessing Sandstone in Portage County yield from 5 to 100 gallons per minute, but are typically less productive than the Sharon Conglomerate due to a lower formation permeability.

In general, the hydraulic gradient in the Sharon Conglomerate bedrock aquifer results in a regional eastward flow of groundwater (Figure 1-15) that appears to be more uniform than flow directions in the unconsolidated surficial deposits (Figure 1-13) because local surface topography influences the latter. Due to the lack of well data in the western portion of the facility, general flow patterns are difficult to discern. For much of the eastern half of the facility, hydraulic head elevations in bedrock are higher than those in overlying unconsolidated deposits, indicating an

upward vertical hydraulic gradient. These data suggest there is a confining layer separating the two aquifers in some areas. In the far eastern area, there is little difference in the hydraulic head elevations, suggesting a hydraulic connection exists between the two aquifers.

1.4.4.2 Groundwater Usage and Domestic Water Supply

The former RVAAP historically used groundwater for both domestic and industrial supplies. Groundwater utilized at the former RVAAP during past operations was obtained from production wells located throughout the former RVAAP, with most wells screened in the Sharon Conglomerate. The Army discontinued use of most of the groundwater production wells prior to 1993, when the facility was placed in modified caretaker status. Currently, one of the four original groundwater production wells remains in use by the OHARNG. This well, located in the former Administration Area, is not used as a potable water source, but supplies non-potable water for sanitary purposes for active use buildings on the facility.

In addition, as of 2011, the OHARNG has installed two bedrock aquifer production wells at the facility. These two OHARNG supply wells were completed in the Sharon Conglomerate near Buildings 1067 and 1068 within the former Administration Area. There is also one inactive non-potable supply well just south of Winklepeck Burning Grounds along the east side of George Road, which was formerly used to supply water for environmental restoration activities.

The closest population center to the facility, the City of Newton Falls, obtains municipal water supplies from the east branch of the Mahoning River. Currently, most groundwater use in the area surrounding the facility is for domestic and livestock supply, with the Sharon Conglomerate acting as the major producing aquifer in the area. The Connoquennissing Sandstone Member and Homewood Sandstone Member also provide limited groundwater supplies, primarily to the western half of the facility. Unconsolidated deposits can also be an important source of groundwater. Many of the domestic wells and small public water supplies located near the facility obtain sustainable quantities of water from wells completed in unconsolidated, surficial deposits.

In the unconsolidated aquifer, groundwater flows predominantly eastward; however, the unconsolidated zone shows numerous local flow variations influenced by topography and drainage patterns (Figure 1-13). The local variations in flow direction suggest the following: (1) groundwater in the unconsolidated deposits is generally in direct hydraulic communication with surface water, and (2) surface water drainage ways may also act as groundwater discharge locations. In addition, topographic ridges between surface water drainage features act as groundwater divides in the unconsolidated deposits.

Local groundwater within and surrounding the facility contains proportionately high levels of iron, manganese, and naturally occurring carbonate compounds. As such, it is classified as "hard" water. Hard water has an associated metallic taste that can be unpalatable if not properly treated for human consumption (OHARNG 2008).

1.4.4.3 Regional Surface Water

The facility resides within the Mahoning River watershed, which is part of the Ohio River basin. The west branch of the Mahoning River is the main surface stream in the area. The west branch flows adjacent to the west end of the facility, generally north to south, before flowing into the Michael J. Kirwan Reservoir south of State Route 5 (Figure 1-3). The west branch flows out of the reservoir and parallels the southern facility boundary before joining the Mahoning River east of the facility.

The western and northern portions of the facility display low hills and a dendritic surface drainage pattern. The eastern and southern portions are characterized by an undulating to moderately level surface, with less dissection of the surface drainage. The facility is marked with marshy areas and flowing and intermittent streams whose headwaters are located in the upland areas of the facility.

The three primary watercourses that drain the facility are as follows (Figure 1-3):

- South fork of Eagle Creek
- Sand Creek
- Hinkley Creek

All of these watercourses have many associated tributaries. Sand Creek, with a drainage area of 13.9 square miles (36 square km), flows generally in a northeast direction to its confluence with the south fork of Eagle Creek. In turn, the south fork of Eagle Creek continues in a northerly direction for 2.7 miles (4.3 km) to its confluence with Eagle Creek. The drainage area of the south fork of Eagle Creek is 26.2 square miles (67.8 square km), including the area drained by Sand Creek. Hinkley Creek originates just southeast of the intersection between State Route 88 and State Route 303 to the north of the facility. Hinkley Creek, with a drainage area of 11.0 square miles (28.5 square km), flows in a southerly direction through the facility, and converges with the west branch of the Mahoning River south of the facility (USACE 2001).

Approximately one-third of the facility meets the regulatory definition of a wetland, with the majority of the wetland areas located in the eastern portion of the facility. Wetland areas at the facility include seasonal wetlands, wet fields, and forested wetlands. Many of the wetland areas are the result of natural drainage or beaver activity; however, some wetland areas are associated with anthropogenic settling ponds and drainage areas.

Approximately 50 ponds are scattered throughout the facility. Many were constructed within natural drainage ways to function as settling ponds or basins for process effluent and runoff. Others are natural in origin, resulting from glacial action or beaver activity. Water bodies at the facility support aquatic vegetation and biota. Stormwater runoff is controlled primarily by natural drainage, except in former operations areas where an extensive storm sewer network helps to direct runoff to drainage ditches and settling ponds. Additionally, the storm sewer system was one of the primary drainage mechanisms for process effluent during the period that former production facilities were in operation.

1.4.5 Climate

The general climate of the area where the facility is located is continental and characterized by moderately warm and humid summers, reasonably cold and cloudy winters, and wide variations in precipitation from year to year. Climate data for the facility, presented below, were obtained from available National Weather Service records for the 30-year period of record from 1981 to 2010 at the Youngstown Regional Airport, Ohio *(http://www.nws.noaa.gov/climate/xmacis.php?wfo=cle*). Wind speed data for Youngstown, Ohio, are from the National Climatic Data Center *(http://www.ncdc.noaa.gov/data-access/quick-links#wind*) for the available 66-year period of record from 1930 through 1996.

Average annual rainfall in the area is 38.86 inches (98.7 cm), with the highest monthly average occurring in July (4.31 inches [10.9 cm]) and the lowest monthly average occurring in February (2.15 inches [5.46 cm]). Average annual snowfall totals approximately 63.4 inches (161.0 cm) with the highest monthly average occurring in January (17.1 inches [43.43 cm]). Due to the influence of lake-effect snowfall events associated with Lake Erie, located approximately 35 miles (56.3 km) northwest of the facility, snowfall totals vary widely throughout northeastern Ohio.

The average annual daily temperature in the area is 49.3 degrees Fahrenheit (ºF), with an average daily high temperature of 59.0ºF and an average daily low temperature of 39.7ºF. The record high temperature of 100ºF occurred in July 1988, and the record low temperature of -22ºF occurred in January 1994. The prevailing wind direction at the facility is from the west-southwest, with the highest average wind speed occurring in January (12 miles [19.3 km] per hour) and the lowest average wind speed occurring in August (7 miles [11.3 km] per hour). As per the National Climatic Data Center, 20 storm events (category Thunderstorm Wind) were reported between January 1, 1996 and July 31, 2013 *(http://tinyurl.com/k2kn47o).* The area is susceptible to tornadoes; minor structural damage to several buildings on the facility property occurred as the result of a tornado in 1985.

1.5 REPORT ORGANIZATION

This SI report is organized into the following sections:

- ***Chapter 1 (Introduction)*—**Provides an overview of the purpose and scope of this SI, a general description, and the demography and land use of the facility. This section also provides an overview of the environmental setting at the facility.

- ***Chapter 2 (Site Description and Operational History)*—**Provides the site description and land use history of CC RVAAP-72 FWUSTs. The physical property characteristics, chronological history of the property, military operations, and summary of the past investigations at the CC RVAAP-72 FWUSTs are included.

- ***Chapter 3 (Historical Operations)*—**Summarizes the historical operations, investigations, and removal actions at CC RVAAP-72 FWUSTs.

- ***Chapter 4 (Field Investigation)***—Addresses the scope of activities performed under this SI. This section discusses sampling rationale for placement of environmental media sampling locations, field activity procedures, laboratory methods, and protocols. Included in this section are the pre-mobilization activities and the field sampling methodologies for the subsurface soil sampling. Deviations from the work plan are outlined in this section. Site surveying and the collection and characterization of the investigation-derived wastes (IDW) generated during this SI are discussed.

- ***Chapter 5 (Data Evaluation and Summary of Analytical Results)***—Provides the data evaluation process used for this SI, a summary of subsurface soil sampling results, and a presentation of the comparison of the non-petroleum compound SRCs to the most stringent Resident Receptor FWCUGs, and the petroleum compound SRCs to the BUSTR Soil Action Levels Class 1 criteria to identify the presence of potential contamination. The results of the weight-of-evidence (WOE) evaluation are provided in this chapter, as well as a discussion of the IDW characterization results.

- ***Chapter 6 (Exposure Pathways)***—Summarizes physical conditions, and hydrological and hydrogeological settings and provides conclusions for the exposure pathways identified for soil, air, surface water, and groundwater.

- ***Chapter 7 (Summary and Conclusions)***—Summarizes findings and conclusions of this SI.

- ***Chapter 8 (References)***—Lists references used for this report.

Report appendixes contain summarized investigation data as follows:

- Appendix A – Field Activity Forms

- Appendix B – Boring Logs

- Appendix C – Data Verification Report

- Appendix D – Laboratory Analytical Results, Laboratory Data, and Chain of Custody Forms

- Appendix E – Data Validation Report

- Appendix F – IDW Disposal Letter Reports

- Appendix G – Site Photographs

- Appendix H – Surface Geophysical Survey Report

- Appendix I – Historical Groundwater Data

- Appendix J – Regulatory Correspondence and Comment Response Table

1406 **Table 1-1: Soil Types at CC RVAAP-72**

USDA Soil Series Classification	Parent Material	Geographic Setting	Slope %	Drainage	Surface Runoff	Permeability
Frenchtown silt loams (Fr)	Formed in loam glacial till	On undulating till plain and in long, narrow areas along drainage ways	Level	Poorly drained	Slow	Slow
Holly silt loams (Ho)	Formed in recent alluvium	On narrow flood plains and strips on large flood plains	Level	Poorly drained	Slow	Moderate to moderately slow
Mahoning silt loams (MgA)	Formed in silty clay loam or clay loam glacial till	In upland areas between drainage ways	0-2	Poorly drained	Slow	Slow
Mahoning silt loams (MgB)	Formed in silty clay loam or clay loam glacial till	In slightly convex upland areas	2-6	Poorly drained	Medium to rapid	Slow
Mahoning-Urban land complex (MnB)	Formed in silty clay loam or clay loam glacial till	In urban or industrialized areas	Undulating	Varies	Varies	Varies
Mitiwanga silt loam (MtB)	Formed in glacial till 20-40 inches thick overlaying sandstone bedrock	On uplands, commonly at a slightly higher elevation than surrounding soils	2-6	Poorly drained	Medium	Moderate
Trumbull silt loam (TrA)	Formed in silty clay loam, clay loam, or silty clay glacial till	Along small drainage ways or in small depressions adjacent to the better-drained Mahoning and Remsen soils	0-2	Poorly drained	Slow	Very slow
Udorthents (Ud)	Subsoil or substratum of adjacent soils	In areas that have been cut or filled	0-10	Varies	Varies	Varies
Wadsworth silt loams (WaA)	Formed in silty clay loam and silt loam glacial till	On broad upland flats	0-2	Poorly drained	Slow	Slow
Wadsworth silt loams (WaB)	Formed in silty clay loam and silt loam glacial till	Near the heads of drainage ways and on long gentle upland slopes	2-6	Poorly drained	Moderate	Slow

1407 Note:
1408 USDA = United States Department of Agriculture.
1409
1410

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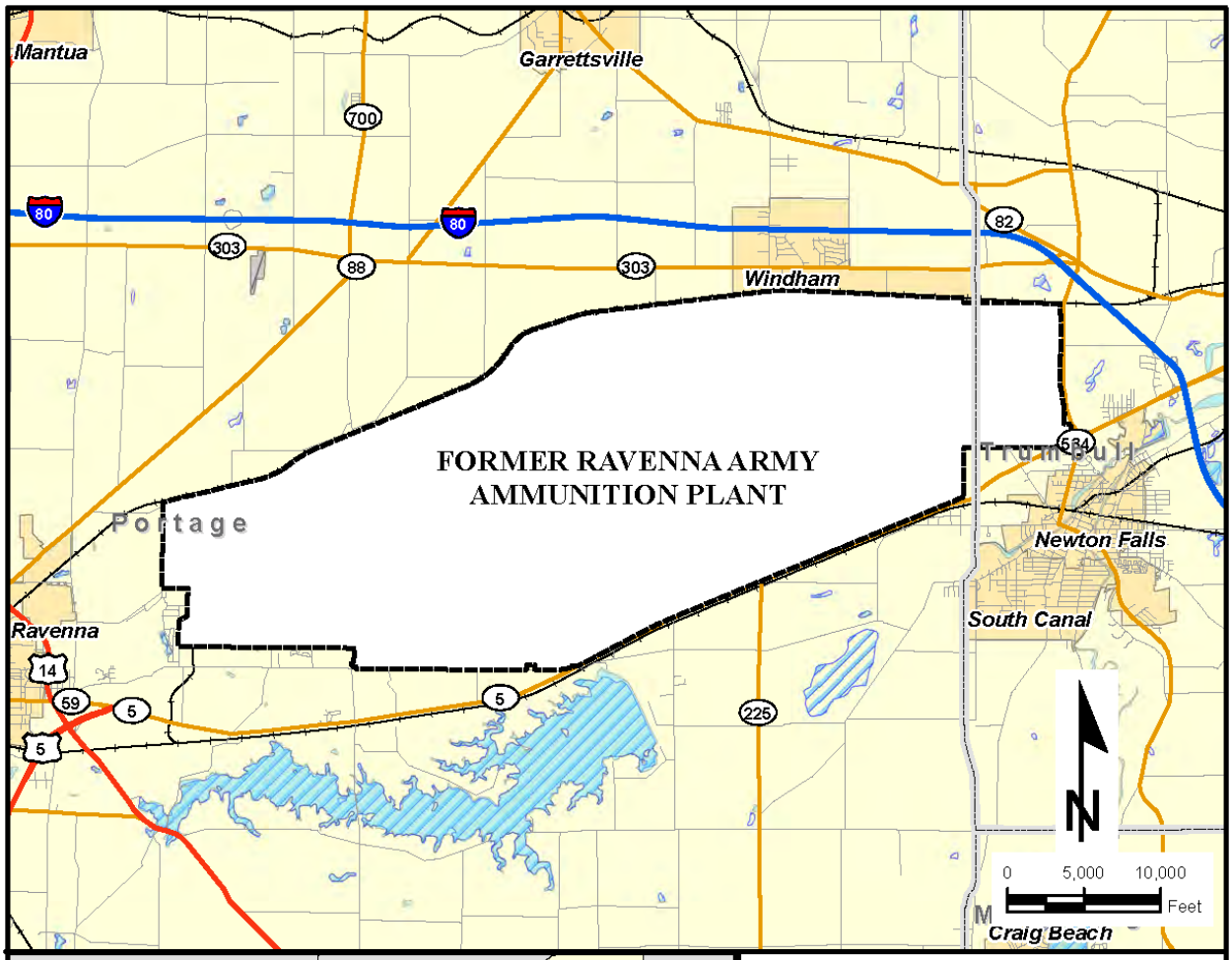

NOTES & SOURCES

Map Coordinates: WGS 84, UTM Zone 17N in Meters

U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY

Figure 1-1

Location Map

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

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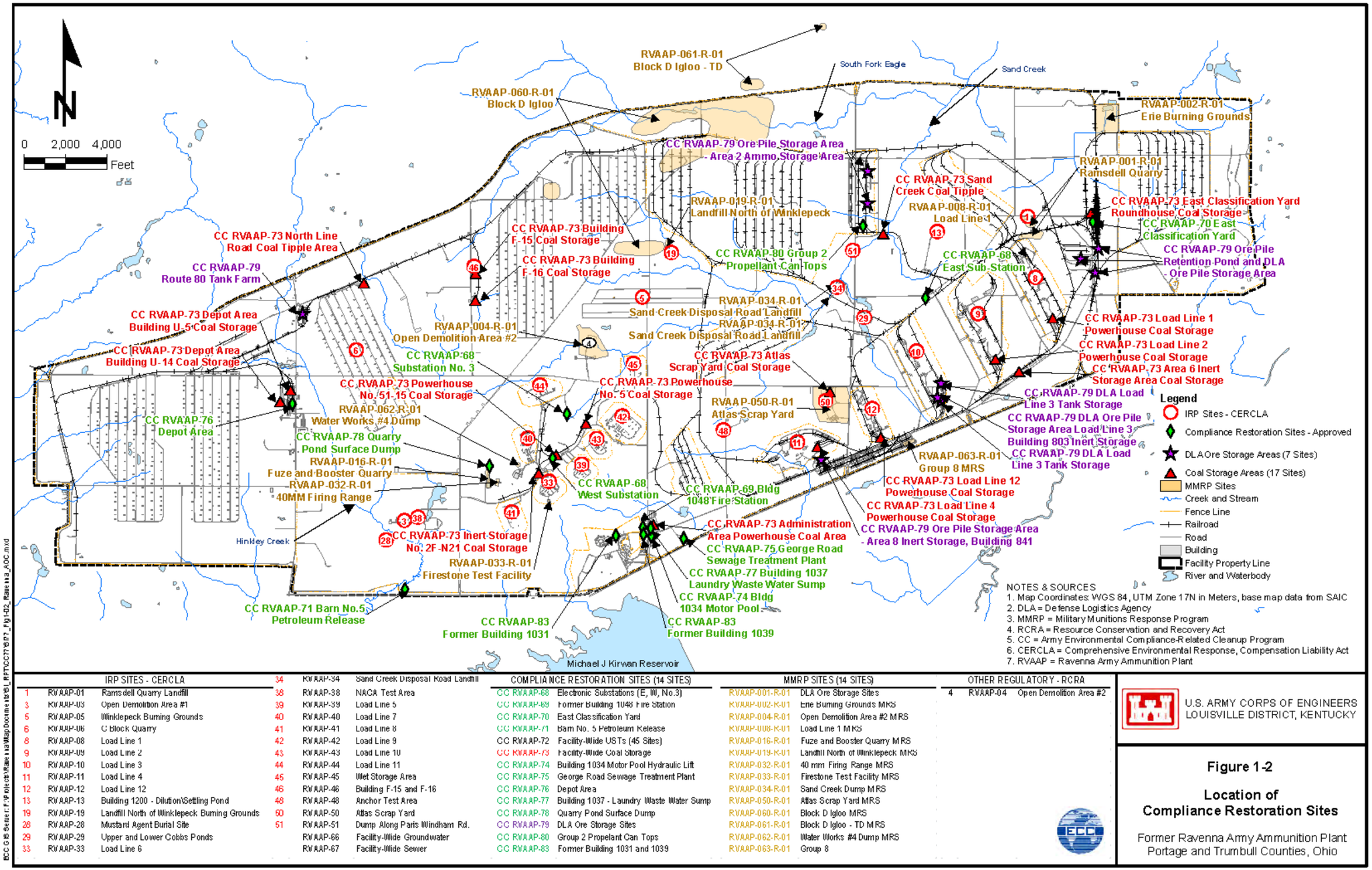
N
0 2,000 4,000
Feet
RVAAP-061-R-01
Block D Igloo - TD
South Fork Eagle
Sand Creek
RVAAP-060-R-01
Block D Igloo
RVAAP-002-R-01
Erie Burning Grounds
CC RVAAP-79 Ore Pile Storage Area
Area 2 Ammo Storage Area
RVAAP-001-R-01
Ramsdell Quarry
CC RVAAP-73 Sand
Creek Coal Tipple
RVAAP-019-R-01
Landfill North of Winklepeck
RVAAP-008-R-01
Load Line 1
CC RVAAP-73 East Classification Yard
Roundhouse Coal Storage
CC RVAAP-70 East
Classification Yard
CC RVAAP-73 North Line
Road Coal Tipple Area
CC RVAAP-73 Building
F-15 Coal Storage
CC RVAAP-79
Route 80 Tank Farm
CC RVAAP-73 Building
F-16 Coal Storage
CC RVAAP-80 Group 2
Propellant Can Tops
CC RVAAP-68
East Sub-Station
CC RVAAP-79 Ore Pile
Retention Pond and DLA
Ore Pile Storage Area
RVAAP-034-R-01
Sand Creek Disposal Road Landfill
CC RVAAP-73 Depot Area
Building U-5 Coal Storage
RVAAP-004-R-01
Open Demolition Area #2
RVAAP-034-R-01
Sand Creek Disposal Road Landfill
CC RVAAP-73 Load Line 1
Powerhouse Coal Storage
CC RVAAP-73 Depot Area
Building U-14 Coal Storage
CC RVAAP-68
Substation No. 3
CC RVAAP-73 Atlas
Scrap Yard Coal Storage
CC RVAAP-73 Load Line 2
Powerhouse Coal Storage
CC RVAAP-73 Area 6 Inert
Storage Area Coal Storage
CC RVAAP-73 Powerhouse
No. 51-15 Coal Storage
CC RVAAP-73 Powerhouse
No. 5 Coal Storage
RVAAP-050-R-01
Atlas Scrap Yard
CC RVAAP-79 DLA Load
Line 3 Tank Storage
RVAAP-062-R-01
Water Works #4 Dump
CC RVAAP-76
Depot Area
CC RVAAP-78 Quarry
Pond Surface Dump
CC RVAAP-79 DLA Ore Pile
Storage Area Load Line 3
Building 803 Inert Storage
RVAAP-016-R-01
Fuze and Booster Quarry
RVAAP-063-R-01
Group 8 MRS
CC RVAAP-79 DLA Load
Line 3 Tank Storage
RVAAP-032-R-01
40MM Firing Range
CC RVAAP-68
West Substation
CC RVAAP-69 Bldg
1048 Fire Station
CC RVAAP-73 Load Line 12
Powerhouse Coal Storage
CC RVAAP-73 Load Line 4
Powerhouse Coal Storage
CC RVAAP-73 Administration
Area Powerhouse Coal Area
CC RVAAP-79 Ore Pile Storage Area
- Area 8 Inert Storage, Building 841
Hinkley Creek
CC RVAAP-73 Inert Storage
No. 2F-N21 Coal Storage
RVAAP-033-R-01
Firestone Test Facility
CC RVAAP-75 George Road
Sewage Treatment Plant
CC RVAAP-77 Building 1037
Laundry Waste Water Sump
CC RVAAP-74 Bldg
1034 Motor Pool
CC RVAAP-71 Barn No.5
Petroleum Release
CC RVAAP-83
Former Building 1031
CC RVAAP-83
Former Building 1039
Michael J Kirwan Reservoir
Legend
IRP Sites - CERCLA
Compliance Restoration Sites - Approved
DLA Ore Storage Areas (7 Sites)
Coal Storage Areas (17 Sites)
MMRP Sites
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
River and Waterbody
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters, base map data from SAIC
2. DLA = Defense Logistics Agency
3. MMRP = Military Munitions Response Program
4. RCRA = Resource Conservation and Recovery Act
5. CC = Army Environmental Compliance-Related Cleanup Program
6. CERCLA = Comprehensive Environmental Response, Compensation Liability Act
7. RVAAP = Ravenna Army Ammunition Plant
IRP SITES - CERCLA
1 RVAAP-01 Ramsdell Quarry Landfill
3 RVAAP-03 Open Demolition Area #1
5 RVAAP-05 Winklepeck Burning Grounds
6 RVAAP-06 C Block Quarry
8 RVAAP-08 Load Line 1
9 RVAAP-09 Load Line 2
10 RVAAP-10 Load Line 3
11 RVAAP-11 Load Line 4
12 RVAAP-12 Load Line 12
13 RVAAP-13 Building 1200 - Dilution\Settling Pond
19 RVAAP-19 Landfill North of Winklepeck Burning Grounds
28 RVAAP-28 Mustard Agent Burial Site
29 RVAAP-29 Upper and Lower Cobbs Ponds
33 RVAAP-33 Load Line 6
34 RVAAP-34 Sand Creek Disposal Road Landfill
38 RVAAP-38 NACA Test Area
39 RVAAP-39 Load Line 5
40 RVAAP-40 Load Line 7
41 RVAAP-41 Load Line 8
42 RVAAP-42 Load Line 9
43 RVAAP-43 Load Line 10
44 RVAAP-44 Load Line 11
45 RVAAP-45 Wet Storage Area
46 RVAAP-46 Building F-15 and F-16
48 RVAAP-48 Anchor Test Area
50 RVAAP-50 Atlas Scrap Yard
51 RVAAP-51 Dump Along Paris Windham Rd.
RVAAP-66 Facility-Wide Groundwater
RVAAP-67 Facility-Wide Sewer
COMPLIANCE RESTORATION SITES (14 SITES)
CC RVAAP-68 Electronic Substations (E, W, No.3)
CC RVAAP-69 Former Building 1048 Fire Station
CC RVAAP-70 East Classification Yard
CC RVAAP-71 Barn No. 5 Petroleum Release
CC RVAAP-72 Facility-Wide USTs (45 Sites)
CC RVAAP-73 Facility-Wide Coal Storage
CC RVAAP-74 Building 1034 Motor Pool Hydraulic Lift
CC RVAAP-75 George Road Sewage Treatment Plant
CC RVAAP-76 Depot Area
CC RVAAP-77 Building 1037 - Laundry Waste Water Sump
CC RVAAP-78 Quarry Pond Surface Dump
CC RVAAP-79 DLA Ore Storage Sites
CC RVAAP-80 Group 2 Propelant Can Tops
CC RVAAP-83 Former Building 1031 and 1039
MMRP SITES (14 SITES)
RVAAP-001-R-01 DLA Ore Storage Sites
RVAAP-002-R-01 Erie Burning Grounds MRS
RVAAP-004-R-01 Open Demolition Area #2 MRS
RVAAP-008-R-01 Load Line 1 MRS
RVAAP-019-R-01 Landfill North of Winklepeck MRS
RVAAP-032-R-01 40 mm Firing Range MRS
RVAAP-033-R-01 Firestone Test Facility MRS
RVAAP-034-R-01 Sand Creek Dump MRS
RVAAP-050-R-01 Atlas Scrap Yard MRS
RVAAP-060-R-01 Block D Igloo MRS
RVAAP-061-R-01 Block D Igloo - TD MRS
RVAAP-062-R-01 Water Works #4 Dump MRS
RVAAP-063-R-01 Group 8
OTHER REGULATORY - RCRA
4 RVAAP-04 Open Demolition Area #2
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-2
Location of
Compliance Restoration Sites
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
ECC
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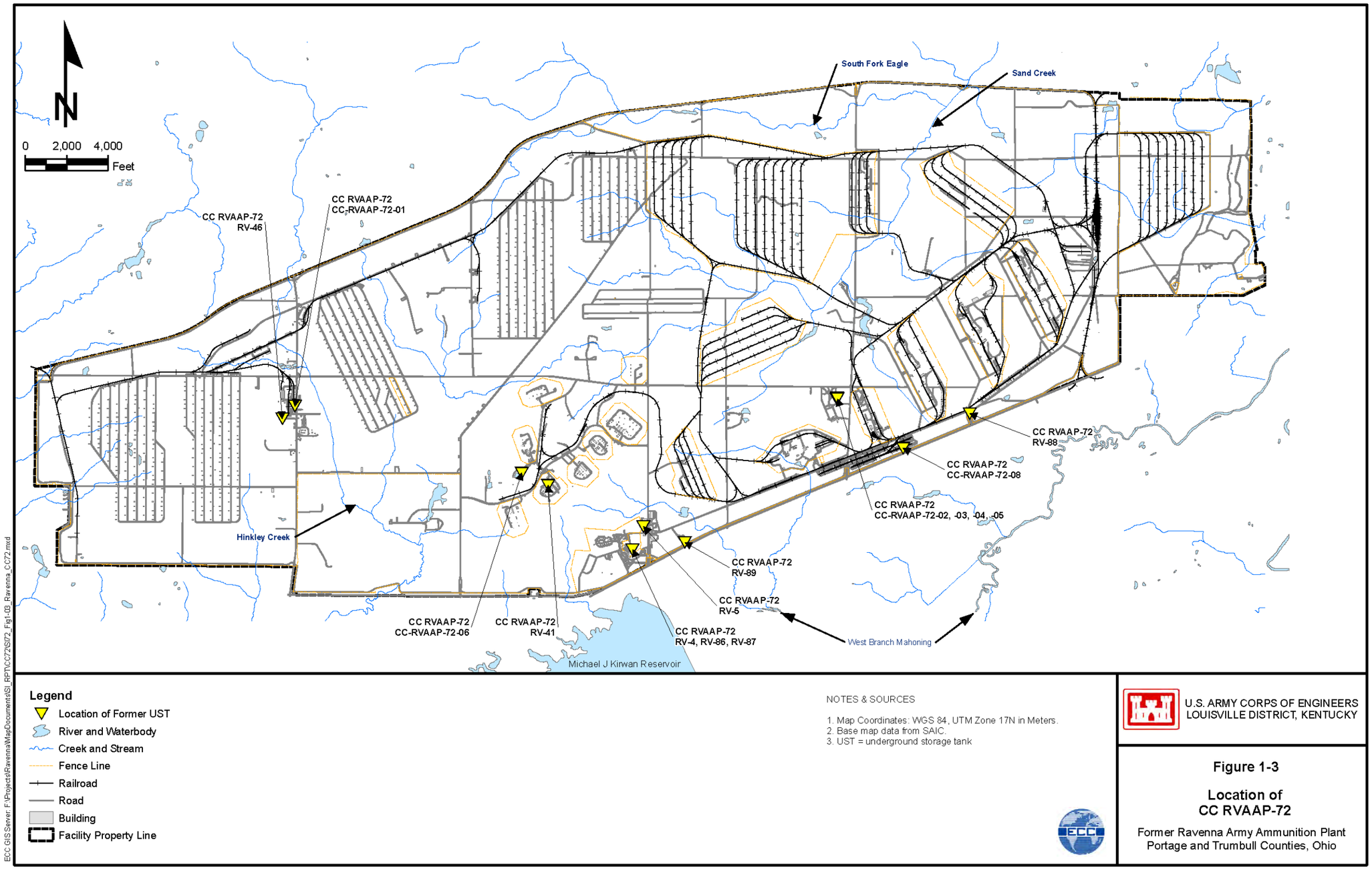
N
0 2,000 4,000
Feet
South Fork Eagle
Sand Creek
CC RVAAP-72
RV-46
CC RVAAP-72
CC-RVAAP-72-01
CC RVAAP-72
RV-88
CC RVAAP-72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
Hinkley Creek
CC RVAAP-72
RV-89
CC RVAAP-72
RV-5
CC RVAAP-72
CC-RVAAP-72-06
CC RVAAP-72
RV-41
CC RVAAP-72
RV-4, RV-86, RV-87
West Branch Mahoning
Michael J Kirwan Reservoir
Legend
Location of Former UST
River and Waterbody
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters.
2. Base map data from SAIC.
3. UST = underground storage tank
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-3
Location of
CC RVAAP-72
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
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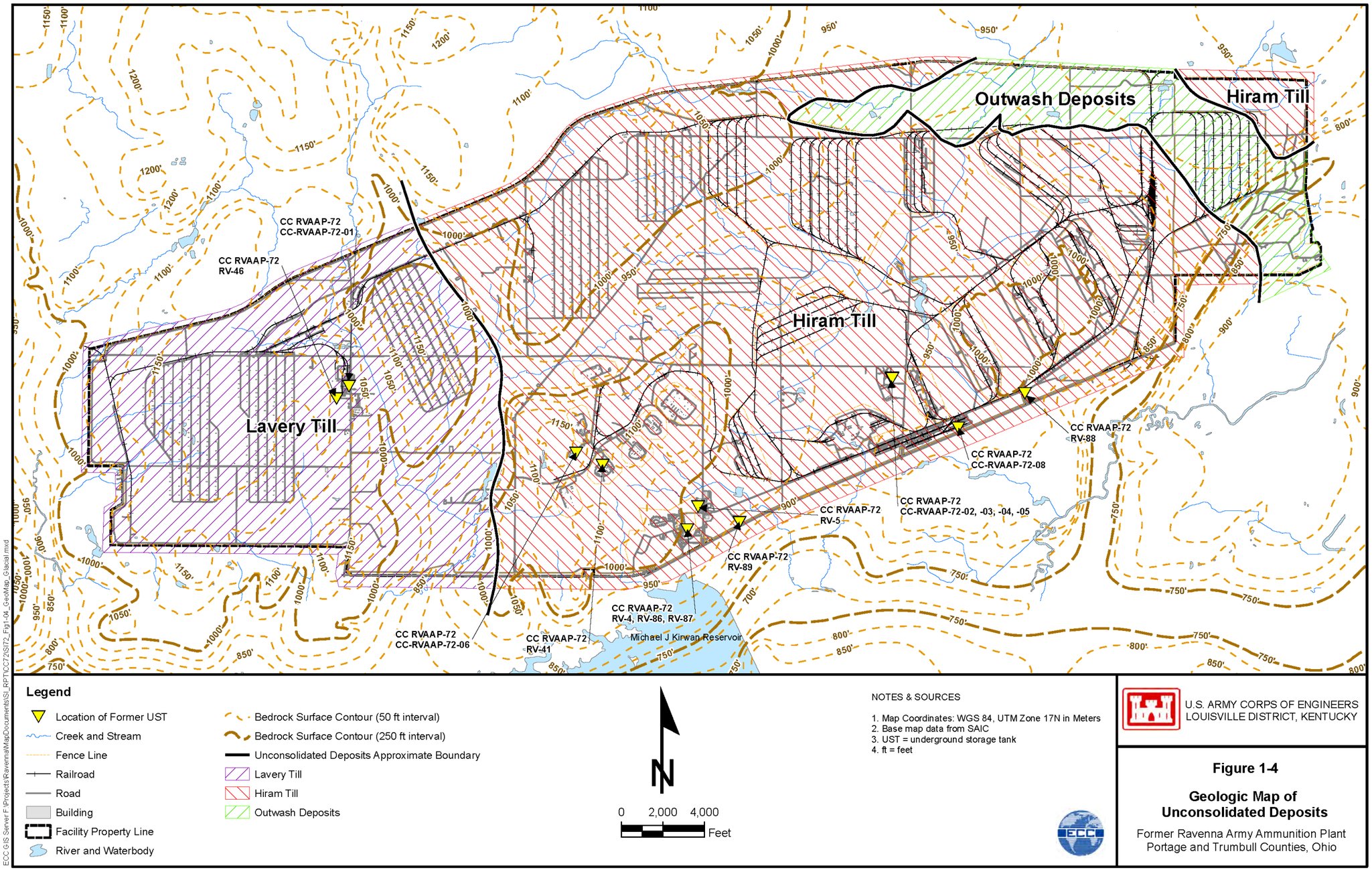
Outwash Deposits
Hiram Till
Hiram Till
Lavery Till
CC RVAAP-72
CC-RVAAP-72-01
CC RVAAP-72
RV-46
CC RVAAP-72
RV-88
CC RVAAP-72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-5
CC RVAAP-72
RV-89
CC RVAAP-72
RV-4, RV-86, RV-87
Michael J Kirwan Reservoir
CC RVAAP-72
CC-RVAAP-72-06
CC RVAAP-72
RV-41
ECC GIS Server:F:\Projects\Ravenna\MapDocuments\SI_RPT\CC72SIT2_Fig1-04_GeoMap_Glacial.mxd
Legend
Location of Former UST
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
River and Waterbody
Bedrock Surface Contour (50 ft interval)
Bedrock Surface Contour (250 ft interval)
Unconsolidated Deposits Approximate Boundary
Lavery Till
Hiram Till
Outwash Deposits
N
0 2,000 4,000
Feet
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters
2. Base map data from SAIC
3. UST = underground storage tank
4. ft = feet
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-4
Geologic Map of
Unconsolidated Deposits
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

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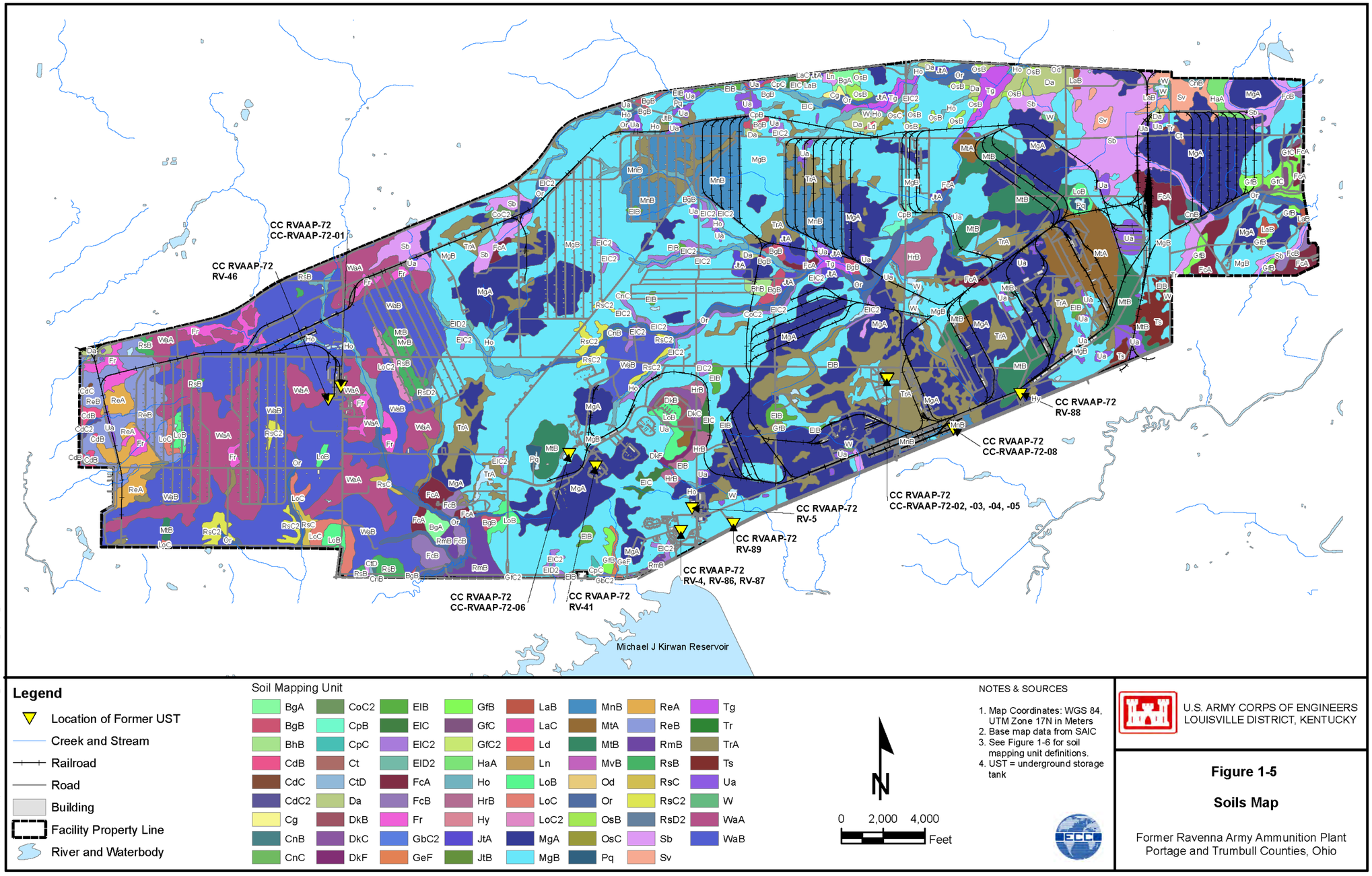
CC RVAAP-72
CC-RVAAP-72-01
CC RVAAP-72
RV-46
CC RVAAP-72
RV-88
CC RVAAP-72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-5
CC RVAAP-72
RV-89
CC RVAAP-72
RV-4, RV-86, RV-87
CC RVAAP-72
RV-41
CC RVAAP-72
CC-RVAAP-72-06
Michael J Kirwan Reservoir
Legend
Location of Former UST
Creek and Stream
Railroad
Road
Building
Facility Property Line
River and Waterbody
Soil Mapping Unit
BgA BgB BhB CdB CdC CdC2 Cg CnB CnC CoC2 CpB CpC Ct CtD Da DkB DkC DkF EIB EIC EIC2 EID2 FcA FcB Fr GbC2 GeF GfB GfC GfC2 HaA Ho HrB Hy JtA JtB LaB LaC Ld Ln LoB LoC LoC2 MgA MgB MnB MtB MvB OsB OsC Or Pq RmB RsB RsC RsC2 RsD2 Sb Sv Tg Tr TrA Ts Ua W WaA WaB
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters
2. Base map data from SAIC
3. See Figure 1-6 for soil mapping unit definitions.
4. UST = underground storage tank
N
0 2,000 4,000
Feet
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-5
Soils Map
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
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Legend

Soil Mapping Unit

- BgA, Bogart silt loam, 0-2% slopes
- BgB, Bogart silt loam, 2-6% slopes
- BhB, Bogart-Haskins complex, 2-6% slopes
- CdB, Canfield silt loam, 2-6% slopes
- CdC, Canfield silt loam, 6-12% slopes
- CdC2, Canfield silt loam, 6-12% slopes, moderately eroded
- Cg, Carlisle muck
- CnB, Chili loam, 2-6% slopes
- CnC, Chili loam, 6-12% slopes
- CoC2, Chili gravelly loam, 6-12% slopes, moderately eroded
- CpB, Chili silt loam, 2-6% slopes
- CpC, Chili silt loam, 6-12% slopes
- Ct, Chili-Oshtemo complex
- CtD, Chili-Oshtemo complex, 12-18% slopes
- Da, Damascus loam
- DkB, Dekalb channery loam, 2-6% slopes
- DkC, Dekalb channery loam, 6-12% slopes
- DkF, Dekalb channery loam, 25-70% slopes
- ElB, Ellsworth silt loam, 2-6% slopes
- ElC, Ellsworth silt loam, 6-12% slopes
- ElC2, Ellsworth silt loam, 6-12% slopes, moderately eroded
- ElD2, Ellsworth silt loam, 12-18% slopes, moderately eroded
- FcA, Fitchville silt loam, 0-2% slopes
- FcB, Fitchville silt loam, 2-6% slopes
- Fr, Frenchtown silt loam
- GbC2, Geeburg silt loam, 6-12% slopes, moderately eroded
- GeF, Geeburg and Glenford silt loams, steep
- GfB, Glenford silt loam, 2-6% slopes
- GfC, Glenford silt loam, 6-12% slopes
- GfC2, Glenford silt loam, 6-12% slopes, moderately eroded
- HaA, Haskins loam, 0-2% slopes
- Ho, Holly silt loam
- HrB, Hornell silt loam, 3-8% slopes
- Hy, Holly silt loam, frequently flooded
- JtA, Jimtown loam, 0-2% slopes
- JtB, Jimtown loam, 2-6% slopes
- LaB, Lakin loamy sand, 2-6% slopes
- LaC, Lakin loamy sand, 6-12% slopes
- Ld, Linwood muck
- Ln, Lorain silty clay loam
- LoB, Loudonville silt loam, 2-6% slopes
- LoC, Loudonville silt loam, 6-12% slopes
- LoC2, Loudonville silt loam, 6-12% slopes, moderately eroded
- MgA, Mahoning silt loam, 0-2% slopes
- MgB, Mahoning silt loam, 2-6% slopes
- MnB, Mahoning-Urban land complex, undulating
- MtA, Mitiwanga silt loam, 0-2% slopes
- MtB, Mitiwanga silt loam, 2-6% slopes
- MvB, Mitiwanga silt loam, 2-6% slopes, moderately well drained variant
- Od, Olmsted loam
- Or, Orrville silt loam
- OsB, Oshtemo sandy loam, 2-6% slopes
- OsC, Oshtemo sandy loam, 6-12% slopes
- Pq, Pits, quarries
- ReA, Ravenna silt loam, 0-2% slopes
- ReB, Ravenna silt loam, 2-6% slopes
- RmB, Remsen silt loam, 2-6% slopes
- RsB, Rittman silt loam, 2-6% slopes
- RsC, Rittman silt loam, 6-12% slopes
- RsC2, Rittman silt loam, 6-12% slopes, moderately eroded
- RsD2, Rittman silt loam, 12-18% slopes, moderately eroded
- Sb, Sebring slit loam
- Sv, Sebring silt loam, dark surface variant
- Tg, Tioga loam
- Tr, Trumbull silt loam
- TrA, Trumbull silt loam, 0-2% slopes
- Ts, Trumbull silty clay loam
- Ua, Udorthents
- W, Water
- WaA, Wadsworth silt loam, 0-2% slopes
- WaB, Wadsworth silt loam, 2-6% slopes

NOTES & SOURCES

1. Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed 12/28/2012.
2. See Figure 1-5 for soils map.

U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY

Figure 1-6

Description of Soil Mapping Units

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

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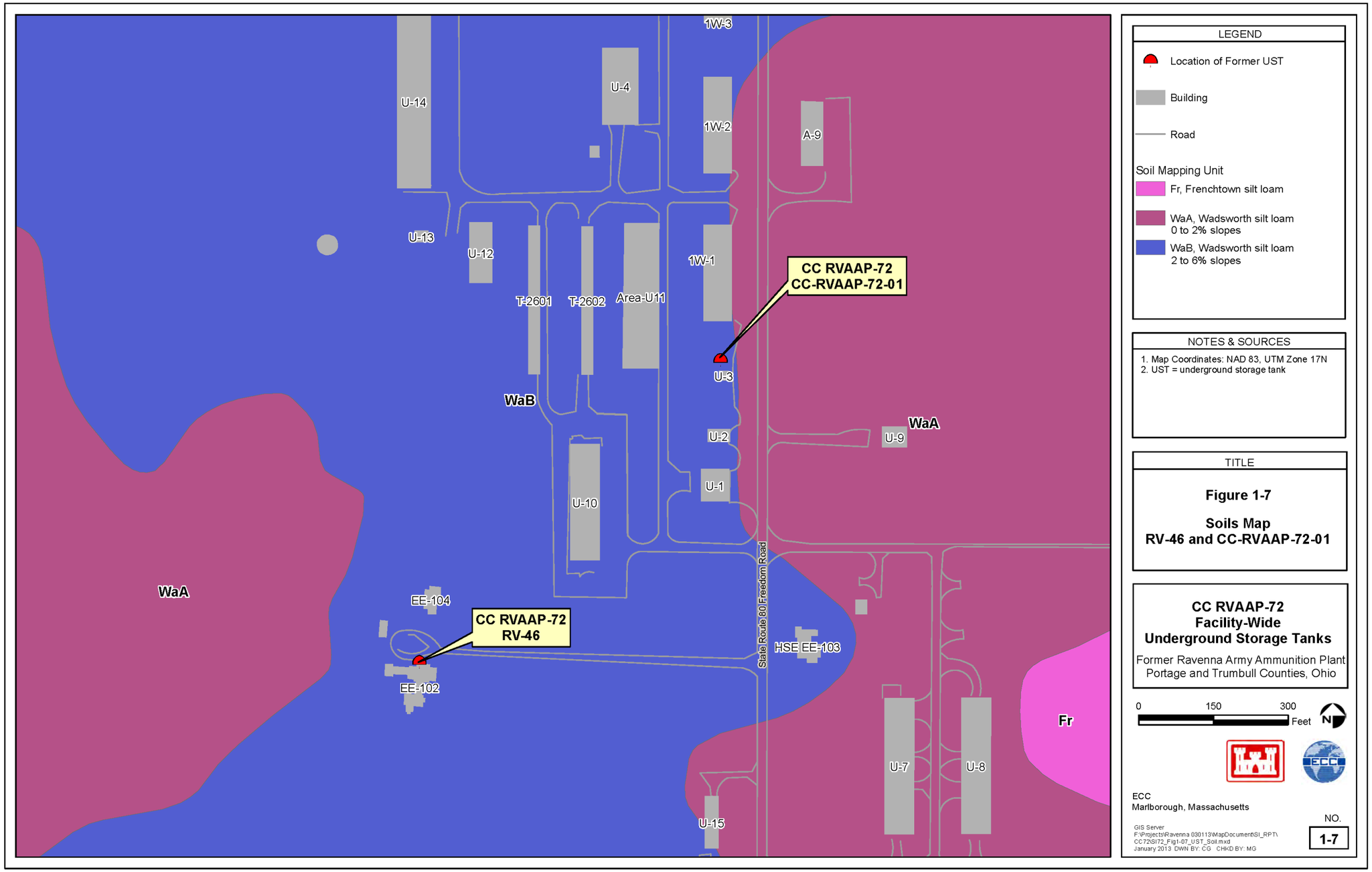
1W-3
U-14
U-4
1W-2
A-9
U-13
U-12
1W-1
CC RVAAP-72
CC-RVAAP-72-01
T-2601
T-2602
Area-U11
U-3
WaB
WaA
U-2
U-9
U-1
U-10
WaA
EE-104
CC RVAAP-72
RV-46
State Route 80 Freedom Road
HSE EE-103
Fr
EE-102
U-7
U-8
U-15
LEGEND
Location of Former UST
Building
Road
Soil Mapping Unit
Fr, Frenchtown silt loam
WaA, Wadsworth silt loam
0 to 2% slopes
WaB, Wadsworth silt loam
2 to 6% slopes
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N
2. UST = underground storage tank
TITLE
Figure 1-7
Soils Map
RV-46 and CC-RVAAP-72-01
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0
150
300
Feet
ECC
Marlborough, Massachusetts
GIS Server
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CC72SI72_Fig1-07_UST_Soil.mxd
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LEGEND

Location of Former UST

Building

Road

Soil Mapping Unit

MgA, Mahoning silt loam
0 to 2% slopes

MgB, Mahoning silt loam
2 to 6% slopes

MtB, Mitiwanga silt loam
2 to 6% slopes

NOTES & SOURCES

1. Map Coordinates: NAD 83, UTM Zone 17N
2. UST = underground storage tank

TITLE

Figure 1-8

Soils Map
RV-41 and CC-RVAAP-72-06

CC RVAAP-72
Facility-Wide
Underground Storage Tanks

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

0 150 300 Feet

ECC
Marlborough, Massachusetts

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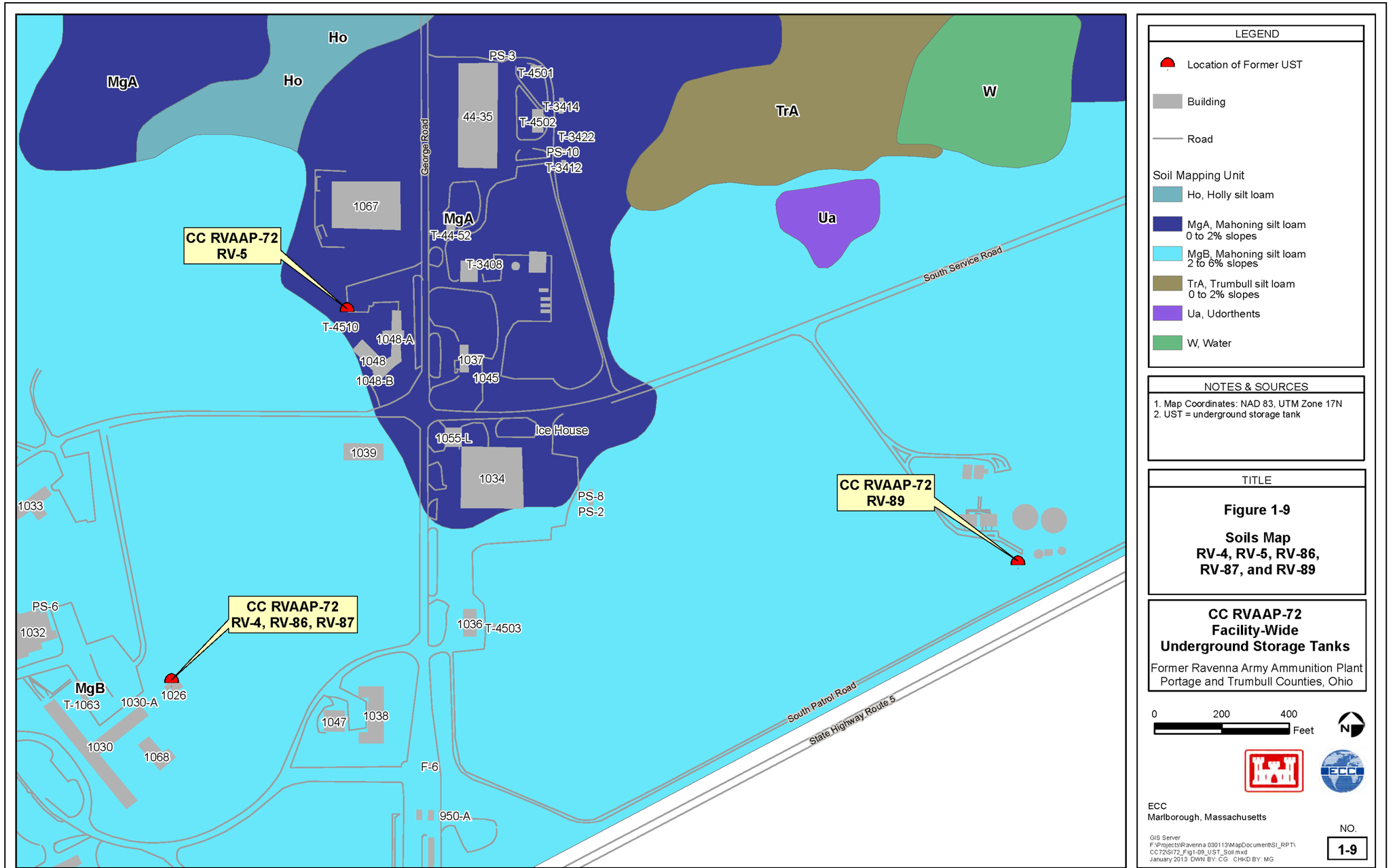
Ho
MgA
Ho
PS-3
T-4501
T-3414
44-35
T-4502
T-3422
PS-10
T-3412
George Road
TrA
W
1067
MgA
T-44-52
Ua
CC RVAAP-72
RV-5
T-3408
South Service Road
T-4510
1048-A
1048
1048-B
1037
1045
1055-L
Ice House
1039
1034
PS-8
PS-2
1033
CC RVAAP-72
RV-89
PS-6
1032
CC RVAAP-72
RV-4, RV-86, RV-87
1036
T-4503
MgB
T-1063
1030-A
1026
1047
1038
1030
1068
F-6
South Patrol Road
State Highway Route 5
950-A
LEGEND
Location of Former UST
Building
Road
Soil Mapping Unit
Ho, Holly silt loam
MgA, Mahoning silt loam
0 to 2% slopes
MgB, Mahoning silt loam
2 to 6% slopes
TrA, Trumbull silt loam
0 to 2% slopes
Ua, Udorthents
W, Water
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N
2. UST = underground storage tank
TITLE
Figure 1-9
Soils Map
RV-4, RV-5, RV-86,
RV-87, and RV-89
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0
200
400
Feet
N
ECC
Marlborough, Massachusetts
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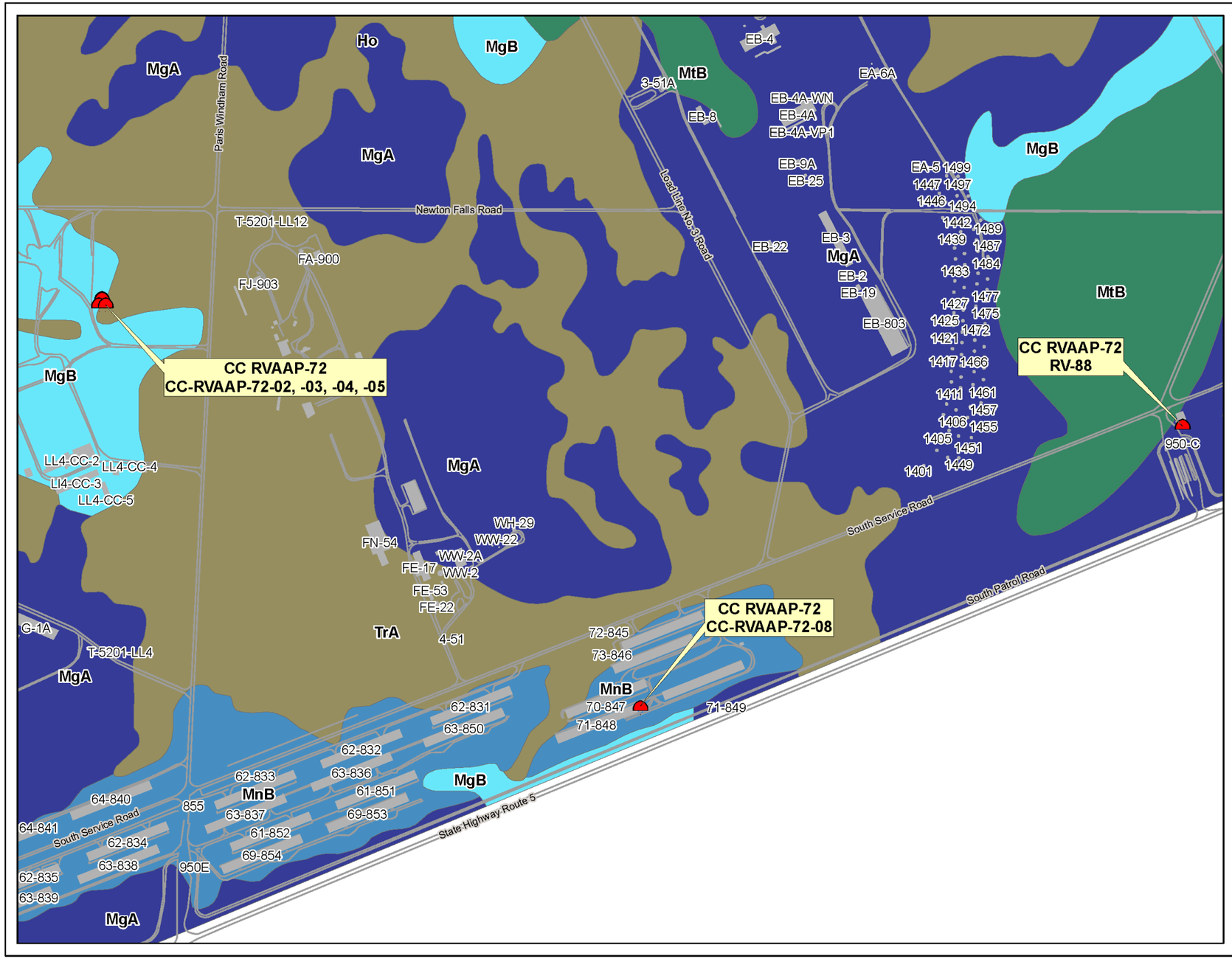
Ho
MgB
MgA
MtB
EB-4
3-51A
EA-6A
EB-4A-WN
EB-8
EB-4A
EB-4A-VP1
EB-9A
EB-25
EA-5
1499
1447
1497
1446
1494
1442
1489
1439
1487
1433
1484
1427
1477
1425
1475
1421
1472
1417
1466
1411
1461
1457
1406
1455
1405
1451
1401
1449
950-C
Paris Windham Road
Newton Falls Road
Load Line No. 3 Road
T-5201-LL12
FA-900
FJ-903
EB-22
EB-3
EB-2
EB-19
EB-803
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-88
LL4-CC-2
LL4-CC-4
LI4-CC-3
LL4-CC-5
WH-29
WW-22
FN-54
WW-2A
FE-17
WW-2
FE-53
FE-22
South Service Road
South Patrol Road
G-1A
TrA
4-51
CC RVAAP-72
CC-RVAAP-72-08
72-845
73-846
T-5201-LL4
MnB
70-847
71-848
71-849
62-831
63-850
62-832
62-833
63-836
61-851
64-840
855
63-837
69-853
64-841
South Service Road
61-852
62-834
69-854
63-838
950E
62-835
63-839
State Highway Route 5
LEGEND
Location of Former UST
Building
Road
Soil Mapping Unit
MgA, Mahoning silt loam 0 to 2% slopes
MgB, Mahoning silt loam 2 to 6% slopes
MnB, Mahoning-Urban land complex undulating
MtB, Mitiwanga silt loam 2 to 6% slopes
TrA, Trumbull silt loam
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N
2. UST = underground storage tank
TITLE
Figure 1-10
Soils Map
RV-88, CC-RVAAP-72-02, -03, -04, -05, and -08
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0
450
900
Feet
N
ECC
Marlborough, Massachusetts
GIS Server
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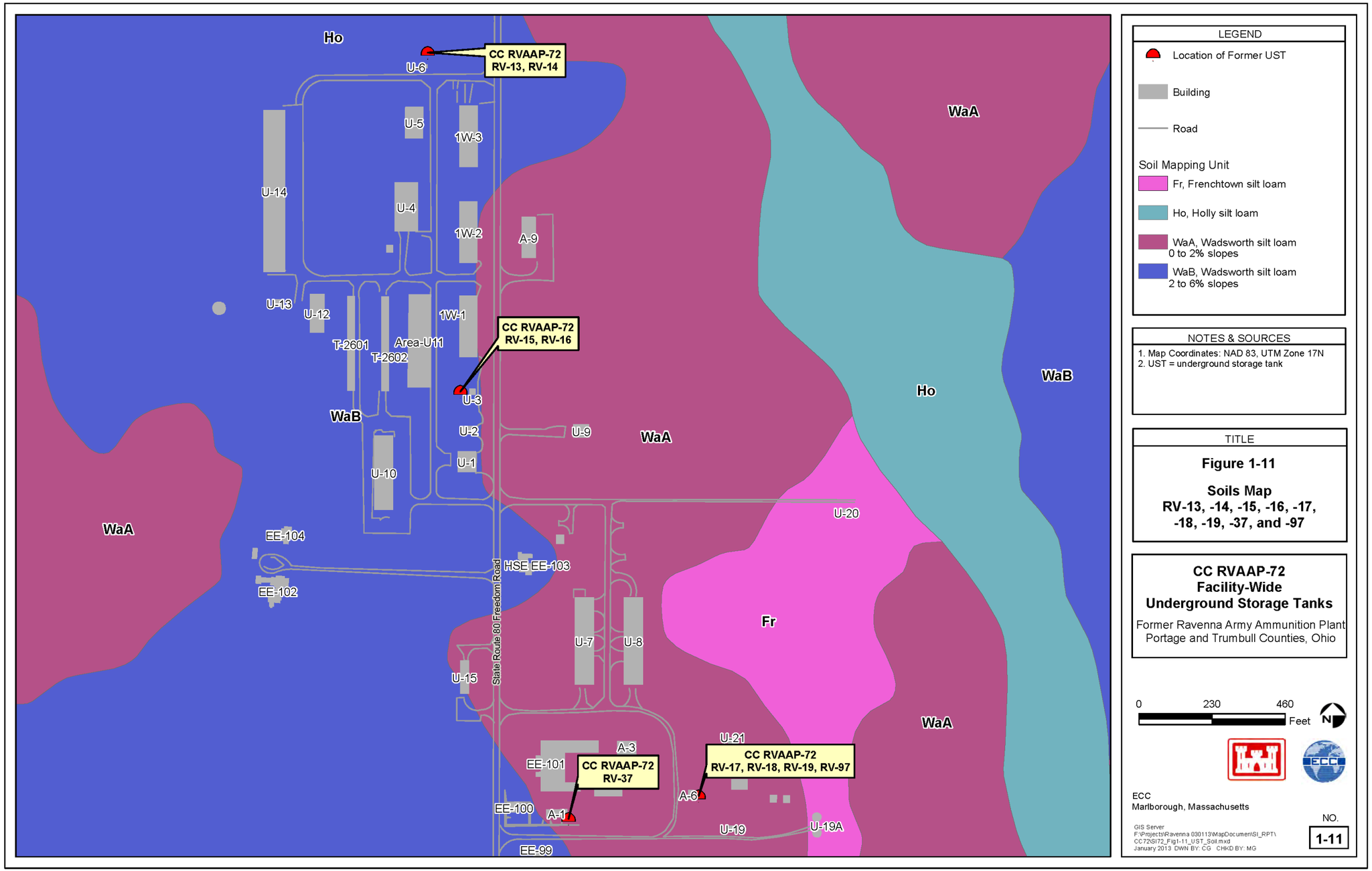
Ho
CC RVAAP-72
RV-13, RV-14
U-6
U-5
1W-3
WaA
U-14
U-4
1W-2
A-9
U-13
U-12
1W-1
CC RVAAP-72
RV-15, RV-16
T-2601
Area-U11
T-2602
WaB
U-3
WaB
Ho
U-2
U-9
WaA
U-1
U-10
U-20
WaA
EE-104
HSE EE-103
EE-102
State Route 80 Freedom Road
Fr
U-7
U-8
U-15
WaA
U-21
A-3
EE-101
CC RVAAP-72
RV-37
CC RVAAP-72
RV-17, RV-18, RV-19, RV-97
A-6
EE-100
A-1
U-19
U-19A
EE-99
LEGEND
Location of Former UST
Building
Road
Soil Mapping Unit
Fr, Frenchtown silt loam
Ho, Holly silt loam
WaA, Wadsworth silt loam
0 to 2% slopes
WaB, Wadsworth silt loam
2 to 6% slopes
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N
2. UST = underground storage tank
TITLE
Figure 1-11
Soils Map
RV-13, -14, -15, -16, -17,
-18, -19, -37, and -97
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0
230
460
Feet
N
ECC
Marlborough, Massachusetts
GIS Server
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January 2013 DWN BY: CG CHKD BY: MG
NO.
1-11

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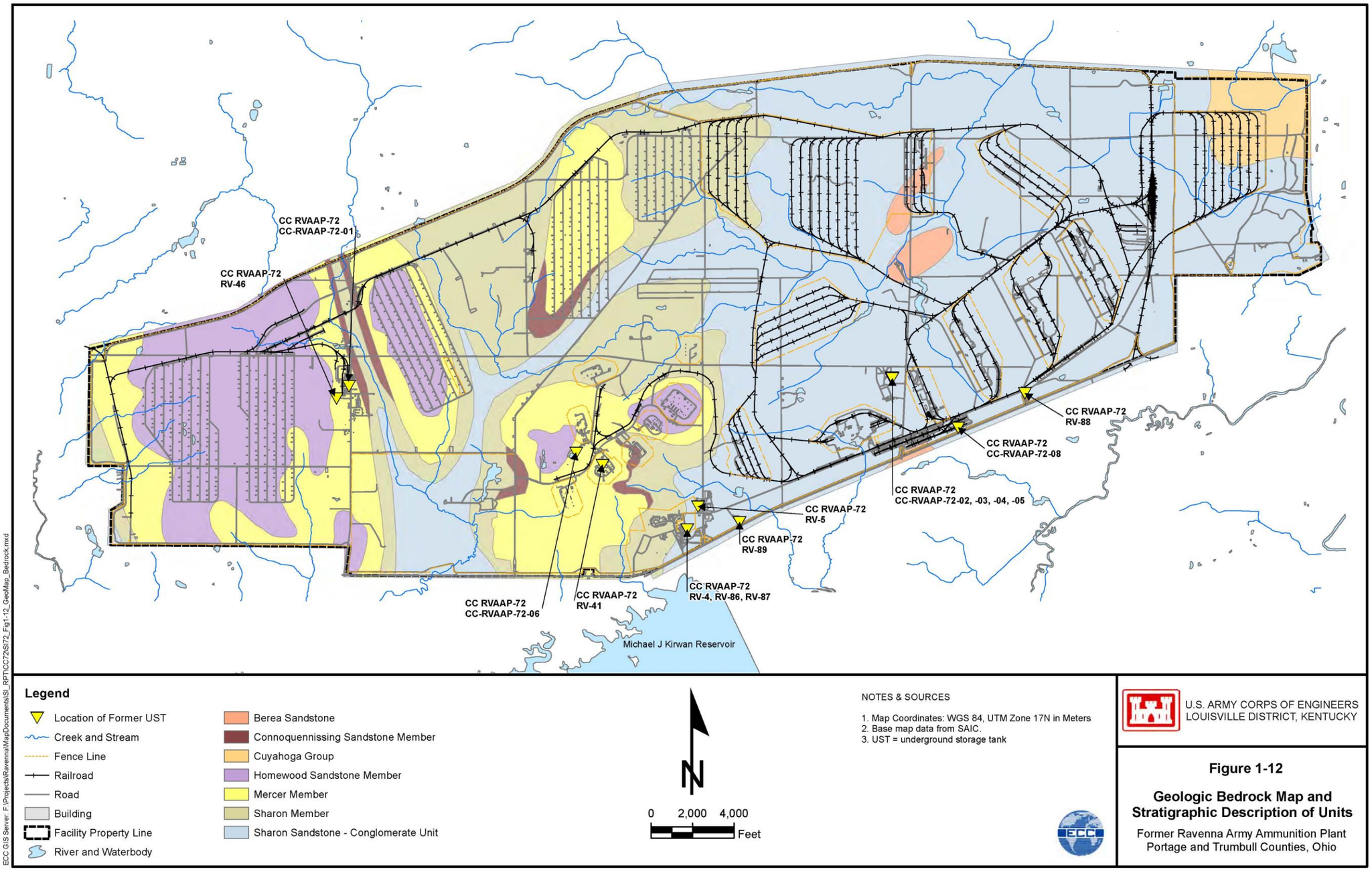
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CC-RVAAP-72-01
CC RVAAP-72
RV-46
CC RVAAP-72
RV-88
CC RVAAP-72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-5
CC RVAAP-72
RV-89
CC RVAAP-72
RV-4, RV-86, RV-87
CC RVAAP-72
RV-41
CC RVAAP-72
CC-RVAAP-72-06
Michael J Kirwan Reservoir
Legend
Location of Former UST
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
River and Waterbody
Berea Sandstone
Connoquennissing Sandstone Member
Cuyahoga Group
Homewood Sandstone Member
Mercer Member
Sharon Member
Sharon Sandstone - Conglomerate Unit
N
0 2,000 4,000
Feet
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters
2. Base map data from SAIC.
3. UST = underground storage tank
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-12
Geologic Bedrock Map and Stratigraphic Description of Units
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
ECC GIS Server: F:\Projects\RavennaMapDocuments\SI_RPT\CC72SI72_Fig1-12_GeoMap_Bedrock.mxd

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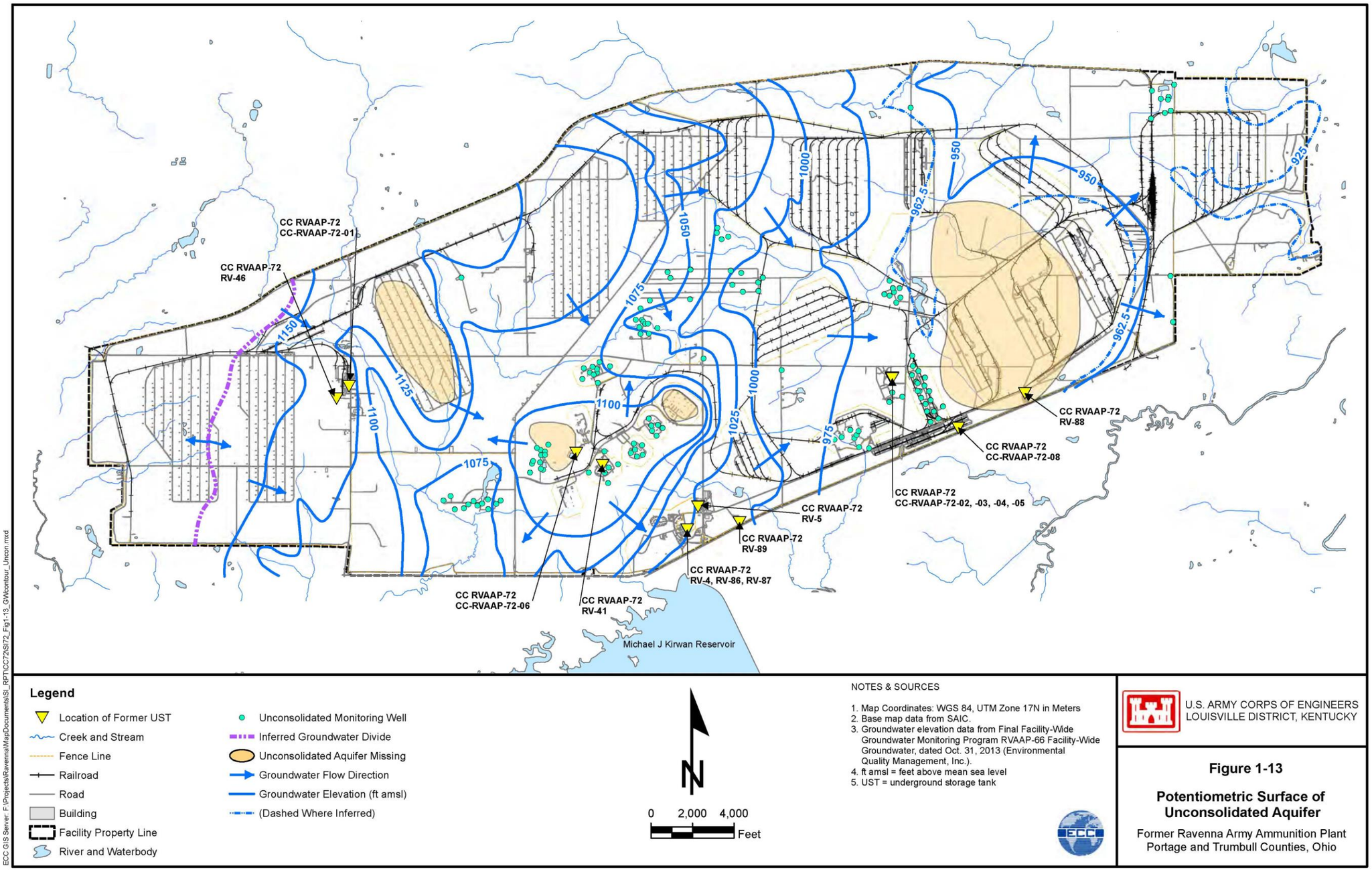
CC RVAAP-72
CC-RVAAP-72-01
CC RVAAP-72
RV-46
CC RVAAP-72
RV-88
CC RVAAP-72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-5
CC RVAAP-72
RV-89
CC RVAAP-72
RV-4, RV-86, RV-87
CC RVAAP-72
CC-RVAAP-72-06
CC RVAAP-72
RV-41
Michael J Kirwan Reservoir
1150
1125
1100
1075
1050
1025
1000
975
962.5
950
925
Legend
Location of Former UST
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
River and Waterbody
Unconsolidated Monitoring Well
Inferred Groundwater Divide
Unconsolidated Aquifer Missing
Groundwater Flow Direction
Groundwater Elevation (ft amsl)
(Dashed Where Inferred)
N
0 2,000 4,000
Feet
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters
2. Base map data from SAIC.
3. Groundwater elevation data from Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater, dated Oct. 31, 2013 (Environmental Quality Management, Inc.).
4. ft amsl = feet above mean sea level
5. UST = underground storage tank
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-13
Potentiometric Surface of Unconsolidated Aquifer
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
ECC GIS Server: F:\Projects\RavennaMapDocuments\SI_RPT\CC72SI72_Fig1-13_GWcontour_Uncon.mxd

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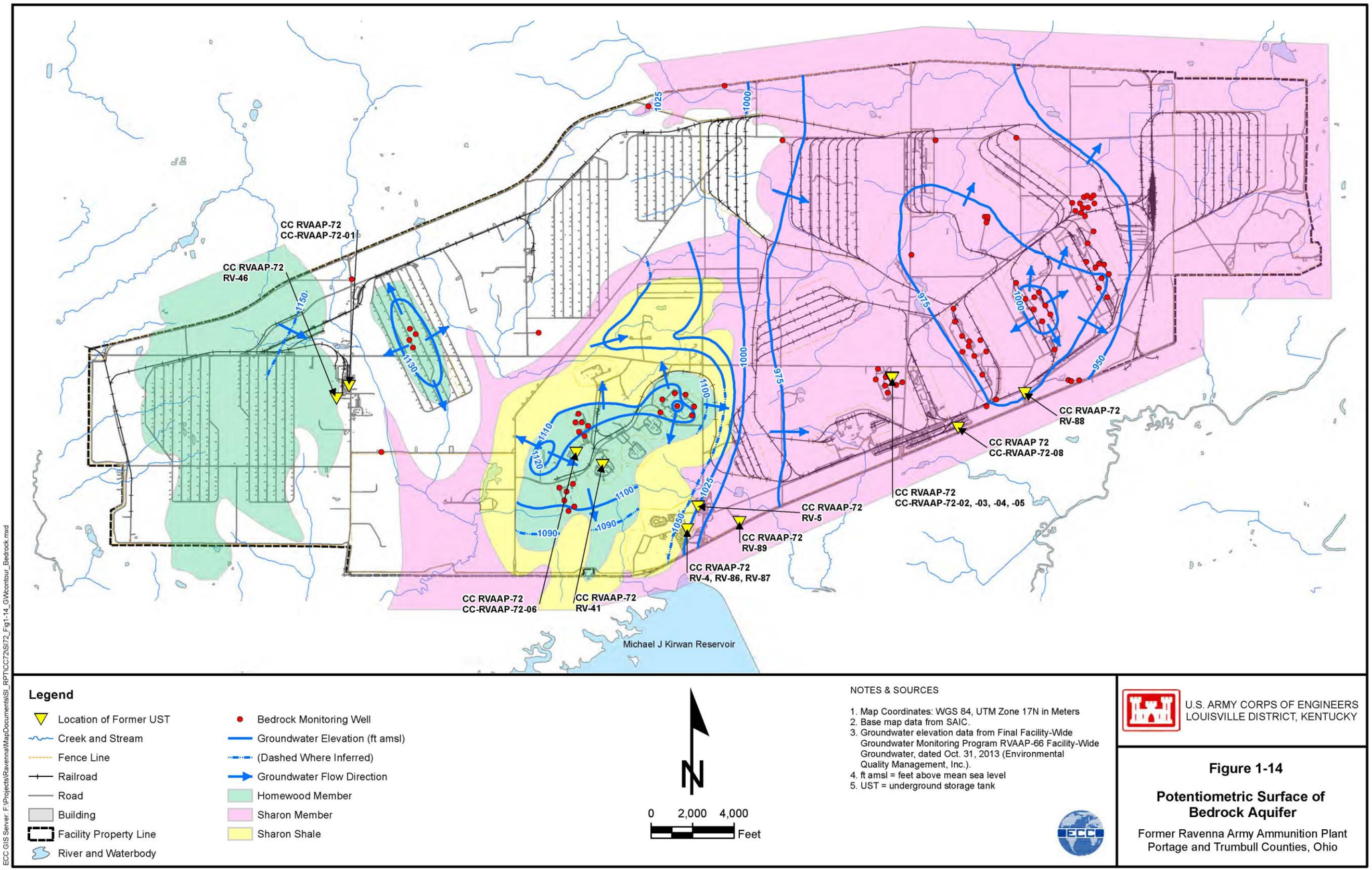
CC RVAAP-72
CC-RVAAP-72-01
CC RVAAP-72
RV-46
CC RVAAP-72
RV-88
CC RVAAP 72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-5
CC RVAAP-72
RV-89
CC RVAAP-72
RV-4, RV-86, RV-87
CC RVAAP-72
CC-RVAAP-72-06
CC RVAAP-72
RV-41
Michael J Kirwan Reservoir
1025
1000
975
950
1150
1130
1100
1110
1120
1090
1050
Legend
Location of Former UST
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
River and Waterbody
Bedrock Monitoring Well
Groundwater Elevation (ft amsl)
(Dashed Where Inferred)
Groundwater Flow Direction
Homewood Member
Sharon Member
Sharon Shale
N
0 2,000 4,000
Feet
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters
2. Base map data from SAIC.
3. Groundwater elevation data from Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater, dated Oct. 31, 2013 (Environmental Quality Management, Inc.).
4. ft amsl = feet above mean sea level
5. UST = underground storage tank
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-14
Potentiometric Surface of Bedrock Aquifer
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
ECC GIS Server: F:\Projects\RavennaMapDocuments\SI_RPT\CC72SI\72_Fig1-14_GWcontour_Bedrock.mxd

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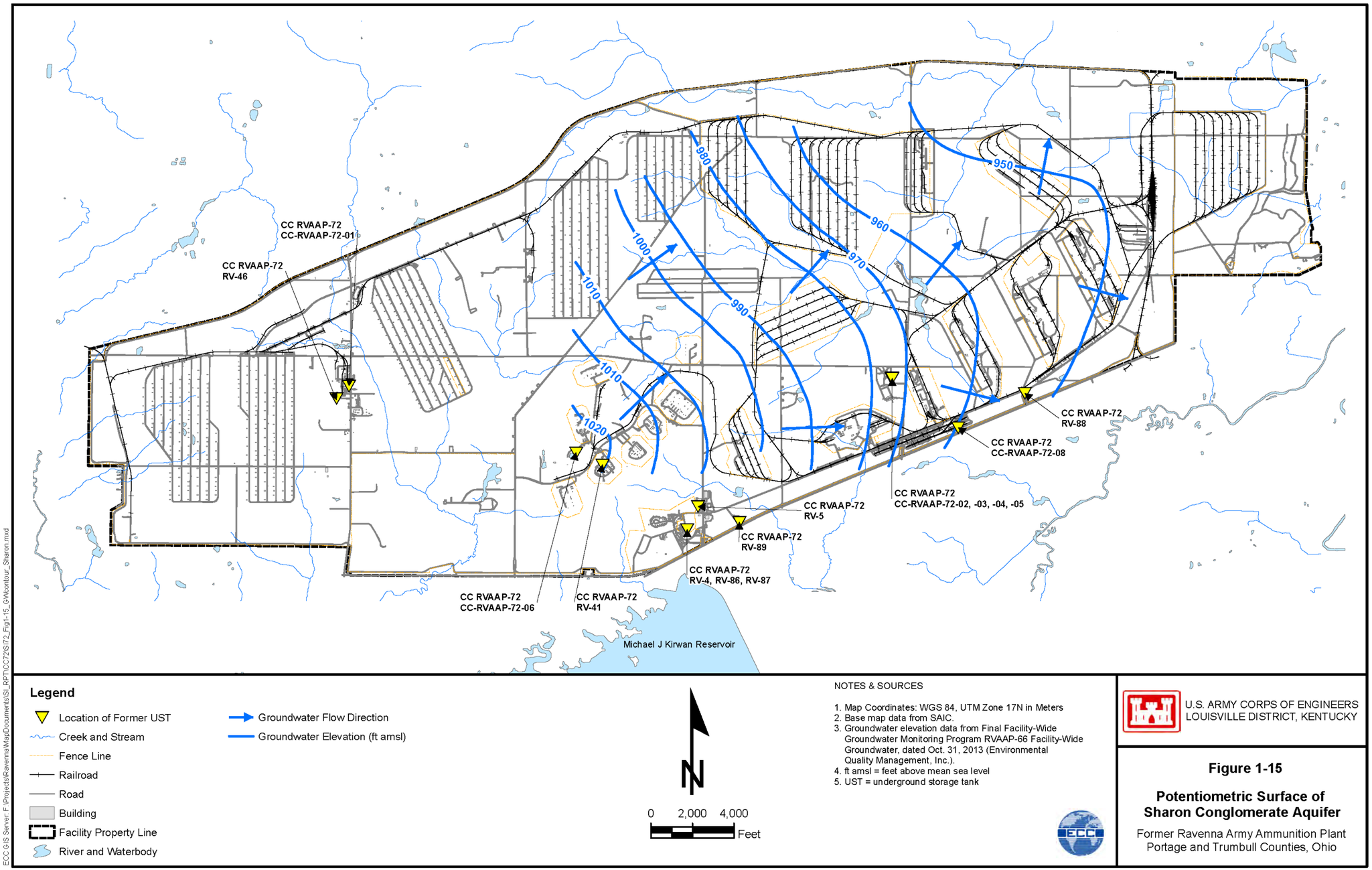
CC RVAAP-72
CC-RVAAP-72-01
CC RVAAP-72
RV-46
980
1000
1010
990
1010
1020
960
970
950
CC RVAAP-72
RV-88
CC RVAAP-72
CC-RVAAP-72-08
CC RVAAP-72
CC-RVAAP-72-02, -03, -04, -05
CC RVAAP-72
RV-5
CC RVAAP-72
RV-89
CC RVAAP-72
RV-4, RV-86, RV-87
CC RVAAP-72
CC-RVAAP-72-06
CC RVAAP-72
RV-41
Michael J Kirwan Reservoir
Legend
Location of Former UST
Creek and Stream
Fence Line
Railroad
Road
Building
Facility Property Line
River and Waterbody
Groundwater Flow Direction
Groundwater Elevation (ft amsl)
N
0
2,000
4,000
Feet
NOTES & SOURCES
1. Map Coordinates: WGS 84, UTM Zone 17N in Meters
2. Base map data from SAIC.
3. Groundwater elevation data from Final Facility-Wide Groundwater Monitoring Program RVAAP-66 Facility-Wide Groundwater, dated Oct. 31, 2013 (Environmental Quality Management, Inc.).
4. ft amsl = feet above mean sea level
5. UST = underground storage tank
U.S. ARMY CORPS OF ENGINEERS
LOUISVILLE DISTRICT, KENTUCKY
Figure 1-15
Potentiometric Surface of Sharon Conglomerate Aquifer
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
ECC G:\S Server F:\Projects\RavennaWapDocuments\SI_RPT\CC72\SI72_Fig1-15_GWcontour_Sharon.mxd

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2.0 SITE DESCRIPTION AND OPERATIONAL HISTORY

2.1 SITE DESCRIPTION

The CR site, CC RVAAP-72 FWUSTs AOC, consists of 58 former UST locations. Of these 58 former UST locations, the findings of the HRR recommend further investigation at 15 of the former UST locations (Figure 2-1) and Ohio EPA requested hexavalent chromium sampling at 9 former NFA USTs (Figure 2-2). These 24 former UST locations investigated during this SI have general common characteristic site descriptions, as stated in the HRR (SAIC 2011a), "*physical property characteristics of each UST site vary. However, all USTs were installed above bedrock in unconsolidated material. The majority of USTs were installed above the water table in the vadose zone"* and *"during RVAAP operations, USTs were typically installed within former or current industrial facilities."*

All 24 former UST locations that are the subject of this SI were installed to support government-owned, contractor-operated activities at the former RVAAP. Specific information on the purpose of each UST included in this SI is summarized on Table 2-1. Further detailed information on the chronological summary of each former UST from installation, last use, and removal, as well as purpose, analytical data, and other available documented information is provided in the UST inventory summary forms in Appendix S of the Final HRR (SAIC 2011a).

All former UST locations are no longer active. Table 2-1 provides removal dates for those former UST locations where documentation of removal was available. All former UST locations have documentation of either the UST removal or previous geophysical survey results that did not locate any USTs except for the following:

- RV-4
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89
- CC-RVAAP-72-01
- CC-RVAAP-72-06

No previous documentation or evidence of the presence of military munitions at the 24 former UST sites, subject of this SI, was found during the HRR (SAIC 2011a). Results of the munitions and explosives of concern (MEC) clearance conducted as part of this SI did not indicate any evidence or notable findings at the former UST sites.

2.2 LAND USE AND OWNERSHIP HISTORY

CC RVAAP-72 FWUSTs are located within the former RVAAP. Camp Ravenna is used for military training.

2.3 PREVIOUS INVESTIGATIONS

As presented in Table 2-1, during this SI, field inspections were performed at the former UST locations, and geophysical surveys were performed at select locations.

At 15 former UST locations (listed below), no records of soil sampling were found during the HRR (SAIC 2011a) to demonstrate compliance with BUSTR closure sampling requirements.

- RV-4
- RV-5
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89
- CC-RVAAP-72-01
- CC-RVAAP-72-02
- CC-RVAAP-72-03
- CC-RVAAP-72-04
- CC-RVAAP-72-05
- CC-RVAAP-72-06
- CC-RVAAP-72-08

At these 9 former NFA UST locations (listed below), Ohio EPA requested that hexavalent chromium samples be collected. At the time the USTs were removed and soil samples collected, none of the soil samples were analyzed for hexavalent chromium, potassium dichromate (which is a hexavalent chromium compound) was once used in these former USTs to prevent corrosion when they were not in use.

- RV-13
- RV-14
- RV-15
- RV-16
- RV-17
- RV-18
- RV-19
- RV-37
- RV-97

This SI was completed based on the former UST location information and recommendations provided in the HRR report.

1702 **Table 2-1: Summary of Known Information for 15 Former Underground Storage Tanks and 9 Hexavalent Chromium No Further Action Former Underground Storage Tanks**

Former UST	Regulated under BUSTR	Date Removed	Summary of Removal Documentation Available from Field Notes and Reports	Available Soil Analytical Data	Location	Building	Size (gallons)	Stored Fuel Type	Further Action Recommended in HRR (SAIC 2011a)	Site Inspection Field Activities
Fifteen Former Underground Storage Tanks without Records of Soil Sampling										
RV-4	No	1987	Not regulated under BUSTR (<110-gallon capacity). Documentation stating tank removed.	Unknown	Administration Area	Building 1026 Telephone Exchange	100	Gasoline	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals. Geophysical survey(2)
RV-5	No	Prior to 1990 (date unknown)	Not regulated under BUSTR (<110-gallon capacity). Documentation stating tank was removed and scrapped.	Unknown	Administration Area	Building 1048A	100	Gasoline	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO and TPH DRO, and TAL Metals.
RV-41	No	June 1993	Tenant Tank (Physics International Company) Tank removal inspection report indicates no visible signs of soil contamination or visible holes upon tank removal.	Not available, may not exist	Load Line 6	Building 2F-11	6,000	No. 2 fuel oil/used for building and process heat	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals. Geophysical survey(2)
RV-46	No	1986, as listed in a report; unable to verify	Nozzle News report from December 1991 indicates a 20- x 20-ft grid search in potential area of UST. No tank was found. Interviewees recall removal of tank from Bolton Mansion.	Not available, may not exist	Depot Area	Building EE-102 Bolton Mansion	1,500	No. 2 fuel oil for steam boiler	Yes	Subsurface soil sampling PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals(3). Geophysical survey(2)
RV-86	Unknown	Unknown	Nozzle News report from December 1991 indicates a 20- x 20-ft grid search in potential area of each UST site. No tanks were found. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Administration Area	Building 1026 Telephone Building	Unknown	Unknown	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals. Geophysical survey(2)
RV-87	Unknown	Unknown	Nozzle News report from December 1991 indicates a 20- x 20-ft grid search in potential area of each UST site. No tanks were found. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Administration Area	Building 1026 Telephone Building	Unknown	Unknown	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals. Geophysical survey(2)
RV-88	Unknown	Unknown	Nozzle News report from December 1991 indicates a 20- x 20-ft grid search in potential area of each UST site. No tanks were found. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Building 1103	McClintocksburg Gate/Fire Station No. 2	Unknown	Diesel for boiler 19	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals. Geophysical survey(2)
RV-89	Unknown	Unknown	Nozzle News report from December 1991 indicates a 20- x 20-ft grid search in potential area of each UST site. No tanks were found. No visual evidence of above grade tank components observed during 2010 property visit.	Unknown	South Service Road	George Road Sewage Treatment Plant – 100 yards south of South Service Road	Unknown	Fuel oil for generator	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals. Geophysical survey(2)

1703 **Table 2-1: Summary of Known Information for 15 Former Underground Storage Tanks and 9 Hexavalent Chromium No Further Action Former Underground Storage Tanks (continued)**

Former UST	Regulated Under BUSTR	Date Removed	Summary of Removal Documentation Available from Field Notes and Reports	Available Soil Analytical Data	Location	Building	Size (gallons)	Stored Fuel Type	Further Action Recommended in HRR (SAIC 2011a)	Site Inspection Field Activities
CC-RVAAP-72-01	Yes	Unknown	Drawing 6698-RU A-10 indicates the presence of a kerosene tank at U-3. Some above grade piping was noticed at the U-3 during the property visit.	Not available	Depot	U-3	Unknown	Kerosene	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals[(3)].
CC -RVAAP-72-02	Yes	Unknown	No tank was located during a geophysical survey performed by MKM in 2004. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Atlas Scrap Yard	Northern Service Station; Building T-15	1,000	Leaded gasoline; fueling station	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GROTPH DRO, and TAL Metals
CC-RVAAP-72-03	Yes	Unknown	No tank was located during a geophysical survey performed by MKM in 2004. No sampling was performed. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Atlas Scrap Yard	Northern Service Station; Building T-15	1,000	Leaded gasoline; fueling station	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals
CC-RVAAP-72-04	Yes	Unknown	No tank was located during a geophysical survey performed by MKM in 2004. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Atlas Scrap Yard	Northern Service Station; Building T-15	1,000	Fuel oil	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals
CC-RVAAP-72-05	Yes	Unknown	No tank was located during a geophysical survey performed by MKM in 2004. No visual evidence of above grade tank components observed during 2010 property visit.	Not available	Atlas Scrap Yard	Northern Service Station; Building T-15	2,000	Kerosene	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals
CC-RVAAP-72-06	Unknown	Unknown	Map for Water Works 3 indicated the presence of a UST at the area of concern. It is unknown whether this UST has been removed.	Not available	Water Works 3	Water Works 3	280	Fuel oil	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals
CC-RVAAP-72-08	No	December 10, 1971	Tank was installed in October 1971. UST was replaced with an aboveground storage tank in December 1971 due to a November malfunction causing a release of 400 gallons of fuel oil.	Not available	Inert Storage Area 8	Building 848	550	Fuel oil	Yes	Subsurface soil sampling for PAHs, BTEX with MTBE, TPH GRO, TPH DRO, and TAL Metals

1704

Table 2-1: Summary of Known Information for 15 Former Underground Storage Tanks and 9 Hexavalent Chromium No Further Action Former Underground Storage Tanks (continued)

Former UST	Regulated Under BUSTR	Date Removed	Summary of Removal Documentation Available from Field Notes and Reports	Available Soil Analytical Data	Location	Building	Size (gallons)	Stored Fuel Type	Further Action Recommended in HRR (SAIC 2011a)	Site Inspection Field Activities
Nine Former Underground Storage Tanks Sampled for Hexavalent Chromium at the Request of Ohio EPA										
RV-13	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building U-6, North Tank	12,000	Diesel	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-14	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building U-6, South Tank	12,000	Diesel	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-15	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building U-3, South Tank	12,000	Gasoline	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-16	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building U-3, North Tank	12,000	Gasoline	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-17	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building A-6, North Tank	3,900	Gasoline	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-18	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building A-6, Center Tank	3,900	Gasoline	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-19	Yes	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building A-6, South Tank	3,900	Gasoline	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-37	No	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building A-1	5,000	Heating oil	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A
RV-97	No	February 1990	1990 Closure Report by Cardamone Construction details tank removal and soil sampling.	Data tabulated in closure report	Depot Area	Building A-6	550	Heating oil	No[(1)]	Subsurface soil samples analyzed only for hexavalent chromium – USEPA Method 7196A

Notes:

1. Although the HRR (SAIC 2011a) recommended No Further Action, these former UST locations were added to this SI under CC RVAAP-72 FWUSTs in response to Ohio Environmental Protection Agency's comment letter issued September 4, 2011 that requested additional subsurface soil sampling for hexavalent chromium only from these 9 former NFA USTs.
2. Two methods of surface geophysics were used; ground penetrating radar and electromagnetic at these noted UST locations.
3. TAL Metal analysis includes total chromium. Additional sample volume was collected at these locations and held at the laboratory. If elevated total chromium concentrations were reported, hexavalent chromium analysis was conducted.
4. Table information was obtained from Table 5-1 of *the Final Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern), Ravenna Army Ammunition Plant, Ravenna, Ohio* (Science Applications International Corporation 2011a).

BTEX = Benzene, toluene, ethylbenzene, and total xylenes.
BUSTR = Bureau of Underground Storage Tank Regulations.
DRO = Diesel range organics.
ft = Feet.
GRO = Gasoline range organics.
HRR = Historical Records Review.
mg/kg = Milligrams per kilogram.
MTBE = Methyl tertiary-butyl ether.
PAH = Polycyclic aromatic hydrocarbon.
SAIC = Science Applications International Corporation.
TAL = Target Analyte List.
TPH = Total petroleum hydrocarbon.
USEPA = United States Environmental Protection Agency.
UST = Underground storage tank.

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LEGEND

- Location of Former UST
- Facility Property Line
- Road

NOTES & SOURCES

1. Map Coordinates: NAD 83, UTM Zone 17N
   2006 Orthoimagery from USGS
2. UST = underground storage tank

TITLE

Figure 2-1

15 Former UST Locations

CC RVAAP-72
Facility-Wide
Underground Storage Tanks

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

0 3,000 6,000 Feet

ECC
Marlborough, Massachusetts

GIS Server
F:\Projects\Ravenna 030113\MapDocuments\SI_RPT\CC72\SI72_Fig2-1_UST_Locs.mxd
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Newton Falls Road
State Route 80 Freedom Road
CC RVAAP-72
RV-13, RV-14
CC RVAAP-72
RV-15, RV-16
CC RVAAP-72
RV-17, RV-18, RV-19, RV-97
CC RVAAP-72
RV-37
LEGEND
Location of Former UST
Road
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N
2006 Orthoimagery from USGS
2. UST = underground storage tank
3. NFA = no further action
TITLE
Figure 2-2
9 NFA UST Locations
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0
310
620
Feet
N
ECC
Marlborough, Massachusetts
NO.
2-2
GIS Server
F:\Projects\Ravenna 030113\MapDocuments\SI_RPT\CC72\
SI72_Fig2-2_UST_Locs.mxd
January 2013 DWN BY: CG CHKD BY: GC

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3.0 HISTORICAL OPERATIONS

As stated for CC RVAAP-72 FWUSTs AOC in the HRR report (SAIC 2011a), "*this AOC includes only petroleum USTs (e.g., gasoline, fuel oil, diesel, etc.) and does not include USTs that were used to store waste products from RVAAP operations, such as waste oil, pink water, wastewater, and spent chemical reagent.*" The potential contaminants at the CC RVAAP-72 FWUSTs are petroleum-related compounds (polycyclic aromatic hydrocarbon [PAH]); benzene, toluene, ethylbenzene, and total xylenes [BTEX]; methyl tertiary-butyl ether [MTBE]; two total petroleum hydrocarbon [TPH] diesel range organics [DRO] carbon chain compounds [C10-C20, C20-C34]; and one TPH gasoline range organic [GRO] carbon chain compound (C6-C12).

The previous UST removal actions, geophysical survey, field inspections, and chemical soil sampling at the 24 former UST locations, subject of this SI, are summarized in Table 2-1, which also includes descriptions of petroleum compounds stored in the former USTs.

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4.0 FIELD INVESTIGATION

Work completed for this SI was conducted in accordance with the Final SI/Remedial Investigation (RI) Work Plan (ECC 2012) and the former *RVAAP-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC 2011b) dated February 24, 2011, unless specifically noted otherwise (Section 4.4). Photographs of the field activities are provided in Appendix G. The subsurface soil samples collected for this SI are presented in Table 4-1.

4.1 SAMPLING RATIONALE

Discrete subsurface soil sampling was conducted at the 15 former CC RVAAP-72 FWUSTs without records of previous sampling, and the 9 former NFA CC RVAAP-72 FWUSTs from which Ohio EPA requested subsurface hexavalent chromium samples, to determine the presence of potential contamination associated with these 24 former USTs. Discrete samples were collected as required per the sampling protocols in the BUSTR Technical Guidance Manual (Ohio Department of Commerce 2014).

These 15 former USTs (listed below) were recommended for subsurface soil sampling because no records of soil sampling were found during the HRR (SAIC 2011a) to demonstrate compliance with BUSTR closure sampling requirements.

- RV-4
- RV-5
- RV-41
- RV-46
- RV-86
- RV-87
- RV-88
- RV-89
- CC-RVAAP-72-01
- CC-RVAAP-72-02
- CC-RVAAP-72-03
- CC-RVAAP-72-04
- CC-RVAAP-72-05
- CC-RVAAP-72-06
- CC-RVAAP-72-08

At 7 of these 15 former UST locations (listed below), there is also no documentation or physical evidence of UST removal. Geophysical methods were used at these 7 former UST locations during this SI to search for anomalies indicative of a UST remaining in-place.

- RV-4
- RV-41
- RV-46
- RV-86

- RV-87
- RV-88
- RV-89

Based upon the geophysical survey results, the pre-planned soil boring locations were adjusted to increase the likelihood of finding potential contamination.

The Ohio EPA requested additional sampling for hexavalent chromium at 9 former NFA USTs in a comment letter received on September 4, 2011. The Ohio EPA requested that subsurface soil samples be collected at these 9 former NFA UST locations and only be analyzed for hexavalent chromium because potassium dichromate was once used in these former UST locations to prevent corrosion when they were not in use. Subsurface soil samples were collected at the 9 former NFA UST locations (listed below) to assess whether or not hexavalent chromium is present in subsurface soils. Each of these USTs was documented as removed in February 1990, and NFA designations were determined for each of these 9 former UST locations in 1991. However, at the request of the Ohio EPA, additional sampling for only hexavalent chromium was conducted as part of this SI. Figure 2-2 shows the locations of the 9 former NFA USTs.

These 9 former NFA USTs locations were recommended for subsurface soil sampling by Ohio EPA only for hexavalent chromium:

- RV-13
- RV-14
- RV-15
- RV-16
- RV-17
- RV-18
- RV-19
- RV-37
- RV-97

All subsurface soil samples were collected as discrete samples, with exception of the composite subsurface soil sample collected between 7 and 13 ft below ground surface (bgs). At each former UST location or co-located cluster of former UST locations, 3 or more soil borings were advanced within the inferred UST excavation cavity or around the former UST location identified in the HRR (SAIC 2011a). Subsurface soil samples were collected at a depth below fill material in the UST cavity excavation, if encountered, or a targeted depth determined from depth and size of the former UST. Subsurface soil samples were collected at intervals based on field screening, observation of staining, or petroleum odor to increase the likelihood of identifying potential contamination. Soil samples were also collected based on field screening at soil borings located around the former UST cavity excavation. At 7 of the former UST locations, geophysical survey results were used to locate soil borings. Multiple subsurface soil samples within the inferred or around UST excavation cavity and below the former UST were collected to increase the likelihood of identifying potential contamination.

The discrete subsurface soil sampling at the 9 former NFA UST locations included the completion of 2-4 direct-push borings along the sides of the former UST location or cluster of former USTs or within it. Additionally, one boring was completed on each end of the inferred location of the former UST cavity excavation. The retrieved soil cores were recorded to determine vertical extent of the backfill within the former UST cavity excavation. A soil sample was collected from 0 to 2 ft below the extent of the UST cavity excavation backfill material or the inferred depth of the UST determined from the HRR (SAIC 2011a). These samples were analyzed for hexavalent chromium. Table 4-1 provides a sampling summary for the 9 former NFA UST locations.

This sampling strategy followed the BUSTR soil sampling guidance for using highly biased sample locations to identify potential contamination from a former UST.

Sediment and surface water are not present at this AOC, and groundwater is being evaluated on a facility-wide basis (RVAAP-66 Facility-Wide Groundwater). Therefore, samples were not collected from sediment, surface water, or groundwater during this SI.

4.2 PRE-MOBILIZATION ACTIVITIES

Prior to the field investigation, a series of pre-mobilization activities were undertaken to ensure that all applicable requirements were met. These included providing necessary notifications to the RVAAP Facility Manager, Ohio EPA, operating contractor, and other stakeholders.

ECC personnel mobilized to former RVAAP on October 22, 2012 to conduct a site walk to identify the location of each former UST, based on available information in the HRR (SAIC 2011a), and mark direct-push boring locations at each of the 24 former UST locations. The pre-mobilization tasks included the following activities:

- Conducting a site walk
- Locating the former UST location
- Locating the soil borings
- Decontaminating the sampling equipment
- MEC clearance at select former UST locations

4.2.1 Site Walk

ECC conducted a site walk at CC RVAAP-72 FWUSTs on October 22, 2012 to assess current site conditions and to note any potential health and safety hazards that could affect the SI field work.

4.2.2 Subsurface Soil Sampling and Geophysical Survey Locations

For this SI, after the former UST locations were located by reference to historical records (SAIC 2011a) and for select former UST locations by geophysical survey, the direct-push soil boring locations were marked with wooden stakes with high visibility paint and flagging. The locations

of the 15 former UST locations without sampling records are shown on Figures 4-1 through 4-5. The locations of the 9 former NFA USTs are shown on Figure 2-2.

4.2.3 Munitions and Explosives of Concern and Utility Clearance Surveys

MEC clearance was not conducted at 11 of the 15 former UST locations due to the fact that they are not located within a Munitions Response Site and no documentation of military munitions being historically located or stored onsite was discovered (SAIC 2011a).

In preparation for this SI, MEC avoidance procedures were conducted at four former UST locations: CC-RVAAP-72-02, CC-RVAAP-72-03, CC-RVAAP-72-04, and CC-RVAAP-72-05. These former UST locations were located in the Atlas Scrap Yard Munitions Response Site. According to the HRR, these former UST located at the Atlas Scrap Yard, while not used to contain explosive materials, were part of the supporting infrastructure (boiler houses, power plants, etc.) that were involved in the production of munitions. Unexploded ordnance support (avoidance) was used due to Atlas Scrap Yard being a Munitions Response Site.

Prior to any intrusive activities at former UST locations CC-RVAAP-72-02, CC-RVAAP-72-03, CC-RVAAP-72-04, and CC-RVAAP-72-05, the soil boring locations were "swept" by a trained ECC unexploded ordnance technician using a field instrument. If any anomalies were detected, the boring location was moved a short distance (1-2 ft) from the original location, and the location was re-swept. Thereafter, following drilling of the borehole to a depth of 2 ft bgs, the location was swept again with the unexploded ordnance field instrument. In this manner, the location was "cleared" to a depth of 10 ft bgs. No MEC anomalies were observed at any of the borings drilled at former UST locations CC-RVAAP-72-02, CC RVAAP72-03, CC-RVAAP-72-04, and CC-RVAAP-72-05.

ECC met with Vista Sciences Corporation representatives on October 23, 2012 at Building 1037. During this meeting, ECC inquired of Mr. James D. McGee, Vista Sciences Corporation Project Manager for the former RVAAP, about utility clearance protocols at the former RVAAP. After his review of the former UST locations, Mr. McGee reported that any utility within these areas would either have been previously removed or, if still in place, inactive and not energized. No live/active utilities were encountered during any of the drilling activities conducted at CC RVAAP-72 FWUSTs.

4.2.4 Site Clearing Activities

Site clearing activities consisted of clearing low brush and debris from proposed soil sampling areas and soil boring locations. Cut brush was subsequently mechanically chipped and spread on the ground.

4.2.5 Site Security

No specific site security was needed at the CC RVAAP-72 FWUSTs. However, each work day prior to mobilizing to the former UST locations, RVAAP Range Control was notified that ECC and subcontractor personnel would be working at each of the former UST locations.

4.2.6 Equipment Decontamination

Prior to beginning subsurface soil sampling, all sampling equipment was decontaminated at a pre-designated area within Building 1036. For this purpose, a 5-square ft piece of plastic sheeting was placed on the concrete floor of the building in the designated decontamination area.

Five-gallon buckets were used to contain brushes, potable water with Alconox® wash, and potable water rinse. Other decontamination fluids consisted of pesticide grade isopropyl alcohol, a 10 percent nitric acid solution, and laboratory supplied deionized water contained in spray bottles. Following the Alconox® wash with brushes and potable water rinse, sampling equipment was sprayed with isopropyl alcohol, sprayed with the 10 percent nitric acid solution, rinsed with deionized water, and then wrapped in aluminum foil. Sufficient sampling equipment was brought to the sampling location each morning to allow for sampling the former UST without the need to decontaminate equipment. All sampling equipment was decontaminated inside Building 1036 at the end of each work day in preparation for sampling the following day.

Prior to commencing subsurface soil sampling, all direct-push drilling rods and equipment were decontaminated using a high pressure steam cleaner and brushes. A temporary decontamination area was constructed outside of Building 1036 and lined with plastic sheeting. The drilling equipment was then placed on a temporary steel rack within the decontamination pad, and the equipment was thoroughly cleaned. Following conclusion of subsurface soil sampling, drilling equipment was decontaminated using a high pressure steam cleaner.

During subsurface soil sampling at CC RVAAP-72 FWUSTs, direct-push steel samplers were decontaminated as necessary using 5-gallon buckets, Alconox® wash and brushes, potable water rinse, pesticide grade isopropyl alcohol, a 10 percent nitric acid solution, and laboratory-supplied deionized water contained in spray bottles. The decontamination area was set up on plastic sheeting off the eastern side of Building 1037.

All decontamination fluids were containerized in a Department of Transportation-approved 55-gallon closed steel drum located within secondary containment inside Building 1036. The drum was labeled with contents, date of initial generation, and contact information.

All sampling equipment was decontaminated in accordance with the procedures outlined in Section 5.6.2.9 of the *Facility-Wide Sampling and Analysis Plan* (FWSAP) (SAIC 2011b).

4.3 FIELD SAMPLING

At CC RVAAP-72 FWUSTs, discrete subsurface soil samples were collected to determine whether contamination was present at the 15 former UST locations with no record of prior sampling, and to determine if hexavalent chromium is a contaminant at 9 former NFA USTs. Between November 16, 2012 and August 14, 2013 subsurface soil samples were collected at the 24 former UST locations, from depths below the known or suspected depths of the former UST cavity excavation, as summarized in Table 4-1. The subsurface soil samples collected from the 15 former UST locations with no record of prior sampling were analyzed for petroleum-related compounds and metals. Composite subsurface soil samples were also collected from 7 to 13 ft

bgs at the former UST or UST cluster locations, as summarized in Table 4-1 to evaluate subsurface soil to the exposure depth of the resident receptor (i.e., 13 ft bgs). Subsurface soil samples collected from the 9 former NFA UST locations were only analyzed for hexavalent chromium, as requested by Ohio EPA.

Select subsurface soil samples from the 15 former UST locations were analyzed for the RVAAP full suite, which includes the parameters summarized in Table 4-1 and listed below:

- Volatile organic compounds (VOCs)
- Semivolatile organic compounds (SVOCs)
- Polychlorinated biphenyls (PCBs)
- Explosives
- Propellants
- Pesticides
- Target Analyte List (TAL) Metals

Table 4-1 provides a summary of the soil samples collected between November 2012 and August 2013. Table 4-2 summarizes the sampling rationale for each sample collected at the 15 former UST locations with no record of prior sampling and the 9 former NFA USTs.

Soil samples collected during this SI at CC RVAAP-72 FWUSTs were analyzed at TestAmerica Laboratories, Inc. of North Canton, Ohio; Pittsburgh, Pennsylvania; and West Sacramento, California. Quality control samples were also collected during this SI, as summarized in Tables 4-1 and 4-2.

All analytical procedures were completed in accordance with applicable professional standards, USEPA requirements, government regulations and guidelines, Department of Defense Quality Systems Manual Version 4.1, USACE–Louisville District analytical quality assurance standards, and specific project goals and requirements. Preparation and analyses for chemical parameters in field samples were completed using the methods listed in Table 4-3.

4.3.1 Subsurface Soil Sampling Methods

Subsurface soil was collected using a Geoprobe® Model 6620DT direct-push drill rig. Samples were collected using 5-ft long stainless steel Geoprobe® sampling rods lined with acetate Microcore® samplers. Each sample was collected using a dedicated liner. In order to collect the sample, the rods were driven to the desired depth. The sampler was retrieved from the desired depth, and the liner was removed. The liner was cut open length-wise and field screened with a photoionization detector. Samples for headspace field screening were collected using stainless steel scoopulas and placed in 8-ounce glass jars. The jars were then capped with aluminum foil and a plastic lid and allowed to warm for approximately 10 minutes. The tip of the photoionization detector was then inserted into the jar through the aluminum foil and the reading recorded on the boring log.

The liner containing the soil was photographed and soil characteristics for each interval were recorded on a soil boring log. A summary of sampling information was recorded on the field log

forms. Field log forms and boring logs from the site investigation are presented in Appendixes A and B, respectively. Photographs are presented in Appendix G.

The VOC and TPH GRO samples were collected using a disposable Terracore® sampler. Based on required analysis, additional soil samples were collected from the respective interval and placed in the appropriate container(s). All sample containers were labeled and placed in a cooler with ice following collection. The soil characteristics for each interval were logged. The sampling was conducted in accordance with Section 5.5.2.1.3 of the FWSAP (SAIC 2011b).

4.3.1.1 Deep Soil Boring Sampling

One deep soil boring (DSB) was advanced at each of the 15 former UST locations or UST clusters to a depth of 13 ft bgs to characterize the subsurface soils to 13 ft bgs. Twelve DSBs were advanced to a depth of 13 ft bgs and a sample was collected from the 7 to 13-ft bgs interval. The VOC and TPH GRO samples were collected from the deep subsurface soil boring using a disposable Terracore® sampler prior to compositing the sample to avoid loss of volatiles. VOC and TPH GRO samples were collected from the middle of the interval unless field screening or professional judgment biased the sample collection toward a different interval. Soil was collected by running a stainless steel scoopula along the length of the liner from 7 to 10 ft and from 10 to 13 ft. The soil was then mixed with a stainless steel spoon in a stainless steel bowl to collect a representative composite sample. These samples were collected in accordance with sampling procedures as described in Section 5.5.2.5.1 in the FWSAP (SAIC 2011b) and as presented in Appendix A, Section A.4, of the Final SI/RI Work Plan (ECC 2012).

4.3.2 Surface Geophysical Survey at 7 CC RVAAP-72 Facility-Wide Underground Storage Tank Locations

A surface geophysical survey was conducted at 7 former UST locations (RV-4, RV-87, RV-41, RV-46, RV-86, RV-88, and RV-89) to provide data to determine if these former USTs remain in-place. Two types of surface geophysical survey techniques were used for the investigation: GPR and an EM survey. The GPR survey was completed at the selected locations using a GSSI SIR-3000 with a 400-megahertz antenna. GPR is a non-intrusive, surface geophysical technique that detects subsurface structures by transmitting electromagnetic waves from an antenna into the ground. The antenna then monitors the strength and time delay of the return signal. The return signal is then evaluated for any anomalies, which by their size, shape, and orientation can be interpreted as voids, USTs, utility pipelines, soil-bedrock interface, or areas of different sediment compaction. The GPR and EM survey results were used to refine the location of the soil borings.

The EM survey was completed using an EM-61 Mark 2 (EM-61) with on-board logging computer. The EM-61 is a time-domain metal detector that detects both ferrous and non-ferrous metals. A powerful two-coil rectangular transmitter generates a pulsed primary magnetic field into the earth, which induces eddy currents in nearby metallic objects. The EM-61 can detect buried metal beyond 4 ft in the subsurface, depending on the size of the target and the conductivity contrast between the object and surrounding soils.

Of the 7 former UST locations investigated, the geophysical survey results at 6 of the former UST locations did not have GPR and EM survey anomalies that would be indicative of a UST. At the location of former UST RV-46, located next to the Bolton Manor (Building EE-102) the GPR and EM survey results reported anomalies. The results of the EM-61 survey indicated there was a large magnetic anomaly, approximately 2 ft by 3 ft, within the northeastern portion of the survey grid. The GPR survey confirmed this anomaly was an object in place; however, due to its irregular surface, this EM anomaly could not be confirmed as a UST. Another feature was identified during the GPR survey that had proper dimensions and features of a UST, but did not have any magnetic return. This feature was interpreted as a concrete UST approximately 7.5 ft in width and 8.8 ft in length. The geophysical survey report states that the extent of the UST extends partially beyond the survey grid; however, due to obstructions that shortened the survey grid, the full extent of the anomaly was not determined. According to the HRR (SAIC 2011a), the former UST RV-46 was a 1,500-gallon steel tank that was used to store No. 2 fuel oil for heating the former Bolton Manor.

The surface geophysical survey summary letter report for former UST locations RV-4, RV-87, RV-41, RV-46, RV-86, RV-88, and RV-89 is provided in Appendix H.

4.4 DEVIATIONS FROM WORK PLAN

Deviations from the Final SI Work Plan (ECC 2012) for fieldwork conducted at CC RVAAP-72 are listed below:

- At former UST location RV-87 (located at Building 1026), three borings were advanced instead of four due to a number of suspected buried utilities within the drilling area. This information concerning buried utilities was received by ECC after this area had been cleared to conduct soil borings on December 4, 2012. No as-built drawings or other utility plans were available for review prior to drilling. Building 1026 is the active telephone exchange building for Camp Ravenna.

- At former UST location RV-19 (located at former Building A-6), an additional boring (SB-11A, sample identification (ID) 076SB-0087-0001-SO) was advanced outside of the suspected former UST cavity excavation to attempt to get below refusal encountered within the suspected former UST cavity excavation.

- At former UST location RV-97 (550-gallon former UST located to the east of former Building A-6), four borings were advanced instead of the planned three borings. The extra boring was advanced following discovery of an additional site plan that portrayed the former UST in a slightly different location than the site plan on which the work plan was based.

- At former UST location RV-46 (UST at Bolton Manor), an additional soil sample (sample ID 072SB-0078-0001-SO) was collected at 13 ft bgs due to slight petroleum odor in the soil.

- One DSB was advanced at the cluster of former USTs CC-RVAAP-72-02, CC-RVAAP-72-04, CC-RVAAP-72-05, and CC-RVAAP-72-03 (Atlas Scrap Yard) instead of at each former UST location, as these locations are in close proximity to each other. There were no reported BUSTR exceedances of petroleum hydrocarbons or PAHs in the subsurface soil sample results collected from these UST locations.

- Herbicide analysis was inadvertently added to the chain of custody for samples collected from former UST location CC-RVAAP-72-01. Note that herbicides were not identified during the HRR as being stored in this former UST (SAIC 2011a) as it was used to store kerosene.

- Full list VOC (at former UST locations RV-4 and RV-87) and full list SVOC (at former UST locations RV-41, RV-86, RV-89, and CC-RVAAP-72-03) analyses were completed instead of the BTEX/MTBE and PAH analyses.

- Soil boring locations at UST RV-46 location were not surveyed. These soil boring locations were located using geophysical survey and ECC field notes.

4.5 SURVEYING

ECC subcontracted the survey of the soil boring locations within CC RVAAP-72 FWUSTs to Campbell and Associates, Inc., Cuyahoga Falls, Ohio, a licensed surveyor in the state of Ohio. All survey data were reported in North American Datum 1983 Universal Transverse Mercator Zone 17 north in meters.

4.6 INVESTIGATION-DERIVED WASTE

The IDW consisted of soil cuttings from subsurface soil sampling, personal protective equipment, used, empty acetate liners, used TerraCore® samplers, and general non-environmental trash. The soil cuttings were primarily collected in plastic garbage liners placed inside 5-gallon buckets.

Additional soil cuttings were collected on the clear 6-mil-thick plastic sheeting placed on the ground at the end of the cutting table and below the two 5-gallon buckets used for collecting soil cuttings. A large garbage bag was used to contain used nitrile gloves, used TerraCore® samplers, and cut-up pieces of acetate liners. A long-handled steel lopper was used to cut the acetate liners into 12-18-inch long pieces for disposal. Finally, a large garbage bag was used to collect general non-environmental waste. The buckets for soil cuttings were brought to Building 1036 and placed in appropriately labeled 55-gallon open-headed drums. All decontamination fluids were brought to Building 1036 and placed in appropriately labeled 55-gallon drums.

4.6.1 Collection and Containerization

All IDW, including drill cuttings, personal protective equipment, disposable sampling equipment, and decontamination fluids, was properly handled, labeled, characterized, and managed in accordance with Section 8.0 of the FWSAP (SAIC 2011b), federal and state of Ohio

large-quantity generator requirements, and the *Installation Hazardous Waste Management Plan for RVAAP* (Base Realignment and Closure Office 2009).

4.6.2 Characterization for Disposal

IDW disposal characterization samples were collected by ECC personnel on December 12, 2012 and on August 15, 2013. Samples were comprised of liquid IDW consisting of de-contamination fluids, and solid IDW consisting of drill cuttings. IDW analysis included both liquid and solid full-suite Toxicity Characteristic Leaching Procedure, and Reactivity, Corrosivity, and Ignitability analysis.

4.6.3 Transportation and Disposal

On March 15, 2013, Ohio EPA approved the IDW letter report for the transport and disposal of the accumulated IDW as a result of SI tasks executed in 2012. The IDW letter report and Ohio EPA approval letter are provided in Appendix F. On April 5, 2013, the drummed IDW was transported under a non-hazardous waste manifest by Emerald Environmental Services, Inc. for disposal at Vexor Technology in Medina, Ohio. The manifest is provided in Appendix F.

On November 27, 2013, Ohio EPA approved the IDW letter report for the transport and disposal of the accumulated IDW as a result of SI tasks executed in 2013. The IDW letter report and Ohio EPA approval letter are provided in Appendix F. On December 23, 2013, the drummed IDW was transported under a non-hazardous waste manifest by Emerald Environmental Services, Inc. for disposal at Vexor Technology in Medina, Ohio. The manifest is provided in Appendix F.

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
Subsurface Soil Analytical Program- 15 Former UST Locations with No Records of Previous Sampling																			
RV-5 (Building 1048A)																			
FW USTs	SB-01	072SB-0001-0001-SO	SB	5-6	Discrete	3-Dec-12		X		X	X	X	X						
FW USTs	SB-01	072SB-0001-0002-SO	SB	5-6	Discrete	3-Dec-12		X		X	X	X	X						
FW USTs	SB-01	072SB-0002-0001-SO	SB	5-6	Discrete	3-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0003-0001-SO	SB	5-6	Discrete	3-Dec-12	X	X		X	X	X	X	X	X	X	X		
FW USTs	SB-03	072SB-0004-0001-SO	SB	5-6	Discrete	3-Dec-12		X		X	X	X	X						
FW USTs	SB-01	072SB-0005-0001-SO	SB	7-13	Composite	3-Dec-12		X		X	X	X	X						
RV-4 (Building 1026)																			
FW USTs	SB-01	072SB-0007-0001-SO	SB	5-6	Discrete	4-Dec-12	X	X		X	X	X	X						
FW USTs	SB-02	072SB-0008-0001-SO	SB	5-6	Discrete	4-Dec-12	X	X		X	X	X	X						
FW USTs	SB-03	072SB-0009-0001-SO	SB	5-6	Discrete	4-Dec-12	X	X		X	X	X	X						
FW USTs	SB-01	072SB-0010-0001-SO	SB	7-13	Composite	4-Dec-12	X	X		X	X	X	X						

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
RV-86 (Building 1026)																			
FW USTs	SB-01	072SB-0012-0001-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0012-0002-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0013-0001-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-02	072SB-0014-0001-SO	SB	6-7	Discrete	3-Dec-12	X	X	X	X	X	X	X	X	X	X	X		
FW USTs	SB-03	072SB-0015-0001-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-04	072SB-0016-0001-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-05	072SB-0017-0001-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-06	072SB-0018-0001-SO	SB	6-7	Discrete	3-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0019-0001-SO	SB	7-13	Composite	3-Dec-12		X	X	X	X	X	X						
RV-87 (Building 1026)																			
FW USTs	SB-01	072SB-0021-0001-SO	SB	6-7	Discrete	4-Dec-12	X	X		X	X	X	X						
FW USTs	SB-02	072SB-0022-0001-SO	SB	6-7	Discrete	4-Dec-12	X	X		X	X	X	X						
FW USTs	SB-03	072SB-0023-0001-SO	SB	6-7	Discrete	4-Dec-12	X	X		X	X	X	X						
FW USTs	SB-01	072SB-0024-0001-SO	SB	7-13	Composite	4-Dec-12	X	X		X	X	X	X						

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
RV-89 (George Road Treatment Plant)																			
FW USTs	SB-01	072SB-0026-0001-SO	SB	10-11	Discrete	4-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0026-0002-SO	SB	10-11	Discrete	4-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0027-0001-SO	SB	10-11	Discrete	4-Dec-12		X	X	X	X	X	X						
FW USTs	SB-02	072SB-0028-0001-SO	SB	10-11	Discrete	4-Dec-12		X	X	X	X	X	X						
FW USTs	SB-03	072SB-0029-0001-SO	SB	10-11	Discrete	4-Dec-12		X	X	X	X	X	X						
FW USTs	SB-04	072SB-0030-0001-SO	SB	10-11	Discrete	4-Dec-12	X	X	X	X	X	X	X	X	X	X	X		
FW USTs	SB-05	072SB-0031-0001-SO	SB	10-11	Discrete	4-Dec-12		X	X	X	X	X	X						
FW USTs	SB-05	072SB-0032-0001-SO	SB	7-13	Composite	4-Dec-12		X	X	X	X	X	X						
CC-RVAAP-72-03 (Atlas Scrap Yard)																			
FW USTs	SB-01	072SB-0035-0001-SO	SB	8-9	Discrete	5-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0035-0002-SO	SB	8-9	Discrete	5-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0036-0001-SO	SB	8-9	Discrete	5-Dec-12		X	X	X	X	X	X						
FW USTs	SB-02	072SB-0037-0001-SO	SB	8-9	Discrete	5-Dec-12		X	X	X	X	X	X						
FW USTs	SB-03	072SB-0038-0001-SO	SB	8-9	Discrete	5-Dec-12		X	X	X	X	X	X						
FW USTs	SB-04	072SB-0039-0001-SO	SB	8-9	Discrete	5-Dec-12	X	X	X	X	X	X	X	X	X	X	X		

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
FW USTs	SB-05	072SB-0040-0001-SO	SB	8-9	Discrete	5-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0041-0001-SO	SB	7-13	Composite	5-Dec-12		X	X	X	X	X	X						
CC-RVAAP-72-02 (Atlas Scrap Yard)																			
FW USTs	SB-01	072SB-0043-0001-SO	SB	9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0044-0001-SO	SB	9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-03	072SB-0045-0001-SO	SB	9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-04	072SB-0046-0001-SO	SB	9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-05	072SB-0047-0001-SO	SB	5	Discrete	5-Dec-12		X		X	X	X	X						
CC-RVAAP-72-04 (Atlas Scrap Yard)																			
FW USTs	SB-01	072SB-0049-0001-SO	SB	9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0050-0001-SO	SB	9	Discrete	5-Dec-12		X		X	X	X	X						
CC-RVAAP-72-05 (Atlas Scrap Yard)																			
FW USTs	SB-01	072SB-0051-0001-SO	SB	8-9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0052-0001-SO	SB	8-9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-03	072SB-0053-0001-SO	SB	8-9	Discrete	5-Dec-12		X		X	X	X	X						
FW USTs	SB-04	072SB-0054-0001-SO	SB	8-9	Discrete	5-Dec-12		X		X	X	X	X						

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
RV-88 (Building 1103)																			
FW USTs	SB-01	072SB-0056-0001-SO	SB	6	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0057-0001-SO	SB	7	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-03	072SB-0058-0001-SO	SB	7	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-04	072SB-0059-0001-SO	SB	7	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-05	072SB-0060-0001-SO	SB	7	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-05	072SB-0093-0001-SO	SB	7-13	Composite	14-Aug-13		X		X	X	X	X						
RV-46 (Bolton Manor)																			
FW USTs	SB-01	072SB-0063-0001-SO	SB	11.5	Discrete	6-Dec-12		X		X	X	X	X						
FW USTs	SB-01	072SB-0063-0002-SO	SB	11.5	Discrete	6-Dec-12		X		X	X	X	X						
FW USTs	SB-01	072SB-0064-0001-SO	SB	11.5	Discrete	6-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0065-0001-SO	SB	10	Discrete	6-Dec-12	X	X	X	X	X	X	X	X	X	X	X		
FW USTs	SB-03	072SB-0066-0001-SO	SB	10	Discrete	6-Dec-12		X		X	X	X	X						
FW USTs	SB-04	072SB-0067-0001-SO	SB	10	Discrete	6-Dec-12		X		X	X	X	X						
FW USTs	SB-01	072SB-0068-0001-SO	SB	7-13	Composite	6-Dec-12		X		X	X	X	X						

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
RV-46 (Bolton Manor)																			
FW USTs	SB-04	072SB-0078-0001-SO	SB	13	Discrete	6-Dec-12		X		X	X	X	X						
CC-RVAAP-72-08 (Inert Storage Area 8, Building 848)																			
FW USTs	SB-01	072SB-0070-0001-SO	SB	8	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0071-0001-SO	SB	8	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-03	072SB-0072-0001-SO	SB	8	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-04	072SB-0073-0001-SO	SB	8	Discrete	7-Dec-12		X		X	X	X	X						
FW USTs	SB-05	072SB-0094-0001-SO	SB	7-13	Composite	14-Aug-13		X		X	X	X	X						
CC-RVAAP-72-01 (Depot Area, Building U-3)																			
FW USTs	SB-01	072SB-0075-0001-SO	SB	9-10	Discrete	10-Dec-12	X	X	X	X	X	X	X	X	X	X	X	X	
FW USTs	SB-02	072SB-0076-0001-SO	SB	5-6	Discrete	10-Dec-12		X	X	X	X	X	X					X	
FW USTs	SB-02	072SB-0077-0001-SO	SB	5-6	Discrete	10-Dec-12		X	X	X	X	X	X					X	
FW USTs	SB-03	072SB-0079-0001-SO	SB	5-6	Discrete	10-Dec-12		X	X	X	X	X	X					X	
FW USTs	SB-04	072SB-0080-0001SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X					X	
FW USTs	SB-05	072SB-0081-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X					X	

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
CC-RVAAP-72-01 (Depot Area, Building U-3)																			
FW USTs	SB-05	072SB-0095-0001-SO	SB	7-13	Composite	14-Aug-13		X		X	X	X	X						
RV-41 (Load Line 6, Building 2F-11)																			
FW USTs	SB-01	072SB-0082-0001-SO	SB	5-6	Discrete	10-Dec-12	X	X	X	X	X	X	X	X	X	X	X		
FW USTs	SB-02	072SB-0083-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X						
FW USTs	SB-03	072SB-0084-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X						
FW USTs	SB-04	072SB-0085-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X						
FW USTs	SB-04	072SB-0086-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X						
FW USTs	SB-05	072SB-0091-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X						
FW USTs	SB-06	072SB-0092-0001-SO	SB	9-10	Discrete	10-Dec-12		X	X	X	X	X	X						
FW USTs	SB-01	072SB-0097-0001-SO	SB	7-13	Composite	14-Aug-13		X		X	X	X	X						
CC-RVAAP-72-06 (Water Works 3)																			
FW USTs	SB-01	072SB-0087-0001-SO	SB	9-10	Discrete	10-Dec-12		X		X	X	X	X						
FW USTs	SB-02	072SB-0088-0001-SO	SB	9-10	Discrete	10-Dec-12		X		X	X	X	X						
FW USTs	SB-03	072SB-0089-0001-SO	SB	9-10	Discrete	10-Dec-12		X		X	X	X	X						
FW USTs	SB-04	072SB-0090-0001-SO	SB	9-10	Discrete	10-Dec-12		X		X	X	X	X						
FW USTs	SB-05	072SB-0096-0001-SO	SB	7-13	Composite	14-Aug-13		X		X	X	X	X						

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location / Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
Subsurface Soil Analytical Program - 9 Former NFA USTs Sampled at Request of Ohio EPA for Hexavalent Chromium																			
Building A-6 UST																			
RV-97	SB-01	076SB-0076-0001-SO	SB	6-7	Discrete	16-Nov-12													X
RV-97	SB-01	076SB-0076-0001-SO	SB	6-7	Discrete	16-Nov-12													X
RV-97	SB-02	076SB-0077-0001-SO	SB	6-7	Discrete	16-Nov-12													X
RV-97	SB-03	076SB-0078-0001-SO	SB	6-7	Discrete	16-Nov-12													X
RV-17	SB-04	076SB-0079-0001-SO	SB	10-11	Discrete	16-Nov-12													X
RV-17	SB-05	076SB-0080-0001-SO	SB	10-11	Discrete	16-Nov-12													X
RV-17	SB-06	076SB-0081-0001-SO	SB	10-11	Discrete	16-Nov-12													X
RV-17	SB-07	076SB-0082-0001-SO	SB	7-8	Discrete	16-Nov-12													X
RV-18	SB-08	076SB-0083-0001-SO	SB	7-8	Discrete	16-Nov-12													X
RV-19	SB-09	076SB-0084-0001-SO	SB	7-8	Discrete	16-Nov-12													X
RV-19	SB-10	076SB-0085-0001-SO	SB	9-10	Discrete	16-Nov-12													X
RV-19	SB-11	076SB-0086-0001-SO	SB	10-11	Discrete	16-Nov-12													X
RV-19	SB-11A	076SB-0087-0001-SO	SB	9-10	Discrete	16-Nov-12													X
RV-19	SB-12	076SB-0088-0001-SO	SB	10-11	Discrete	16-Nov-12													X
RV-97	SB-01	076SB-0089-0001-SO	SB	6-7	Discrete	16-Nov-12													X

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
Building U-3																			
RV-16	SB-01	076SB-0119-0001-SO	SB	15-16	Discrete	11-Dec-12													X
RV-15	SB-02	076SB-0120-0001-SO	SB	15-16	Discrete	11-Dec-12													X
RV-16	SB-03	076SB-0121-0001-SO	SB	15-16	Discrete	11-Dec-12													X
RV-15	SB-04	076SB-0122-0001-SO	SB	15-16	Discrete	11-Dec-12													X
RV-15	SB-05	076SB-0123-0001-SO	SB	15-16	Discrete	11-Dec-12													X
RV-15	SB-06	076SB-0124-0001-SO	SB	15-16	Discrete	11-Dec-12													X
Building U-6																			
RV-14	SB-01	076SB-0125-0001-SO	SB	19-20	Discrete	12-Dec-12													X
RV-14	SB-01	076SB-0125-0002-SO	SB	19-20	Discrete	12-Dec-12													X
RV-13	SB-02	076SB-0126-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-13	SB-02	076SB-0127-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-13	SB-03	076SB-0128-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-13	SB-04	076SB-0129-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-14	SB-05	076SB-0130-0001-SO	SB	19-20	Discrete	12-Dec-12													X
RV-14	SB-06	076SB-0131-0001-SO	SB	19-20	Discrete	12-Dec-12													X

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
Building A-1																			
RV-37	SB-01	076SB-0132-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-37	SB-01	076SB-0133-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-37	SB-02	076SB-0134-0001-SO	SB	19-20	Discrete	11-Dec-12													X
RV-37	SB-03	076SB-0135-0001-SO	SB	19-20	Discrete	11-Dec-12													X
Building A-6																			
RV-97	SB-13	076SB-0136-0001-SO	SB	6-7	Discrete	11-Dec-12													X
Field Quality Control - Trip Blanks																			
None	Trip Blank	072SB-0006-0001-TB	QC	NA	NA	03-Dec-12	X												
None	Trip Blank	072SB-0011-0001-TB	QC	NA	NA	04-Dec-12	X												
None	Trip Blank	072SB-0020-0001-TB	QC	NA	NA	03-Dec-12	X												
None	Trip Blank	072SB-0025-0001-TB	QC	NA	NA	04-Dec-12	X												
None	Trip Blank	072SB-0033-0001-TB	QC	NA	NA	04-Dec-12	X												
None	Trip Blank	072SB-0034-0001-TB	QC	NA	NA	04-Dec-12	X												
None	Trip Blank	072SB-0042-0001-TB	QC	NA	NA	05-Dec-12	X												
None	Trip Blank	072SB-0048-0001-TB	QC	NA	NA	05-Dec-12	X												

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Former UST Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
None	Trip Blank	072SB-0055-0001-TB	QC	NA	NA	05-Dec-12	X												
None	Trip Blank	072SB-0061-0001-TB	QC	NA	NA	07-Dec-12	X												
None	Trip Blank	072SB-0069-0001-TB	QC	NA	NA	06-Dec-12	X												
None	Trip Blank	072SB-0074-0001-TB	QC	NA	NA	07-Dec-12	X												
Field Quality Control – Source Water																			
None	Source Water (ECC bottled decontamination water)	070-0057-0001-Source Water	QC	NA	Non-dedicated hand sampling tools	12-Dec-12	X	X	X	X	X	X	X	X	X	X	X	X	
None	Source Water (Driller decontamination water)	070-0056-0001-Source Water	QC	NA	Direct Push Tools	12-Dec-12	X	X	X	X	X	X	X	X	X	X	X	X	
None	Source Water (Driller decontamination water)	079-0007-0001-Source Water	QC	NA	Direct Push Tools	14-Mar-13	X	X	X	X	X	X	X	X	X	X	X	X	X
Field Quality Control – Equipment Rinsate																			
None	Equipment Rinsate Blank	076-0067-0001-ER	QC	NA	Non-dedicated hand sampling tools during sampling event	15-Nov-12	X	X	X	X	X	X	X	X	X	X	X	X	

Table 4-1: Summary of Samples Collected between November 2012 and August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Location	Sample Location/Soil Boring	Sample ID	Matrix	Depth (ft)	Sampling Method	Date	VOC	BTEX/ MTBE	SVOC	PAH	TPH GRO	TPH DRO	TAL Metals	PCB	Pesticides	Explosives	Propellants	Herbicides	Hexavalent Chromium
NA	Equipment Rinsate Blank	076-0140-0001-ER	QC	NA	Non-dedicated hand sampling tools during sampling event	9-Dec-12	X	X	X	X	X	X	X	X	X	X	X	X	
NA	Equipment Rinsate Blank	083SB-0023-0001-ER	QC	NA	Non-dedicated hand sampling tools during sampling event	15-Aug-13	X	X	X	X	X		X	X	X	X	X		

Notes: **FD** **MS/ MSD** **FULL SUITE**

Propellants include nitroguanidine, nitrocellulose, and nitroglycerin.

BTEX = Benzene, toluene, ethylbenzene, and total xylenes.
DRO = Diesel range organics (Carbon (C)10-C20, C20-C34).
ER = Equipment rinsate.
FD = Field duplicate.
ft = Feet.
GRO = Gasoline range organics (C6-C12).
ID = Identification.
MS = Matrix spike.
MSD = Matrix spike duplicate.
MTBE = Methyl tertiary-butyl ether.
PAH = Polycyclic aromatic hydrocarbons.
PCB = Polychlorinated biphenyl.
QC = Quality control.
SB = Soil boring.
SorW = Source water.
SVOC = Semivolatile organic compound.
TAL = Target Analyte List.
TB = Trip blank.
TPH = Total petroleum hydrocarbon.
UST = Underground storage tank.
VOC = Volatile organic compound.

2299 **Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at**
2300 **CC RVAAP-72 Facility-Wide Underground Storage Tanks**

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Subsurface Soil Analytical Program – 15 former UST locations with No Records of Previous Sampling						
Discrete	RV-5	5-6	SB1	072SB-0001-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-5	5-6	SB1	072SB-0001-0002-SO	3-Dec-2012	QC. MS/MSD sample of 072SB-0001-0001-SO
Discrete	RV-5	5-6	SB1	072SB-0002-0001-SO	3-Dec-2012	QC. Field Duplicate sample of 072SB-0001-0001-SO
Discrete	RV-5	5-6	SB2	072SB-0003-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis
Discrete	RV-5	5-6	SB3	072SB-0004-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-5	7-13	SB1	072SB-0005-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-5	NA	NA	072SB-0006-0001-TB	3-Dec-2012	QC. Trip Blank
Discrete	RV-4	5-6	SB1	072SB-0007-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-4	5-6	SB2	072SB-0008-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-4	5-6	SB3	072SB-0009-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-4	7-13	SB1	072SB-0010-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-4	NA	NA	072SB-0011-0001-TB	4-Dec-2012	QC. Trip Blank
Discrete	RV-86	6-7	SB1	072SB-0012-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-86	6-7	SB1	072SB-0012-0002-SO	3-Dec-2012	QC. MS/MSD sample of 072SB-0012-0001-SO
Discrete	RV-86	6-7	SB1	072SB-0013-0001-SO	3-Dec-2012	QC. Duplicate sample of 072SB-0012-0001-SO
Discrete	RV-86	6-7	SB2	072SB-0014-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis
Discrete	RV-86	6-7	SB3	072SB-0015-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-86	6-7	SB4	072SB-0016-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-86	6-7	SB5	072SB-0017-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-86	6-7	SB6	072SB-0018-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled

2301

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Subsurface Soil Analytical Program- 15 former UST locations with No Records of Previous Sampling						
Composite	RV-86	7-13	SB1	072SB-0019-0001-SO	3-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-86	NA	NA	072SB-0020-0001-TB	3-Dec-2012	QC. Trip Blank
Discrete	RV-87	6-7	SB1	072SB-0021-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-87	6-7	SB2	072SB-0022-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-87	6-7	SB3	072SB-0023-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-87	7-13	SB1	072SB-0024-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-87	NA	NA	072SB-0025-0001-SO	4-Dec-2012	QC. Trip Blank
Discrete	RV-89	10-11	SB1	072SB-0026-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-89	10-11	SB1	072SB-0026-0002-SO	4-Dec-2012	QC. MS/MSD sample of 072SB-0026-0001-SO
Discrete	RV-89	10-11	SB1	072SB-0027-0001-SO	4-Dec-2012	QC. Duplicate sample of 072SB-0026-0001-SO
Discrete	RV-89	10-11	SB2	072SB-0028-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-89	10-11	SB3	072SB-0029-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-89	10-11	SB4	072SB-0030-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis
Discrete	RV-89	10-11	SB5	072SB-0031-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-89	7-13	SB5	072SB-0032-0001-SO	4-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-89	NA	NA	072SB-0033-0001-SO	4-Dec-2012	QC. Trip Blank
Discrete	RV-89	NA	NA	072SB-0034-0001-SO	4-Dec-2012	QC. Trip Blank
Discrete	CC-72-03	8-9	SB1	072SB-0035-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-03	8-9	SB1	072SB-0035-0002-SO	5-Dec-2012	QC. MS/MSD sample of 072SB-0035-0001-SO
Discrete	CC-72-03	8-9	SB1	072SB-0036-0001-SO	5-Dec-2012	QC. Duplicate sample of 072SB-0035-0001-SO
Discrete	CC-72-03	8-9	SB2	072SB-0037-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-03	8-9	SB3	072SB-0038-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Discrete	CC-72-03	8-9	SB4	072SB-0039-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis
Discrete	CC-72-03	8-9	SB5	072SB-0040-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled.
Composite	CC-72-03	7-13	SB1	072SB-0041-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-03	NA	NA	072SB-0042-0001-SO	5-Dec-2012	QC. Trip Blank
Discrete	CC-72-02	9	SB1	072SB-0043-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-02	9	SB2	072SB-0044-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-02	9	SB3	072SB-0045-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-02	9	SB4	072SB-0046-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-02	5	SB5	072SB-0047-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-02	NA	CC-72-02	072SB-0048-0001-SO	5-Dec-2012	QC. Trip Blank
Discrete	CC-72-04	9	SB1	072SB-0049-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-04	9	SB2	072SB-0050-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-05	8-9	SB1	072SB-0051-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-05	8-9	SB2	072SB-0052-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-05	8-9	SB3	072SB-0053-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-05	8-9	SB4	072SB-0054-0001-SO	5-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-05	NA	NA	072SB-0055-0001-TB	5-Dec-2012	QC. Trip Blank
Discrete	RV-88	6	SB1	072SB-0056-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-88	7	SB2	072SB-0057-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-88	7	SB3	072SB-0058-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Discrete	RV-88	7	SB4	072SB-0059-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-88	7	SB5	072SB-0060-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-88	7-13	SB5	072SB-0093-0001-SO	14-Aug-2013	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-88	NA	NA	072SB-0061-0001-TB	7-Dec-2012	QC. Trip Blank
Discrete	RV-46	11.5	SB1	072SB-0063-0001-SO	6-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-46	11.5	SB1	072SB-0063-0002-SO	6-Dec-2012	QC. MS/MSD sample of 072SB-0063-0001-SO
Discrete	RV-46	11.5	SB1	072SB-0064-0001-SO	6-Dec-2012	QC. Duplicate sample of 072SB-0063-0001-SO
Discrete	RV-46	10	SB2	072SB-0065-0001-SO	6-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis
Discrete	RV-46	10	SB3	072SB-0066-0001-SO	6-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-46	10	SB4	072SB-0067-0001-SO	6-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-46	7-13	SB1	072SB-0068-0001-SO	6-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-46	NA	NA	072SB-0069-0001-TB	6-Dec-2012	QC. Trip Blank
Discrete	RV-46	13	SB4	072SB-0078-0001-SO	6-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-08	8	SB1	072SB-0070-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-08	8	SB2	072SB-0071-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-08	8	SB3	072SB-0072-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-08	8	SB4	072SB-0073-0001-SO	7-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	CC-72-08	7-13	SB4	072SB-0094-0001-SO	14-Aug-2013	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-08	NA	NA	072SB-0074-0001-TB	7-Dec-2012	QC. Trip Blank
Discrete	CC-72-01	9-10	SB1	072SB-0075-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Discrete	CC-72-01	5-6	SB2	072SB-0076-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-01	5-6	SB2	072SB-0077-0001-SO	10-Dec-2012	QC. Duplicate sample of 072SB-0076-0001-SO
Discrete	CC-72-01	5-6	SB3	072SB-0079-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-01	9-10	SB4	072SB-0080-0001SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-02	9-10	SB5	072SB-0081-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	CC-72-01	7-13	SB5	072SB-0095-0001-SO	14-Aug-2013	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-41	5-6	SB1	072SB-0082-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled. Analyzed for RVAAP full-suite analysis
Discrete	RV-41	9-10	SB2	072SB-0083-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-41	9-10	SB3	072SB-0084-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-41	9-10	SB4	072SB-0085-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-41	9-10	SB4	072SB-0086-0001-SO	10-Dec-2012	QC. Duplicate sample of 072SB-0085-0001-SO
Discrete	RV-41	9-10	SB5	072SB-0091-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	RV-41	9-10	SB6	072SB-0092-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Composite	RV-41	7-13	SB1	072SB-0097-0001-SO	14-Aug-2013	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-06	9-10	SB1	072SB-0087-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-06	9-10	SB2	072SB-0088-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-06	9-10	SB3	072SB-0089-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Discrete	CC-72-06	9-10	SB4	072SB-0090-0001-SO	10-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Composite	CC-72-06	7-13	SB2	072SB-0096-0001-SO	14-Aug-2013	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled
Subsurface Soil Analytical Program- 9 former NFA USTs Sampled at Request of Ohio EPA for Hexavalent Chromium						
Discrete	RV-97	6-7	SB1	076SB-0076-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-97	6-7	SB1	076SB-0076-0001-SO	16-Nov-2012	QC. MS/MSD sample of 076SB-0076-0001-SO
Discrete	RV-97	6-7	SB1	076SB-0089-0001-SO	16-Nov-2012	QC. Duplicate sample of 076SB-0076-0001-SO
Discrete	RV-97	6-7	SB2	076SB-0077-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-97	6-7	SB3	076SB-0078-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-17	10-11	SB4	076SB-0079-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-17	10-11	SB5	076SB-0080-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-17	10-11	SB6	076SB-0081-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-17	7-8	SB7	076SB-0082-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-18	7-8	SB8	076SB-0083-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-19	7-8	SB9	076SB-0084-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-19	9-10	SB10	076SB-0085-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Discrete	RV-19	10-11	SB11	076SB-0086-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-19	9-10	SB11A	076SB-0087-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-19	10-11	SB12	076SB-0088-0001-SO	16-Nov-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-16	15-16	SB1	076SB-0119-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-15	15-16	SB2	076SB-0120-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-16	15-16	SB3	076SB-0121-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-15	15-16	SB4	076SB-0122-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-15	15-16	SB5	076SB-0123-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-15	15-16	SB6	076SB-0124-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-14	19-20	SB1	076SB-0125-0001-SO	12-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-14	19-20	SB1	076SB-0125-0002-SO	12-Dec-2012	QC. MS/MSD sample of 076SB-0125-0001-SO
Discrete	RV-13	19-20	SB2	076SB-0126-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-13	19-20	SB2	076SB-0127-0001-SO	11-Dec-2012	QC. Duplicate sample of 076SB-0126-0001-SO

Table 4-2: Subsurface Soil Samples and Rationales, November 2012 – August 2013 at CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type	UST No.	Depth (ft bgs)	Location (SB)	Sample ID	Date Sampled	Comments/Rationale
Discrete	RV-13	19-20	SB3	076SB-0128-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-13	19-20	SB4	076SB-0129-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-14	19-20	SB5	076SB-0130-0001-SO	12-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-14	19-20	SB6	076SB-0131-0001-SO	12-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-37	19-20	SB1	076SB-0132-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-37	19-20	SB1	076SB-0133-0001-SO	11-Dec-2012	QC. Duplicate sample of 076SB-0132-0001-SO
Discrete	RV-37	19-20	SB2	076SB-0134-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-37	19-20	SB3	076SB-0135-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium
Discrete	RV-97	6-7	SB13	076SB-0136-0001-SO	11-Dec-2012	Determine presence or absence of potential contamination in subsurface soil at former UST location not previously sampled for hexavalent chromium

Notes:
bgs = Below ground surface.
ft = Feet.
ID = Identification.
MS = Matrix spike.
MSD = Matrix spike duplicate.
No. = Number.
QC = Quality control.
RVAAP = Ravenna Army Ammunition Plant.
SB = Soil boring.
UST = Underground storage tank.

Table 4-3: Site Inspection Soil Sample Preparation and Analytical Methods, November 2012 – August 2013, CC RVAAP-72 Facility-Wide Underground Storage Tanks

Parameter	Soil	
	Preparation	Method
Inorganic chemicals	SW-846 3015B	SW-846 6020
Mercury	SW-846 7471A	SW-846 7471A
Propellants: - Nitrocellulose - Nitroguanidine - Nitroglycerin	E353.2 Modified SW-846 8330 Modified	E353.2 Modified SW-846 8330 Modified
SVOCs and PAHs	SW-846 3540C	SW-846 8270C
Explosives	SW-846 8330B	SW-846 8330B
VOCs	SW-846 5035	SW-846 8260B
Herbicides	SW-846 3540C	SW-846 8151A
Pesticides	SW-846 3546	SW-846 8081A
PCBs	SW-846 3540C	SW-846 8082
Hexavalent Chromium	SW-846 3060A	SW-846 7196A
TPH GRO	SW-846 5035	SW-846 8015B
TPH DRO	SW-846 3540C	SW-846 8015B

Notes:
DRO = Diesel range organics (Carbon (C) 10-C20, C20-C34).
GRO = Gasoline range organics (C6-C12).
PAH = Polycyclic aromatic hydrocarbon.
PCB = Polychlorinated biphenyl.
SVOC = Semivolatile organic compound.
TPH = Total petroleum hydrocarbon.
VOC = Volatile organic compound.

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RV-86
RV-4 and RV-87
1026
1030
T-4510
1048-A
RV-5
1048
1048-B
LEGEND
Location of Former UST
Fence Line
Road
Former Building
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N, 2009 Orthoimagery from USGS.
2. Location of underground storage tank (UST) is approximate.
TITLE
Figure 4-1
Location of USTs
RV-4, RV-86, RV-87, and RV-5
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0 10 20
Feet
N
ECC
Marlborough, Massachusetts
NO.
4-1

2335

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LEGEND

Location of Former UST

Road

Former Building

NOTES & SOURCES

1. Map Coordinates: NAD 83, UTM Zone 17N, 2009 Orthoimagery from USGS.
2. Location of underground storage tank (UST) is approximate.

TITLE

Figure 4-2

Location of USTs RV-46 and RV-41

CC RVAAP-72 Facility-Wide Underground Storage Tanks

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

0 20 40
Feet

N

ECC
Marlborough, Massachusetts

NO.
4-2

2347

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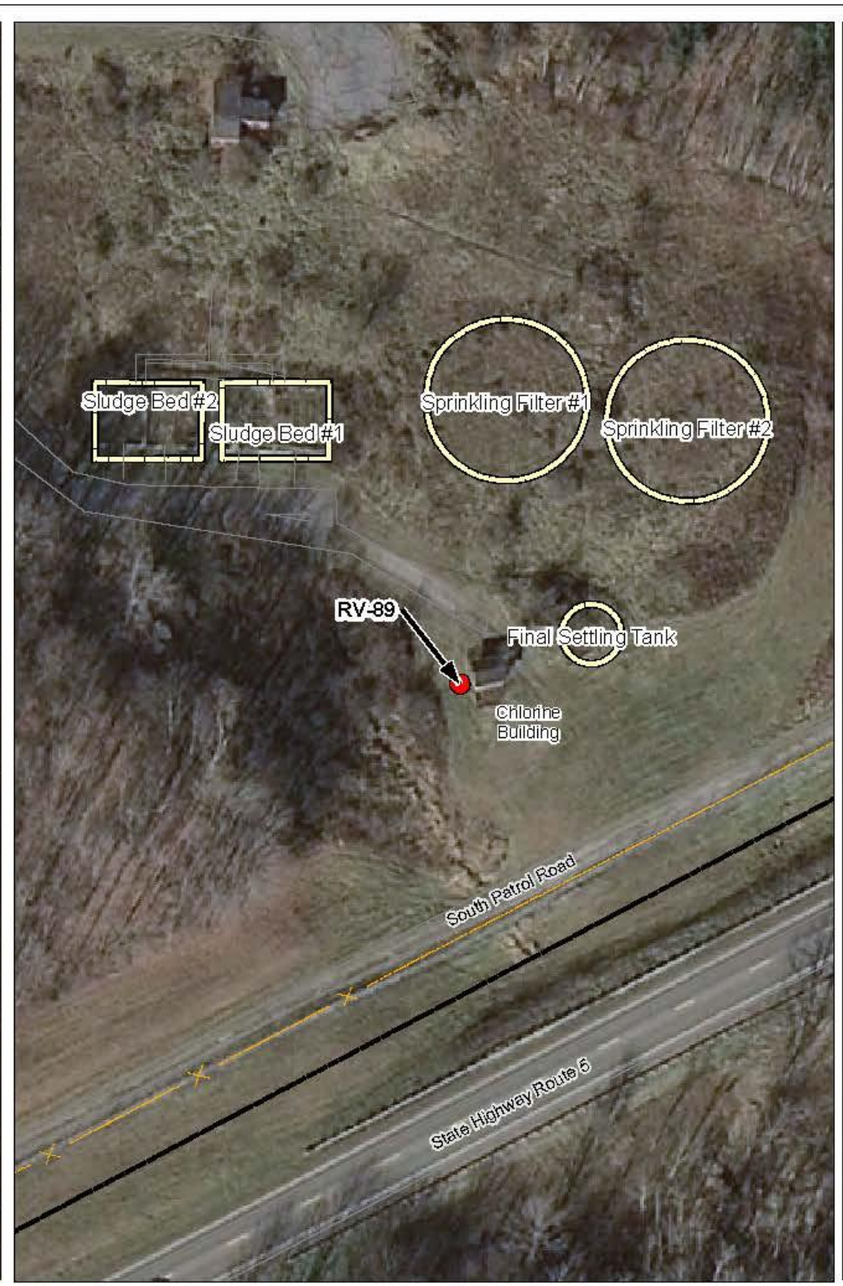

LEGEND

- Location of Former UST
- Fence Line
- Road
- Former Building
- Facility Property Line

NOTES & SOURCES

1. Map Coordinates: NAD 83, UTM Zone 17N, 2009 Orthoimagery from USGS.
2. Location of underground storage tank (UST) is approximate.

TITLE

Figure 4-3

Location of USTs RV-88 and RV-89

CC RVAAP-72 Facility-Wide Underground Storage Tanks

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

0 20 40 Feet

N

ECC
Marlborough, Massachusetts

NO. 4-3

GIS Server
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January 2013 DRWN BY: CG CHKD BY: GC

2358

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MHE Repair
Warehouse Inert Storage
Field Office
Lumber Storage Shed
Area U-11
Warehouse Inert Storage
CC-RVAAP-72-01
Filling Station
Unknown
Unknown
Unknown
Box Repair Shop
State Route 80 Freedom Road
Garage
Unknown
CC-RVAAP-72-02
CC-RVAAP-72-03
CC-RVAAP-72-04
CC-RVAAP-72-05
Atlas Scrap Yard
LEGEND
Location of Former UST
Road
Former Structure
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N, 2009 Orthoimagery from USGS.
2. Location of underground storage tank (UST) is approximate.
TITLE
Figure 4-4
Location of USTs CC-RVAAP-72-01, -02, -03, -04, and -05
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0
40
80
Feet
N
ECC
Marlborough, Massachusetts
NO.
4-4

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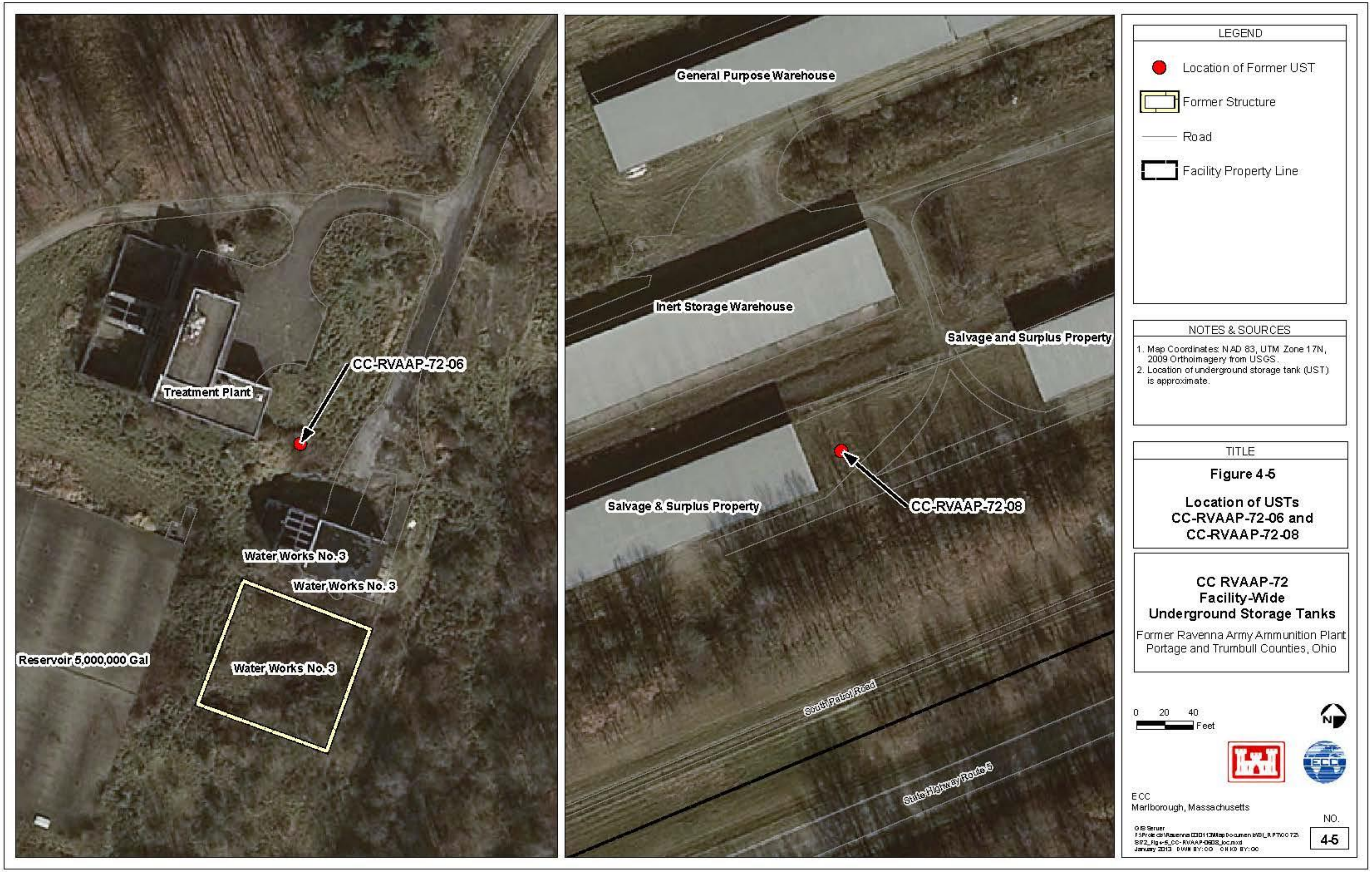

Figure 4-5

Location of USTs CC-RVAAP-72-06 and CC-RVAAP-72-08

2382

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5.0 DATA EVALUATION AND SUMMARY OF ANALYTICAL RESULTS

This chapter summarizes the analytical results for CC RVAAP-72 FWUSTs. The laboratory analytical results, laboratory data, and chain of custody forms for this SI are provided in Appendix D.

5.1 DATA EVALUATION

The data collected during this SI were verified and validated in accordance with the procedures outlined in the FWSAP (SAIC 2011b). The processes used to evaluate the analytical data are described in this section. The completed data verification report is included in Appendix C and the data validation report is included as Appendix E of this SI report. Non-detect data were reported as not detected (ND) in the summary of analytical results tables included in Chapter 5.0 and at the Limit of Detection in Appendixes C and D.

5.1.1 Soil Sampling Intervals

The soil sampling interval was defined for this SI as follows:

- Subsurface soil (1-13 ft bgs)

Subsurface soil was collected at 4 former NFA USTs (RV-37, RV-14, RV-13, and RV-15) at a depth greater than 13 ft bgs in order to meet the Ohio EPA request to determine the presence of hexavalent chromium at 9 former NFA USTs.

5.1.2 Data Verification, Validation, and Determination of Potential Contamination

5.1.2.1 Data Verification and Validation

Data verification was performed on the subsurface soil samples. The analytical results were reported by the laboratory in accordance with the FWSAP (SAIC 2010).

Data qualifiers were assigned to each result based on the laboratory (i.e., TestAmerica of North Canton, Ohio) quality assurance review and verification criteria. The SI analytical results were qualified as follows:

- "U" is not detected
- "UJ" is not detected and the reporting limit is an estimated value
- "J" denotes that the analyte was positively identified; however, the associated numerical value is an approximate concentration of the analyte in the sample
- "R" indicates that the result is not usable

In addition to assigning qualifiers, the verification process also selected the appropriate result to use when re-analyses or dilutions were performed. Where laboratory surrogate recovery data or laboratory QC samples were outside of analytical method specifications, the verification chemist determined whether or not laboratory re-analysis should be used in place of an original reported result. If the laboratory reported results for both diluted and undiluted samples, diluted sample results were used for those analytes that exceeded the calibration range of the undiluted sample. A complete discussion of verification process results is contained in the Data Verification Report (Appendix C).

A data validation report was completed for all six CR sites where ECC conducted site SIs. The *Final Data Validation Report for Compliance Restoration Sites: RVAAP-70 East Classification Yard, RVAAP-71 Barn No. 5 Petroleum Release, RVAAP-72 Facility-Wide USTs, RVAAP-75 George Road Sewer Treatment Plan Mercury Spill, RVAAP-77 Building 1037 Laundry Waste Water Sump and RVAAP-83 Former Buildings 1031 and 1039* was issued by North Wind Services and MEC^{x} in August 2014. The report is provided in Appendix E.

In general, the data validation performed for this CC RVAAP-72 FWUSTs SI indicates that no false negatives or false positives were identified, and the results are usable for their intended purposes. Antimony was rejected in two samples; however, antimony is not a known additive to petroleum fuels or a UST corrosion inhibitor.

5.1.2.2 Determination of Potential Contamination

This section provides an outline of the process used to determine if potential contamination is present at the 24 CC RVAAP-72 FWUSTs that are the subject of this SI. Per the Facility-Wide Human Health Risk Assessment Manual (USACE 2005), a chemical detected at a concentration greater than the established background value, which is not an essential nutrient, or screened out through a frequency of detection evaluation is identified as an SRC. An SRC may, or may not, be related to the former operations at the site. The maximum detected concentration of each SRC that is not a petroleum related compound is then compared to the most stringent FWCUGs for the Resident Receptor between the adult and child using the Target Cancer Risk (TCR) level of 10^{-6} or the Target Hazard Quotient (THQ) of 0.1 for each SRC, as outlined in the Final Facility-Wide Human Health Cleanup Goals for RVAAP (SAIC 2010). Both risk levels (carcinogenic and non-carcinogenic) were assessed for the Resident Receptor (adult and child) to determine which one was the most stringent for comparison to each SRC to determine potential contamination. Compare the maximum detected concentration of petroleum-related compounds, PAH compounds, BTEX, MTBE, two TPH-DRO carbon chain compounds (C10-C20, C20-C34), and one TPH-GRO carbon chain compound (C6-C12)), to the BUSTR Soil Class 1 Action Levels to determine if petroleum related SRCs are potential contamination.

The specific criteria used to identify SRCs are described below:

- ***Background Screening***—The maximum detected concentrations of inorganic chemicals were compared to the RVAAP background concentrations, where established. If exceedances of background concentrations occurred, the respective inorganic chemicals were identified as SRCs. Several inorganic chemicals were screened against a

background concentration of 0 milligrams per kilogram (mg/kg) (e.g., cadmium, silver). A value of 0 mg/kg was assigned as background when the chemical was not detected in any of the samples collected during the background study.

- ***Screening of Essential Human Nutrients***—Chemicals that are essential nutrients (e.g., calcium, chloride, iodine, iron, magnesium, potassium, phosphorous, and sodium) are an integral part of the human food supply and often added to foods as supplements. The USEPA recommends these chemicals not be evaluated unless they are grossly elevated relative to background concentrations or would exhibit toxicity at the observed concentrations (USEPA 1989).

- ***Frequency of Detection/WOE***—A frequency of detection evaluation was not completed as part of the WOE since less than 20 soil samples were collected at any one former UST location during this investigation. Therefore, frequency of detection was not used to further screen the identified SRCs as part of this SI. The SRCs that exceeded the most stringent Resident Receptor FWCUGs using the TCR level of 10^{-6} or THQ = 0.1 for non-carcinogenic risks, for non-petroleum related compounds and petroleum related compound SRCs that exceeded BUSTR Soil Class 1 Action Levels were then evaluated using a WOE approach. Chemicals not detected were eliminated as SRCs. A WOE evaluation considers the SRCs that exceeded their respective criteria, as described above, to determine if the chemical should be identified as potential contamination. If the results of the WOE evaluation indicated that potential contamination was present, then an additional investigation, such as an RI, is recommended. However, if no potential contamination was identified, then No Further Action (NFA) is recommended.

If no FWCUG or BUSTR criteria have been developed for the particular chemical, then the USEPA's Regional Screening Levels (RSLs) (USEPA 2013) for the Residential Receptor were used for comparison using the same TCR of 10^{-6} and THQ of 0.1. The National Guard Trainee FWCUGs and the EPA Industrial RSLs (November 2013) are provided on the data summary tables in this section for comparison purposes only and were not used to determine whether or not chemicals were identified as potential contamination. If potential contamination is identified in this SI, it indicates that further investigation under CERCLA, in the form of an RI, or under BUSTR, is warranted at CC RVAAP-72 FWUSTs.

Table 5-1 provides a summary of the SRCs identified in the subsurface soil at CC RVAAP-72 FWUSTs.

5.2 SUMMARY OF SUBBSURFACE SOIL ANALYTICAL RESULTS FOR 15 FORMER UNDERGROUND STORAGE TANKS WITH NO RECORDS OF PREVIOUS SAMPLING

Subsurface soil sampling data were evaluated to identify SRCs at 15 former UST locations with no records of previous sampling. At least 3 discrete subsurface soil samples from each of the 15 former UST locations and 7 field duplicates were collected in during this SI and analyzed selectively for SVOCs, PAHs, VOCs, BTEX, MTBE, TPH (DRO/GRO), herbicides, and TAL metals to verify the presence or absence of contamination. Seven subsurface soil samples were

analyzed for the RVAAP full-suite analytes, which includes SVOCs, PAHs, VOCs, BTEX, MTBE, TPH-DRO (C10-C20), TPH-DRO (C20-C34), TPH GRO (C6-C12), herbicides, explosives, propellants, PCBs, and TAL metals.

There were no detected concentrations of PCBs, pesticides, propellants, or explosives in the subsurface soil samples collected; therefore, these chemicals are not potential contamination at CC RVAAP-72 FWUSTs.

Table 5-1 presents the results of the SRC screening for subsurface soil samples for these 15 former CC RVAAP-72 FWUSTs with no previous record of sampling. Figures 5-1 to 5-16 illustrate the distribution of the identified inorganic and organic SRCs in the subsurface soil.

The following organic and inorganic SRCs have been identified in the subsurface soil at 15 former CC RVAAP-72 FWUSTs with no previous record of sampling:

- Seven VOCs (benzene, carbon tetrachloride, chloroform, 1,2 dicholorethane, ethylbenzene, toluene, and xylenes)
- Nineteen SVOCs, primarily PAH compounds, were identified as SRCs as no background criteria have been established for these SVOCs
- One herbicide (dalapon)
- Ten metals (arsenic, barium, beryllium, cadmium, cobalt, copper, lead, manganese, silver, and zinc)
- TPH GRO (C6-C12)
- TPH DRO (C10-C20)
- TPH DRO (C20-C34)

The analytical results from the subsurface discrete soil samples are summarized by chemical group in the sections below. Tables 5-2 and 5-3 provide summaries of the analytical results for organic and inorganic chemicals detected in subsurface soil at the 15 former UST locations at CC RVAAP-72 FWUSTs, respectively.

5.2.1 Volatile Organic Compounds

Seven VOCs (1,2-dichloroethane, benzene, carbon tetrachloride, chloroform, ethylbenzene, toluene, and xylenes) were identified as SRCs in the subsurface soil at the 15 former UST locations for CC RVAAP-72 FWUSTs. BTEX were reported at low concentrations below their respective BUSTR Soil Class 1 Action Levels; therefore, these petroleum-related VOCs are not potential contamination. The reported concentrations of 1,2-dichloroethene and chloroform do not exceed the EPA residential RSL; therefore, these chemicals are not potential contamination.

One VOC (carbon tetrachloride) was reported in the subsurface soil sample collected between 5 and 6 ft bgs at the former UST location RV-5 (at former Building 1048 Fire Station) at an estimated (J) concentration of 14,000 J microgram per kilogram (µg/kg) which exceeds the Residential RSL (610 µg/kg) for this compound, as shown in Figure 5-3. A WOE evaluation determined that carbon tetrachloride was not related to the historical activities and use of former UST RV-5, which was used to store gasoline. As stated in the HRR (SAIC 2011a), "*The acreage where carbon tetrachloride was reported by former employees to have been discharged is not accurately defined but is assumed to be less than 1 acre northwest of former Building 1048. Interviewees noted an approximately 8-ft by 8-ft metal storage shed, used to store carbon tetrachloride and possibly other chemicals, was located adjacent to the fire station."* Carbon tetrachloride is related to the aboveground use of fire extinguishers containing this compound and is not related to the use of former UST RV-5 to store gasoline. Carbon tetrachloride has been addressed by the CC RVAAP-69 RI.

VOCs are not potential contamination at CC RVAAP-72 FWUSTs.

5.2.2 Semivolatile Organic Compounds

A total of 19 SVOCs, primarily PAHs, were reported in the subsurface soils collected at the 15 former UST locations that are the subject of this SI. Reported concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, chrysene, and naphthalene in all subsurface soil samples were less than their respective BUSTR Soil Class 1 Action Levels; therefore, these petroleum-related PAHs are not potential contamination. Reported concentrations of acenapthene, anthracene, and bis(2-ethylhexyl)phthalate do not exceed their respective EPA residential RSLs. Acenaphthylene, benzo(g,h,i)perylene, and phenanthrene do not have BUSTR, FWCUG, or RSL criteria. Reported concentrations of dibenzofuran, fluoranthene, fluorene, pyrene, and 2-methylnaphthalene are less than the most stringent FWCUG.

SVOCs are not potential contamination at CC RVAAP-72 FWUSTs.

5.2.3 Total Petroleum Hydrocarbons

Two TPH DRO compounds and one TPH GRO compound were identified as SRCs in the subsurface soil. The reported concentrations of TPH-DRO (C10-C20, C20-C34) and TPH-GRO (C6-C12) carbon chain compounds were less than BUSTR Soil Class 1 Action Levels; therefore these total petroleum hydrocarbon chain compounds (C6-C12, C10-C20, C20-C34) are not potential contamination at CC RVAAP-72 FWUSTs.

5.2.4 Herbicides

One herbicide (dalapon) was reported at a concentration less than the USEPA Residential RSL. Herbicides are not potential contamination at CC RVAAP-72 FWUSTs.

5.2.5 Target Analyte List Metals

A total of 10 metals were identified as SRCs in the subsurface soil samples collected at the former UST locations. Table 5-3 presents the detected subsurface metals results. Barium, beryllium, cadmium, cobalt, copper, lead, silver, and zinc concentrations reported in subsurface soil samples were less than their respective most stringent FWCUG, and these metals are not potential contamination.

One metal, manganese, was reported at a concentration exceeding both the background value and the FWCUG in the subsurface soil collected from former UST location RV-4 (SB1). One metal, arsenic, was reported exceeding both the background value and the FWCUG from former UST location CC-RVAAP-72-05 (SB4).

- Manganese was reported at estimated concentration of 3,400 J mg/kg, which exceeds background concentration 3,030 mg/kg and the Receptor Resident FWCUG (293 mg/kg) at UST location RV-4 from soil boring SB1 at 5-6 ft bgs (Figure 5-1).

- Arsenic was reported at an estimated concentration of 22 J mg/kg at soil boring SB4 (8 to 9 ft bgs) at UST location CC-RVAAP-72-05, which exceeds background (19.8 mg/kg) and Resident Receptor FWCUGs (0.425 mg/kg), as shown in Figure 5-14.

A WOE evaluation determined that arsenic and manganese were not related to the historical activities and use of former UST RV-4 and CC-RVAAP-72-05 to store gasoline and kerosene, respectively, as arsenic and manganese are not metal additives to gasoline or kerosene.

Metals are not potential contamination at CC RVAAP-72 FWUSTs.

5.3 SUMMARY OF DEEP SOIL BORING SUBBSURFACE SOIL ANALYTICAL RESULTS FOR 15 FORMER UNDERGROUND STORAGE TANK LOCATIONS WITH NO RECORDS OF PREVIOUS SAMPLING

A DSB composite sample was collected from each of the following 12 former UST locations: RV-4 (Building 1026), RV-5 (Building 1048 Fire Station), RV-41 (Load Line 6 Building 2F-11), RV-46 (Bolton Manor), RV-86 (Building 1026), RV-87 (Building 1026), RV-88 (Building 1103), RV-89 (George Road Sewage Treatment Plant), CC-RVAAP-72-01 (Depot Area Building U-3), CC-RVAAP-72-03 (Atlas Scrap Yard), CC-RVAAP-72-06 (Water Works 3), and CC-RVAAP-72-08 (Inert Storage Area 8 Building 848).

5.3.1 Volatile Organic Compounds

Toluene was the only VOC reported at low concentrations in subsurface soil samples collected from former UST locations. All toluene concentrations are less than the toluene BUSTR Soil Class 1 Action Level.

VOCs are not potential contamination at CC RVAAP-72 FWUSTs.

5.3.2 Semivolatile Organic Compounds

Reported concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene**,** and naphthalene in all DSB subsurface soil samples were less than below their respective BUSTR Soil Class 1 Action Levels; therefore, these petroleum related PAHs are not potential contamination. Benzo(g,h,i)perylene does not have BUSTR, FWCUG, or RSL criteria. Reported concentrations of fluoranthene, fluorene, and pyrene are below the most stringent FWCUG.

SVOCs are not potential contamination at CC RVAAP-72 FWUSTs.

5.3.3 Total Petroleum Hydrocarbon

The reported concentrations of TPH DRO (C10-C20, C20-C34) and TPH GRO (C6-C12) carbon chain compounds detected in subsurface soil samples were less than BUSTR Soil Class 1 Action Levels; therefore, these total petroleum-related hydrocarbon chain compounds (C6-C12, C10-C20, C20-C34) are not potential contamination at CC RVAAP-72 FWUSTs.

5.3.4 Target Analyte List Metals

One metal (arsenic) was reported at a concentration greater than background and its respective FWCUG at one DSB sampling location:

- Arsenic was reported at a concentration of 20 mg/kg, which exceeds the background value (19.8 mg/kg) and the Resident Receptor FWCUG (0.425 mg/kg) at UST location CC-RVAAP-72-08 (SB4), as shown in Figure 5-16.

A WOE evaluation determined that arsenic was not related to the historical activities and use of former CC-RVAAP-72-08 to store No. 2 fuel oil, as arsenic is not a metal additive to fuel oils.

Metals are not potential contamination at CC RVAAP-72 FWUSTs.

5.4 SUBSURFACE SOIL ANALYTICAL RESULTS FOR 9 FORMER NO FURTHER ACTION UNDERGROUND STORAGE TANKS SAMPLED FOR HEXAVALENT CHROMIUM

Subsurface soil samples were collected from the 9 former NFA UST locations (RV-13 through RV-19, RV-37, and RV-97) and analyzed for hexavalent chromium. The detected concentrations of hexavalent chromium are presented in Table 5-4. Figure 5-17 shows the hexavalent chromium detections at the 9 former NFA USTs.

- All reported concentrations of hexavalent chromium were less than the most stringent FWCUG.

- Therefore, hexavalent chromium is not a potential contaminant at the 9 former NFA UST locations.

5.5 SURFACE GEOPHYSICAL SURVEY

Greenstar Environmental Solutions LLC was contracted by ECC to conduct surface geophysical surveys at 7 former UST locations at CC RVAAP-72 FWUSTs to verify whether USTs were removed at these former UST locations. If no geophysical survey anomalies were reported, then it was concluded that the UST had been removed. If a geophysical survey anomaly interpreted as a UST was reported, then a UST may remain in-place.

The geophysical surveys were completed between November 5 and November 7, 2012 at the following 7 former UST locations:

- RV-4/RV-87
- RV-41
- RV-46
- RV-86
- RV-88
- RV-89

The 7 locations that were investigated comprised an area of approximately 7,275 square ft. Two techniques were used: GPR and EM. The GPR survey used a GSSI SIR-3000 instrument with a 400-megahertz antenna. The EM survey was completed with an EM-61 and on-board logging computer. The Greenstar Environmental Solutions LLC letter summary report is included in Appendix H. A summary of the findings of the geophysical survey is provided in Table 5-5. In addition to identifying tanks remaining in-place, the geophysical survey results were also used to site soil borings to increase the likelihood of identifying potential contamination.

5.6 SURFACE GEOPHYSICAL SURVEY INTERPRETATION AND RESULTS

5.6.1 RV-4 AND RV-87

At former UST locations RV-4 and RV-87, an area of 2,484 square ft was surveyed with the two instruments (Figure 5-1) to identify the presence or absence of two co-located former UST locations on the northeast side of Building 1026. According to the HRR (SAIC 2011a), former UST RV-4 was 100 gallons in capacity. The volume of former UST RV-87 is unknown. Two potential UST vent pipes were identified in the former UST RV-87 survey area adjacent to the building during the EM survey. The EM survey did not identify any magnetic anomalies at the location of former UST RV-4, but signal strength increased near the chain link fence boundary. The GPR survey identified a nonmetallic conduit within the survey grid of former UST RV-4. The EM-61 displayed three significant responses adjacent to the building. Due to their small footprint and location relative to surface features, these responses were interpreted to be the two vent pipes from the former UST locations and a drain gutter in the former UST RV-87 survey area; tank-sized targets were not identified. No other anomalies were noted during the EM-61 survey. Three direct-push borings were advanced in the immediate area of the vent pipes, which corresponded with the suspected location of former UST RV-87.

At the suspected location of former UST RV-4, a depression on the ground surface was observed outside the chain link fence surrounding Building 1026. The depression suggested possible historic excavation activities. Three borings were advanced within the observed depression. In summary, survey results at former UST locations RV-4/RV-87 did not indicate that USTs remain buried in place at this site within the geophysical survey area.

5.6.2 RV-41

An area of 2,500 square ft was surveyed to identify the presence or absence of the former 6,000-gallon UST adjacent to the southwest side of former Building 2F-11 (Figure 5-5). The EM-61 survey identified a small metallic object near the building and a linear metallic feature, but no anomaly the size indicative of a 6,000-gallon UST was observed. The GPR survey confirmed the EM survey results, and provided no evidence of the presence of a 6,000-gallon UST. The data were examined further to identify the presence of a UST excavation; however, an excavation area was not evident from the survey data. Nevertheless, the ground surface within the survey area was depressed, indicating possible historical excavation activities. Six borings were advanced within and around the depression. The geophysical survey results at former UST RV-41 did not suggest that a UST remains buried in place at this site within the survey area.

5.6.3 RV-46

An area of 324 square ft was surveyed to identify a former 1,500-gallon UST adjacent to the north side of former Building EE-102 (Figure 5-6). The EM-61 survey identified a magnetic anomaly, approximately 2 ft by 3 ft in size, within the survey grid. The GPR survey confirmed this anomaly; however, due to its irregular surface, it could not be confirmed as a UST. A second anomaly was identified during the GPR survey that had the proper dimensions and features of a UST, but did not have any magnetic return. This feature identified by the GPR survey was interpreted as a concrete UST approximately 7.5 ft in width and 8.8 ft in length.

Further action is warranted at the location of the former UST RV-46 EM and GPR anomalies to confirm or complete UST removal from the site in accordance with BUSTR out of service rules.

5.6.4 RV-86

An area of 900 square ft was surveyed for former UST RV-86 north of Building 1026 (Figure 5-2). Former UST RV-86 is of unknown dimensions; therefore, a large area was surveyed. The EM-61 survey identified one small metallic object; however, no magnetic anomalies were observed that suggested the presence of a UST. The GPR survey confirmed these findings, providing no additional evidence of a UST. Two sides of a UST excavation were inferred based on the GPR data. The perimeter of the excavation was marked on the ground, and the remaining two sides were estimated from the orientation of the two inferred excavation boundaries. The inferred excavation dimension was approximately 14.3 ft in length and 8.5 ft in width. The area of the inferred UST excavation correlated with a large depression on the ground surface, also suggestive of historical excavation activities. Six borings were advanced within and around the depression.

In summary, the geophysical survey results did not suggest that a UST remains buried in place at this site within the survey area. Two sides of an historical excavation were interpreted from the geophysical survey data and a depression was evident in the ground surface.

5.6.5 RV-88

An area of 900 square ft was surveyed for one suspected UST of unknown dimensions west of former Building 1103 (Figure 5-7). The EM-61 survey identified several small metallic objects, but no magnetic anomalies were observed that suggested the presence of a UST. The GPR survey confirmed the EM finding, providing no additional evidence of a UST within the geophysical survey area. Five borings were advanced in a five die pattern between the two metallic anomalies identified within the survey area.

The geophysical survey results at the former UST RV-88 location did not suggest that a UST remains buried in place at this site within the survey area.

5.6.6 RV-89

An area of 242 square ft was surveyed for one suspected UST of unknown dimensions west of the chlorine building (Figure 5-8). The EM-61 survey identified a large magnetic anomaly adjacent to a partially backfilled aboveground storage tank sump. The GPR survey did not identify a UST in place within the survey area. While a survey could not be conducted over the aboveground storage tank sump, the EM-61 was lifted over this basin, yielding a strong signal, indicating this structure was the likely source of the magnetic anomaly. Five borings were advanced within the survey area.

The survey results at the former UST RV-89 location did not suggest that a UST remains buried in place at this site within the geophysical survey area.

5.7 INVESTIGATION-DERIVED WASTE ANALYTICAL RESULTS

A description of the IDW streams generated during this SI, along with the Toxicity Characteristic Leaching Procedure waste characterization analysis results and disposal recommendations, are provided in the IDW Disposal Letter Report (Appendix F).

2837 **Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013**

Method/Chemical	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[(a)]	SRC (y/n)	SRC Justification
Volatile Organic Compounds (µg/kg)							
1,1,1-Trichloroethane	71-55-6	0/24	None	None	None	No	Not Detected
1,1,2,2-Tetrachloroethane	79-34-5	0/24	None	None	None	No	Not Detected
1,1,2-Trichloroethane	79-00-5	0/24	None	None	None	No	Not Detected
1,1-Dichloroethane	159-59-2	0/24	None	None	None	No	Not Detected
1,1-Dichloroethene	75-35-4	0/24	None	None	None	No	Not Detected
1,2-Dibromoethane	106-93-4	0/24	None	None	None	No	Not Detected
1,2-Dichloroethane	**107-06-2**	**1/24**	**0.82**	**0.82**	**None**	**Yes**	**Detected Organic**
1,2-Dichloroethene	156-60-5	0/24	None	None	None	No	Not Detected
1,2-Dichloropropane	78-87-5	0/24	None	None	None	No	Not Detected
2-Butanone	591-78-6	0/24	None	None	None	No	Not Detected
2-Hexanone	108-10-1	0/24	None	None	None	No	Not Detected
4-Methyl-2-pentanone	71-55-6	0/24	None	None	None	No	Not Detected
Acetone	67-64-1	0/24	None	None	None	No	Not Detected
Benzene	**71-43-2**	**3/78**	**1.8**	**46**	**None**	**Yes**	**Detected Organic**
Bromochloromethane	74-97-5	0/24	None	None	None	No	Not Detected
Bromodichloromethane	75-27-4	0/24	None	None	None	No	Not Detected
Bromoform	75-25-2	0/24	None	None	None	No	Not Detected
Bromomethane	74-83-9	0/24	None	None	None	No	Not Detected
Carbon Disulfide	75-15-0	0/24	None	None	None	No	Not Detected
Carbon Tetrachloride	**56-23-5**	**1/24**	**14,000**	**14,000**	**None**	**Yes**	**Detected Organic**
Chlorobenzene	108-90-7	0/24	None	None	None	No	Not Detected
Chloroethane	75-00-3	0/24	None	None	None	No	Not Detected
Chloroform	**67-66-3**	**1/24**	**190**	**190**	**None**	**Yes**	**Detected Organic**
Chloromethane	74-87-3	0/24	None	None	None	No	Not Detected
cis-1,3-Dichloropropene	10061-01-5	0/24	None	None	None	No	Not Detected
Dibromochloromethane	124-48-1	0/24	None	None	None	No	Not Detected
Methylene Chloride	100-41-4	0/24	None	None	None	No	Not Detected
Styrene	100-42-5	0/24	None	None	None	No	Not Detected
Tert-Butyl Methyl Ether (MTBE)	1635-04-4	0/78	None	None	None	No	Not Detected
Tetrachloroethene	127-18-4	0/24	None	None	None	No	Not Detected
Ethylbenzene	**100-41-4**	**3/78**	**0.71**	**30**	**None**	**Yes**	**Detected Organic**
trans-1,3-Dichloropropene	10061-02-6	0/24	None	None	None	No	Not Detected
Trichloroethene	79-01-6	0/24	None	None	None	No	Not Detected

2838

2839 **Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013 (continued)**

Method/Chemical	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[(a)]	SRC (y/n)	SRC Justification
Volatile Organic Compounds (µg/kg)							
Vinyl Chloride	75-01-4	0/24	None	None	None	No	Not Detected
Toluene	**108-88-3**	**31/78**	**0.53**	**140**	**None**	**Yes**	**Detected Organic**
Xylenes, Total	**1330-20-7**	**3/78**	**5.4**	**230**	**None**	**Yes**	**Detected Organic**
Semivolatile Organic Compounds (µg/kg)							
2,4-Dinitrophenol	51-28-5	0/32	None	None	None	No	Not Detected
2,4-Dinitrotoluene	121-14-2	0/32	None	None	None	No	Not Detected
2,6-Dinitrotoluene	606-20-2	0/32	None	None	None	No	Not Detected
2-Chloronaphthalene	91-58-7	0/32	None	None	None	No	Not Detected
2-Chlorophenol	95-57-8	0/32	None	None	None	No	Not Detected
2-Methylphenol (o-Cresol)	202-437-8	0/32	None	None	None	No	Not Detected
2-Nitroaniline	88-74-4	0/32	None	None	None	No	Not Detected
2-Nitrophenol	88-75-5	0/32	None	None	None	No	Not Detected
3,3'-Dichlorobenzidine	91-94-1	0/32	None	None	None	No	Not Detected
3-Nitroaniline	99-09-2	0/32	None	None	None	No	Not Detected
4,6-Dinitro-2-Methylphenol	534-52-1	0/32	None	None	None	No	Not Detected
4-Bromophenyl phenyl ether	101-55-3	0/32	None	None	None	No	Not Detected
4-Chloro-3-Methylphenol	59-50-7	0/32	None	None	None	No	Not Detected
4-Chloroaniline	106-47-8	0/32	None	None	None	No	Not Detected
4-Chlorophenyl Phenyl Ether	7005-72-3	0/32	None	None	None	No	Not Detected
4-Nitroaniline	100-01-6	0/32	None	None	None	No	Not Detected
4-Nitrophenol	51-28-5	0/32	None	None	None	No	Not Detected
Acenaphthene	**83-32-9**	**2/78**	**5.1**	**83**	**None**	**Yes**	**Detected Organic**
Acenaphthylene	**208-96-8**	**3/78**	**3.7**	**7.6**	**None**	**Yes**	**Detected Organic**
Anthracene	**120-12-7**	**5/78**	**4.8**	**8.8**	**None**	**Yes**	**Detected Organic**
Benzo(a)anthracene	**56-55-3**	**18/78**	**4.4**	**55**	**None**	**Yes**	**Detected Organic**
Benzo(a)pyrene	**50-32-8**	**12/78**	**4.7**	**40**	**None**	**Yes**	**Detected Organic**
Benzo(b)fluoranthene	**205-99-2**	**43/78**	**3.8**	**65**	**None**	**Yes**	**Detected Organic**
Benzo(g,h,i)perylene	**191-24-2**	**18/78**	**4.2**	**150**	**None**	**Yes**	**Detected Organic**
Benzo(k)fluoranthene	**207-08-9**	**18/78**	**3.6**	**22**	**None**	**Yes**	**Detected Organic**
Benzoic acid	65-85-0	0/32	None	None	None	No	Not Detected
Benzyl alcohol	100-51-6	0/32	None	None	None	No	Not Detected
Benzyl butyl phthalate	85-68-7	0/32	None	None	None	No	Not Detected
bis(2-Chloroethoxy) Methane	111-91-1	0/32	None	None	None	No	Not Detected

2840
2841

Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013(continued)

Analytes	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[(a)]	SRC (y/n)	SRC Justification
Semivolatile Organic Compounds (µg/kg)							
bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	111-44-4	0/32	None	None	None	No	Not Detected
bis(2-Chloroisopropyl) Ether	108-60-1	0/32	None	None	None	No	Not Detected
Carbazole	117-81-7	0/32	None	None	None	No	Not Detected
Chrysene	**218-01-9**	**22/78**	**4**	**41**	**None**	**Yes**	**Detected Organic**
Cresols, m & p	8001-28-3	0/32	None	None	None	No	Not Detected
Dibenzofuran	**132-64-9**	**10/32**	**4.8**	**100**	**None**	**Yes**	**Detected Organic**
Dibenz(a,h)anthracene	**53-70-3**	**3/79**	**11**	**20**	**None**	**Yes**	**Detected Organic**
Diethyl Phthalate	84-66-2	0/32	None	None	None	No	Not Detected
Dimethyl Phthalate	131-11-3	0/32	None	None	None	No	Not Detected
Di-n-Butyl Phthalate	84-74-2	0/32	None	None	None	No	Not Detected
Di-n-Octylphthalate	117-84-0	0/32	None	None	None	No	Not Detected
Fluoranthene	**206-44-0**	**22/78**	**3.7**	**96**	**None**	**Yes**	**Detected Organic**
Fluorene	**86-73-7**	**10/78**	**4.3**	**11**	**None**	**Yes**	**Detected Organic**
Hexachlorobenzene	118-74-1	0/32	None	None	None	No	Not Detected
Hexachlorobutadiene	87-68-3	0/32	None	None	None	No	Not Detected
Hexachlorocyclopentadiene	77-47-4	0/32	None	None	None	No	Not Detected
Hexachloroethane	67-72-1	0/32	None	None	None	No	Not Detected
Indeno(1,2,3-c,d) Pyrene	**193-39-5**	**12/78**	**4.2**	**24**	**None**	**Yes**	**Detected Organic**
Isophorone	78-59-1	0/32	None	None	None	No	Not Detected
Naphthalene	**91-20-3**	**24/78**	**4.1**	**36**	**None**	**Yes**	**Detected Organic**
Nitrobenzene	98-95-3	0/32	None	None	None	No	Not Detected
n-Nitrosodi-n-propylamine	621-64-7	0/32	None	None	None	No	Not Detected
n-Nitrosodiphenylamine	86-30-6	0/32	None	None	None	No	Not Detected
Pentachlorophenol	87-86-5	0/32	None	None	None	No	Not Detected
Phenanthrene	**85-01-8**	**27/78**	**3.6**	**57**	**None**	**Yes**	**Detected Organic**
Phenol	108-95-2	0/32	None	None	None	No	Not Detected
Pyrene	**129-00-0**	**24/78**	**3.9**	**77**	**None**	**Yes**	**Detected Organic**
2-Methylnaphthalene	**95-48-7**	**12/32**	**3.9**	**130**	**None**	**Yes**	**Detected Organic**
Bis(2-Ethylhexyl) Phthalate	**117-81-7**	**12/32**	**20**	**43**	**None**	**Yes**	**Detected Organic**
1,3,5-Trinitrobenzene	99-35-4	0/7	None	None	None	No	Not Detected
1,3-Dinitrobenzene	99-65-0	0/7	None	None	None	No	Not Detected

2845 **Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013 (continued)**

Analytes	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[(a)]	SRC (y/n)	SRC Justification
Explosives (mg/kg)							
2,4,6-Trinitrotoluene	118-96-7	0/7	None	None	None	No	Not Detected
2,4-Dinitrotoluene	121-14-2	0/7	None	None	None	No	Not Detected
2,6-Dinitrotoluene	606-20-2	0/7	None	None	None	No	Not Detected
2-Amino-4,6-dinitrotoluene	35572-78-2	0/7	None	None	None	No	Not Detected
2-Nitrotoluene	88-72-2	0/7	None	None	None	No	Not Detected
3-Nitrotoluene	99-08-1	0/7	None	None	None	No	Not Detected
4-Amino-2,6-Dinitrotoluene	19406-51-0	0/7	None	None	None	No	Not Detected
4-Nitrotoluene	99-99-0	0/7	None	None	None	No	Not Detected
Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)	121-82-4	0/7	None	None	None	No	Not Detected
Nitrobenzene	98-95-3	0/7	None	None	None	No	Not Detected
Nitroglycerin (propellant)	55-63-0	0/7	None	None	None	No	Not Detected
Nitroguanidine (propellant)	556-88-7	0/7	None	None	None	No	Not Detected
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine (HMX)	2691-41-0	0/7	None	None	None	No	Not Detected
Pentaerythritol Tetranitrate	78-11-5	0/7	None	None	None	No	Not Detected
Tetryl	479-45-8	0/7	None	None	None	No	Not Detected
Propellant (mg/kg)							
Nitrocellulose	9004-70-0	0/7	None	None	None	No	Not Detected
Diesel Range Petroleum Hydrocarbons (mg/kg)							
C10-C20	NA	**5/78**	**12**	**990**	**None**	**Yes**	**Detected Organic**
C20-C34	NA	**8/78**	**10**	**160**	**None**	**Yes**	**Detected Organic**
Gasoline Range Petroleum Hydrocarbons (mg/kg)							
C6-C12	NA	**12/78**	**0.054**	**37**	**None**	**Yes**	**Detected Organic**
Herbicides (µg/kg)							
2,4 DB	94-75-7	0/6	None	None	None	No	Not Detected
2,4,5-T (Trichlorophenoxyacetic Acid)	93-76-5	0/6	None	None	None	No	Not Detected
2,4-D (Dichlorophenoxyacetic Acid)	94-75-7	0/6	None	None	None	No	Not Detected
Dalapon	**75-99-0**	**2/6**	**14**	**33**	**None**	**Yes**	**Detected Organic**
Dicamba	1918-00-9	0/6	None	None	None	No	Not Detected
Dichloroprop	15165-67-0	0/6	None	None	None	No	Not Detected
Dinoseb	88-85-7	0/6	None	None	None	No	Not Detected
MCPA	94-74-6	0/6	None	None	None	No	Not Detected

Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013 (continued)

Analytes	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[(a)]	SRC (y/n)	SRC Justification
Herbicides (µg/kg)							
MCPP	93-65-2	0/6	None	None	None	No	Not Detected
Pentachlorophenol	87-86-5	0/6	None	None	None	No	Not Detected
Silvex (2,4,5-TP)	93-72-1	0/6	None	None	None	No	Not Detected
Pesticides (µg/kg)							
Aldrin	309-00-2	0/7	None	None	None	No	Not Detected
alpha-BHC	319-84-6	0/7	None	None	None	No	Not Detected
alpha-Chlordane	959-98-8	0/7	None	None	None	No	Not Detected
alpha-Endosulfan	5103-79-9	0/7	None	None	None	No	Not Detected
beta-BHC	319-85-7	0/7	None	None	None	No	Not Detected
delta-BHC	319-86-8	0/7	None	None	None	No	Not Detected
Dieldrin	60-57-1	0/7	None	None	None	No	Not Detected
Endosulfan Sulfate	1031-07-8	0/7	None	None	None	No	Not Detected
Endrin	72-20-8	0/7	None	None	None	No	Not Detected
Endrin Aldehyde	7421-93-4	0/7	None	None	None	No	Not Detected
Endrin Ketone	53494-70-5	0/7	None	None	None	No	Not Detected
gamma-BHC	58-89-9	0/7	None	None	None	No	Not Detected
gamma-Chlordane	5103-74-2	0/7	None	None	None	No	Not Detected
Heptachlor	76-44-8	0/7	None	None	None	No	Not Detected
Heptachlor Epoxide	1021-57-3	0/7	None	None	None	No	Not Detected
Methoxychlor	72-43-5	0/7	None	None	None	No	Not Detected
p,p'-DDD	72-54-8	0/7	None	None	None	No	Not Detected
p,p'-DDE	72-55-9	0/7	None	None	None	No	Not Detected
p,p'-DDT	50-29-3	0/7	None	None	None	No	Not Detected
Toxaphene	8001-35-2	0/7	None	None	None	No	Not Detected

Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013 (continued)

Analytes	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[a]	SRC (y/n)	SRC Justification
PCBs (µg/kg)							
PCB-1016 (Aroclor 1016)	12674-11-2	0/7	None	None	None	No	Not Detected
PCB-1221 (Aroclor 1221)	11104-28-2	0/7	None	None	None	No	Not Detected
PCB-1232 (Aroclor 1232)	11141-16-5	0/7	None	None	None	No	Not Detected
PCB-1242 (Aroclor 1242)	53469-21-9	0/7	None	None	None	No	Not Detected
PCB-1248 (Aroclor 1248)	12672-29-6	0/7	None	None	None	No	Not Detected
PCB-1254 (Aroclor 1254)	11097-69-1	0/7	None	None	None	No	Not Detected
PCB-1260 (Aroclor 1260)	11096-82-5	0/7	None	None	None	No	Not Detected
Metals (mg/kg)							
Aluminum	7429-90-5	78/78	3,500	14,000	19,500	No	Less than Background
Antimony	7440-36-0	57/78	0.049	0.3	0.96	No	Less than Background
Arsenic	**7440-38-2**	**78/78**	**0.38**	**22**	**19.80**	**Yes**	**Exceeds Background**
Barium	**7440-39-3**	**78/78**	**13**	**150**	**124**	**Yes**	**Exceeds Background**
Beryllium	**7440-41-7**	**78/78**	**0.21**	**1.5**	**0.88**	**Yes**	**Exceeds Background**
Cadmium	**7440-43-9**	**78/78**	**0.092**	**0.31**	**0**	**Yes**	**Exceeds Background**
Calcium**	7440-70-2	78/78	310	28,000	35,500	No	Essential Nutrient
Chromium	7440-47-3	78/78	5.9	22	27.20	No	Less than Background
Hexavalent Chromium[b]	**18540-29-9**	**11/32**	**0.31**	**7.1**	**0**	**Yes**	**Exceeds Background**
Cobalt	**7440-48-4**	**78/78**	**4.5**	**24**	**23.20**	**Yes**	**Exceeds Background**
Copper	**7440-50-8**	**78/78**	**7**	**55**	**32.3**	**Yes**	**Exceeds Background**
Iron**	7439-89-6	78/78	9,100	150,000	35,200	No	Essential Nutrient

Table 5-1: Site-Related Chemical Determination for Subsurface Soil Results, November 2012 – August 2013 (continued)

Analytes	CAS Number	Frequency of Detection	Minimum Detection	Maximum Detection	Background Criteria[(a)]	SRC (y/n)	SRC Justification
Metals (mg/kg)							
Lead	**7439-92-1**	**78/78**	**7.0**	**46**	**19.1**	**Yes**	**Exceeds Background**
Magnesium**	7439-95-4	78/78	1,200	8,700	8,790	No	Essential Nutrient
Manganese	**7439-96-5**	**78/78**	**84**	**3,400**	**3,030**	**Yes**	**Exceeds Background**
Mercury	7439-97-6	35/78	0.014	0.041	0.044	No	Less than Background
Nickel	7440-02-0	78/78	9.2	44	60.7	No	Less than Background
Potassium**	7440-09-7	78/78	620	2,500	3,350	No	Essential Nutrient
Selenium	7782-49-2	78/78	0.10	1.1	1.5	No	Less than Background
Silver	**7440-22-4**	**78/78**	**0.013**	**0.52**	**0**	**Yes**	**Exceeds Background**
Sodium**	7440-23-5	78/78	27	180	145	No	Essential Nutrient
Thallium	7440-28-0	78/78	0.068	0.18	0.91	No	Less than Background
Vanadium	7440-62-2	78/78	7	24	37.6	No	Less than Background
Zinc	**7440-66-6**	**78/78**	**33**	**130**	**93.3**	**Yes**	**Exceeds Background**

Notes:

(a) (The background concentrations for metals shown in this table were obtained from two sources: (1) The *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (Science Applications International Corporation 2010)*;* and (2) *Final Phase II Remedial Investigation Report for Winklepeck Burning Grounds at Ravenna Army Ammunition Plant, Ravenna, Ohio* (Science Applications International Corporation 2001).

(b) Hexavalent chromium only sampled at 9 No Further Action USTs at stakeholder request.

Bold indicates analyte identified as an SRC.

** Asterisk denotes the chemical is an essential nutrient.

µg/kg = Microgram per kilogram.
BHC = Hexachlorocyclohexane.
CAS = Chemical abstract number.
DDD = p,p'-Dichlorodiphenyldichloroethane.
DDE = p,p'-Dichlorodiphenyldichloroethylene.
DDT = 1,1,1-trichloro-2,2-di(4-chlorophenyl)ethane.
mg/kg = Milligram per kilogram.
PCB = Polychlorinated biphenyl.
SRC = Site-related chemical.

Note: This SRC table includes subsurface soil sampled collected at the former 15 underground storage tank locations under CC RVAAP-72 without previous recorded sampling, as well as the additional samples collected from the 9 former No Further Action underground storage tank locations specifically sampled only for hexavalent chromium.

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Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks

Sample Type:							Primary	Primary	Primary	Primary	Primary	Dup of 0001-0001-SO
UST No.:							RV-4	RV-4	RV-4	RV-4	RV-5	RV-5
Location ID:							72-1026-RV4-SB1	72-1026-RV4-SB1	72-1026-RV4-SB2	72-1026-RV4-SB3	72-1048-RV5-SB1	72-1048-RV5-SB1
Sample ID:							072SB-0007-0001-SO	072SB-0010-0001-SO	072SB-0008-0001-SO	072SB-0009-0001-SO	072SB-0001-0001-SO	072SB-0002-0001-SO
Lab Sample ID:							240-18441-1	240-18441-4	240-18441-2	240-18441-3	240-18297-9	240-18297-10
Sample Date:							12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/3/2012	12/3/2012
Location Type:							Discrete	Composite	Discrete	Discrete	Discrete	Discrete
Sample Depth:							5-6 ft	7-13 ft	5-6 ft	5-6 ft	5-6 ft	5-6 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	ND	ND	ND	ND	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	ND	ND	ND	ND	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	ND	ND	ND	ND	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	ND	ND	ND
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	**16**	**16**	**8.1**	**7.0 J**	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	**7.3 J**	**5.0 J**	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	ND	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	NR	NR	NR	NR	NR	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	**8.9**	ND
Phenanthrene	None	None	None	None	NA	None	None	**5.6 J**	**4.4 J**	ND	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	**7.1 J**	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	NR	NR	NR	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	NR	NR	NR	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	**0.320 J**	**0.180 J**
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-5	RV-5	RV-5	RV-41	RV-41	RV-41
Location ID:							72-1048-RV5-SB2	72-1048-RV5-SB3	72-1048-RV5-SB1	72-2F11-R41-SB1	72-2F11-R41-SB2	72-2F11-R41-SB3
Sample ID:							072SB-0003-0001-SO	072SB-0004-0001-SO	072SB-0005-0001-SO	072SB-0082-0001-SO	072SB-0083-0001-SO	072SB-0084-0001-SO
Lab Sample ID:							240-18297-11	240-18297-12	240-18297-13	240-18703-8	240-18703-9	240-18703-10
Sample Date:							12/3/2012	12/3/2012	12/3/2012	12/10/2012	12/10/2012	12/10/2012
Location Type:							Discrete	Discrete	Composite	Discrete	Discrete	Discrete
Sample Depth:							5-6 ft	5-6 ft	7-13 ft	5-6 ft	9-10 ft	9-10 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	**14,000 J**	NR	NR	ND	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	**190 J**	NR	NR	ND	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	ND	NR	NR	ND	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	**1.7 J**	**2.7 J**	**3.5 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	**8.8**	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	ND	**17**	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	**9.6**	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	ND	ND	**13**	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	**17**	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	**5.6 J**	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	ND	**9.2**	ND	**5.3 J**
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	ND	NR	NR	**12 J**	ND	ND
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	**15**	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	**11**	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	**7.6 J**	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	**7.0 J**	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	ND	ND	ND	**20**	ND	**8.9**
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	ND	**22**	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	ND	NR	NR	**17**	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	ND	NR	NR	ND	ND	ND
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	**220**	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	**25**	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	**0.76**	**0.31**	**0.44**	**37**	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

							Sample Type:	Primary	Dup of 0085-0001-SO	Primary	Primary	Primary	Dup of 0063-0001-SO
							UST No.:	RV-41	RV-41	RV-41	RV-41	RV-46	RV-46
							Location ID:	72-2F11-R41-SB4	72-2F11-R41-SB4	72-2F11-R41-SB5	72-2F11-R41-SB6	72-BM-RV46-SB1	72-BM-RV46-SB1
							Sample ID:	072SB-0085-0001-SO	072SB-0086-0001-SO	072SB-0091-0001-SO	072SB-0092-0001-SO	072SB-0063-0001-SO	072SB-0064-0001-SO
							Lab Sample ID:	240-18703-11	240-18703-12	240-18703-17	240-18703-1	240-18544-1	240-18544-2
							Sample Date:	12/10/2012	12/10/2012	12/10/2012	12/10/2012	12/6/2012	12/6/2012
							Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
							Sample Depth:	9-10 ft	9-10 ft	9-10 ft	9-10 ft	11.5 ft	11.5 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**							
			Resident Receptor										
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	**4.3 J**	**2.6 J**	**5.0 J**	**3.1 J**	ND	**0.94 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	ND	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	ND	ND	ND	NR	ND	ND
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	ND	ND	ND	NR	ND	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	ND	ND	ND	NR	ND	ND
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-46	RV-46	RV-46	RV-46	RV-46	RV-86
Location ID:							72-BM-RV46-SB1	72-BM-RV46-SB2	72-BM-RV46-SB3	72-BM-RV46-SB4	72-BM-RV46-SB4	72-1026-R86-SB1
Sample ID:							072SB-0068-0001-SO	072SB-0065-0001-SO	072SB-0066-0001-SO	072SB-0067-0001-SO	072SB-0078-0001-SO	072SB-0012-0001-SO
Lab Sample ID:							240-18544-6	240-18544-3	240-18544-4	240-18544-5	240-18544-18	240-18297-15
Sample Date:							12/6/2012	12/6/2012	12/6/2012	12/6/2012	12/6/2012	12/3/2012
Location Type:							Composite	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							7-13 ft	10 ft	10 ft	10 ft	13 ft	6-7 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	ND	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	ND	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	ND	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	**3.1 J**	**0.86 J**	**0.53 J**	**3.0 J**	**4.0 J**	ND
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	**83**	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	**6.1 J**	ND	ND	**4.4 J**	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	**6.9 J**	ND	ND	**9.7 J**	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	**4.7 J**	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	ND	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	ND	ND	ND	**100 J**	NR	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	ND	**3.7 J**	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	ND	**20 J**	**4.8 J**	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	ND	ND	ND	ND	NR	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	ND	ND	ND	ND	NR	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	**12 J**	**990**	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	**26**	**160 J**	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	**6.7**	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Dup of 0012-0001-SO	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-86	RV-86	RV-86	RV-86	RV-86	RV-86
Location ID:							72-1026-R86-SB1	72-1026-R86-SB1	72-1026-R86-SB2	72-1026-R86-SB3	72-1026-R86-SB4	72-1026-R86-SB5
Sample ID:							072SB-0013-0001-SO	072SB-0019-0001-SO	072SB-0014-0001-SO	072SB-0015-0001-SO	072SB-0016-0001-SO	072SB-0017-0001-SO
Lab Sample ID:							240-18297-16	240-18297-22	240-18297-17	240-18297-18	240-18297-19	240-18297-20
Sample Date:							12/3/2012	12/3/2012	12/3/2012	12/3/2012	12/3/2012	12/3/2012
Location Type:							Discrete	Composite	Discrete	Discrete	Discrete	Discrete
Sample Depth:							6-7 ft	7-13 ft	6-7 ft	6-7 ft	6-7 ft	6-7 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	ND	NR	NR	ND
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	ND	NR	NR	ND
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	ND	NR	NR	ND
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	ND	ND	**6.7 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)												
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	**11**	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	**4.4 J**	**29**	**6.7 J**	**6.9 J**	**4.9 J**	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	**10**	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	**10**	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	**12**	ND	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	NR	NR	ND	NR	NR	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	**12**	ND	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	**5.0 J**	**5.4 J**	**6.7 J**	**4.1 J**	ND
Phenanthrene	None	None	None	None	NA	None	None	ND	**34**	ND	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	**8.1**	ND	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	ND	NR	NR	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	ND	NR	NR	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	ND	ND
Herbicides (µg/kg)												
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-86	RV-87	RV-87	RV-87	RV-87	RV-88
Location ID:							72-1026-R86-SB6	72-1026-R87-SB1	72-1026-R87-SB1	72-1026-R87-SB2	72-1026-R87-SB3	72-1103-R88-SB1
Sample ID:							072SB-0018-0001-SO	072SB-0021-0001-SO	072SB-0024-0001-SO	072SB-0022-0001-SO	072SB-0023-0001-SO	072SB-0056-0001-SO
Lab Sample ID:							240-18297-21	240-18441-6	240-18441-9	240-18441-7	240-18441-8	240-18581-7
Sample Date:							12/3/2012	12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/7/2012
Location Type:							Discrete	Discrete	Composite	Discrete	Discrete	Discrete
Sample Depth:							6-7 ft	6-7 ft	7-13 ft	6-7 ft	6-7 ft	6 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	ND	ND	ND	ND	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	ND	ND	ND	ND	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	ND	ND	ND	ND	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	ND	ND	**1.9 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)												
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	**8.3 J**	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	**6.2 J**	**5.8 J**	**13 J**	**9.4 J**	**7.2 J**	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	**6.2 J**	**6.9 J**	**6.1 J**	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	**5.6 J**	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	NR	NR	NR	NR	NR	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	**3.7 J**	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	**4.2 J**	ND	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	ND	ND	**7.2 J**	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	**5.2 J**	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	NR	NR	NR	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	NR	NR	NR	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	ND	ND
Herbicides (µg/kg)												
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:	Primary	Primary	Primary	Primary	Primary	Dup of 0026-0001-SO
UST No.:	RV-88	RV-88	RV-88	RV-88	RV-89	RV-89
Location ID:	72-1103-R88-SB2	72-1103-R88-SB3	72-1103-R88-SB4	72-1103-R88-SB5	72-1026-R89-SB1	72-1026-R89-SB1
Sample ID:	072SB-0057-0001-SO	072SB-0058-0001-SO	072SB-0059-0001-SO	072SB-0060-0001-SO	072SB-0026-0001-SO	072SB-0027-0001-SO
Lab Sample ID:	240-18581-8	240-18581-9	240-18581-10	240-18581-11	240-18441-11	240-18441-12
Sample Date:	12/7/2012	12/7/2012	12/7/2012	12/7/2012	12/4/2012	12/4/2012
Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:	7 ft	7 ft	7 ft	7 ft	10-11 ft	10-11 ft

		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	**1.9 J**	**1.3 J**	**1.2 J**	**1.4 J**	ND	**1.9 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	**15 J**	**4.4 J**
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	**18 J**	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	**16 J**	**15**
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	**140 J**	**42 J**
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	**5.8 J**	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	ND	ND	**9.1 J**	**9.1**
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	NR	NR	NR	NR	**16 J**	**8.7 J**
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	ND	**12 J**	**10**
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	**8.4 J**	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	**17 J**	**12**
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	**29 J**	**14 J**
Phenanthrene	None	None	None	None	NA	None	None	ND	ND	ND	ND	**50 J**	**36**
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	ND	ND	**16 J**	**7.1 J**
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	NR	NR	**100 J**	**11 J**
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	NR	NR	ND	**25 J**
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-89	RV-89	RV-89	RV-89	RV-89	CC RVAAP 72-01
Location ID:							72-1026-R89-SB2	72-1026-R89-SB3	72-1026-R89-SB4	72-1026-R89-SB5	72-1026-R89-SB5	72-FS-01-SB1
Sample ID:							072SB-0028-0001-SO	072SB-0029-0001-SO	072SB-0030-0001-SO	072SB-0031-0001-SO	072SB-0032-0001-SO	072SB-0075-0001-SO
Lab Sample ID:							240-18441-13	240-18441-14	240-18441-15	240-18441-16	240-18441-17	240-18703-18
Sample Date:							12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/10/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							10-11 ft	10-11 ft	10-11 ft	10-11 ft	7-11 ft	9-10 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	ND	NR	NR	ND
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	ND	NR	NR	ND
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	ND	NR	NR	**0.82 J**
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	ND	ND	**3.8 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)												
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	**5.1 J**	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	**3.7 J**	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	**7.1 J**	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	**11 J**	**7.0**	**6.8**	**7.0**	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	**11 J**	**25**	**20**	**26**	**22 J**	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	**13 J**	**12**	**12**	**13**	**21 J**	**3.8 J**
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	**84 J**	**140**	**98**	**150**	**130 J**	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	**4.8 J**	**4.4 J**	**5.3 J**	**6.1 J**	**7.9 J**	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	**7.7 J**	**10**	**10**	**10**	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	**14 J**	**15 J**	**14 J**	**16 J**	**20 J**	ND
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	**16**	**20**	**11 J**	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	**11 J**	**10**	**12**	**12**	**20 J**	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	**4.3 J**	**9.0**	**5.2 J**	**7.6**	**11 J**	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	**13 J**	**23**	**18**	**24**	**22 J**	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	**27 J**	**36**	**27**	**34**	**35 J**	ND
Phenanthrene	None	None	None	None	NA	None	None	**43 J**	**46**	**48**	**54**	**57 J**	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	**16 J**	**14**	**14**	**16**	**22 J**	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	**67 J**	**130**	**83**	**110**	**120 J**	ND
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	ND	**22 J**	**20 J**	**22 J**	**24 J**	ND
Diesel Range Petroleum Hydrocarbons (mg/kg)												
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)												
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	ND	ND
Herbicides (µg/kg)												
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	ND

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Dup of 0076-0001-SO	Primary	Primary	Primary	Primary
UST No.:							CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-02
Location ID:							72-FS-01-SB2	72-FS-01-SB2	72-FS-01-SB3	72-FS-01-SB4	72-FS-01-SB5	72-ASY-02-SB1
Sample ID:							072SB-0076-0001-SO	072SB-0077-0001-SO	072SB-0079-0001-SO	072SB-0080-0001-SO	072SB-0081-0001-SO	072SB-0043-0001-SO
Lab Sample ID:							240-18703-19	240-18703-20	240-18703-21	240-18703-22	240-18703-23	240-18449-10
Sample Date:							12/10/2012	12/10/2012	12/10/2012	12/10/2012	12/10/2012	12/5/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							5-6 ft	5-6 ft	5-6 ft	9-10 ft	9-10 ft	9 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**							
			Resident Receptor										
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	**9.9 J**	**1.8 J**	**46**	**8.9**	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	**22 J**	**0.71 J**	**30**	**22**	ND	ND
Toluene	None	None	None	None	49,100	-	-	**52 J**	**6.7 J**	**140**	**87**	**5.3 J**	ND
Xylenes, Total	None	None	None	None	15,700	-	-	**150 J**	**5.4 J**	**230**	**140**	16 U	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	**7.6 J**	ND	**5.3 J**	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	**5.8 J**	**4.8 J**	**5.5 J**	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	**55 J**	**24 J**	**46**	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	**40 J**	**16 J**	**37**	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	**65 J**	**22 J**	**50**	**6.1 J**	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	**34 J**	**20 J**	**32**	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	**22 J**	**8.9 J**	**21**	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	**41 J**	**17 J**	**35**	**4.5 J**	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	ND	ND	ND	ND	ND	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	**96 J**	**34 J**	**74**	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	**22 J**	**10 J**	**20**	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	**7.6 J**	**12**	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	**47 J**	**21 J**	**32**	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	**77**	**26**	**57**	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	ND	ND	**11**	**17**	ND	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	ND	ND	ND	ND	**31 J**	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	0.07 J	2.2 J	0.86	3.2 J	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	ND	ND	ND	33 J	14 J	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Dup of 0035-0001-SO
UST No.:							CC-RVAAP-72-02	CC-RVAAP-72-02	CC-RVAAP-72-02	CC-RVAAP-72-02	CC-RVAAP-72-03	CC-RVAAP-72-03
Location ID:							72-ASY-02-SB2	72-ASY-02-SB3	72-ASY-02-SB4	72-ASY-02-SB5	72-ASY-03-SB1	72-ASY-03-SB1
Sample ID:							072SB-0044-0001-SO	072SB-0045-0001-SO	072SB-0046-0001-SO	072SB-0047-0001-SO	072SB-0035-0001-SO	072SB-0036-0001-SO
Lab Sample ID:							240-18449-11	240-18449-12	240-18449-13	240-18449-14	240-18449-2	240-18449-3
Sample Date:							12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							9 ft	9 ft	9 ft	5 ft	8-9 ft	8-9 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**							
			Resident Receptor										
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	ND	ND	ND
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	**8.3**	ND	ND	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	**13**
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	**4.3 J**	**3.8 J**	ND	**4.9 J**	**7.8**
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	**11**	**17**
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	**6.8 J**	ND	ND	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	NR	NR	NR	NR	**8.4 J**	**20 J**
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	ND	**6.4 J**	**6.5 J**
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	**7.2 J**
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	**9.8**
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	**7.0 J**	**9.8**
Phenanthrene	None	None	None	None	NA	None	None	ND	ND	ND	ND	**13 J**	**32 J**
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	ND	ND	**10**	**10**
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	NR	NR	**13**	**27**
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	NR	NR	**43 J**	**30 J**
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	**17 J**	**20**
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	**30**	**27**
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	ND	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-04
Location ID:							72-ASY-03-SB1	72-ASY-03-SB2	72-ASY-03-SB3	72-ASY-03-SB4	72-ASY-03-SB5	72-ASY-04-SB1
Sample ID:							072SB-0041-0001-SO	072SB-0037-0001-SO	072SB-0038-0001-SO	072SB-0039-0001-SO	072SB-0040-0001-SO	072SB-0049-0001-SO
Lab Sample ID:							240-18449-8	240-18449-4	240-18449-5	240-18449-6	240-18449-7	240-18449-16
Sample Date:							12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							7-13 ft	8-9 ft	8-9 ft	8-9 ft	8-9 ft	9 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**							
			Resident Receptor										
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	ND	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	ND	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	ND	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	**0.79 J**	ND	ND
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	ND	**5.7 J**	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	**5.6 J**	**6.4 J**	**4.3 J**	ND	**4.7 J**
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	**4.2 J**
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	ND	**7.2 J**	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	**4.8 J**	ND	ND	ND	ND	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	**8.9**	ND	ND	**5.2 J**	ND	**4.2 J**
Phenanthrene	None	None	None	None	NA	None	None	**10**	ND	ND	ND	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	**6.6 J**	ND	ND	ND	ND	**5.1 J**
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	**14**	ND	ND	ND	ND	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	**25 J**	**27 J**	**31 J**	**28 J**	**31 J**	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	**12 J**	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	**0.75**	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							CC-RVAAP-72-04	CC-RVAAP-72-05	CC-RVAAP-72-05	CC-RVAAP-72-05	CC-RVAAP-72-05	CC-RVAAP-72-06
Location ID:							72-ASY-04-SB2	72-ASY-05-SB1	72-ASY-05-SB2	72-ASY-05-SB3	72-ASY-05-SB4	72-WTP-06-SB1
Sample ID:							072SB-0050-0001-SO	072SB-0051-0001-SO	072SB-0052-0001-SO	072SB-0053-0001-SO	072SB-0054-0001-SO	072SB-0087-0001-SO
Lab Sample ID:							240-18449-17	240-18449-18	240-18449-19	240-18449-20	240-18449-21	240-18703-13
Sample Date:							12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/10/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							9 ft	8-9 ft	8-9 ft	8-9 ft	8-9 ft	9-10 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	ND	ND	ND	ND	ND	**6.2**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	**9.3**	**6.0 J**	ND	ND	ND	**13**
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	**5.5 J**	ND	ND	**5.4 J**	**4.5 J**	**9.3**
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	**6.6 J**	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	ND	**3.6 J**
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	**9.5**	**6.9 J**	ND	ND	ND	**5.5 J**
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	NR	NR	NR	NR	NR	ND
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	**6.3 J**	ND	ND	**5.4 J**	ND	**12**
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	**10**	ND	ND	**20**	ND	**3.6 J**
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	ND	ND	ND	ND	**7.6**
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	NR	NR	NR	**3.9 J**
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	NR	NR	NR	ND
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	ND	**0.75**	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							CC-RVAAP-72-06	CC-RVAAP-72-06	CC-RVAAP-72-06	CC-RVAAP-72-08	CC-RVAAP-72-08	CC-RVAAP-72-08
Location ID:							72-WTP-06-SB2	72-WTP-06-SB3	72-WTP-06-SB4	72-SSP-08-SB1	72-SSP-08-SB2	72-SSP-08-SB3
Sample ID:							072SB-0088-0001-SO	072SB-0089-0001-SO	072SB-0090-0001-SO	072SB-0070-0001-SO	072SB-0071-0001-SO	072SB-0072-0001-SO
Lab Sample ID:							240-18703-14	240-18703-15	240-18703-16	240-18581-13	240-18581-14	240-18581-15
Sample Date:							12/10/2012	12/10/2012	12/10/2012	12/7/2012	12/7/2012	12/7/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							9-10 ft	9-10 ft	9-10 ft	8 ft	8 ft	8 ft
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)													
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	NR	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	**5.2 J**	**3.8 J**	**2.8 J**	**1.1 J**	**1.2 J**	**1.0 J**
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	ND	**11**	ND	ND	ND
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	ND	ND
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	ND	**4.0 J**	ND	ND	ND
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	ND	ND	ND	NR	NR	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	**12**	**5.5 J**	**6.3 J**	ND	ND	ND
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	**5.6 J**	ND	ND	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	ND	ND	ND	ND	ND
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	ND	ND	ND	ND	ND
Phenanthrene	None	None	None	None	NA	None	None	ND	**4.1 J**	**4.5 J**	**18**	ND	ND
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	**10**	**3.9 J**	**5.0 J**	ND	ND	ND
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	ND	ND	ND	NR	NR	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	ND	ND	ND	NR	NR	NR
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	ND	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	11 J	ND	14 J	ND	ND	ND
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	**0.054 J**	ND	ND	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							CC-RVAAP-72-08	RV-88	RV-41	CC-RVAAP-72-01	CC-RVAAP-72-08	CC-RVAAP-72-06
Location ID:							72-SSP-08-SB4	72-1103-R88-SB5	72-2F11-R41-SB1	72-FS-01-SB5	72-SSP-08-SB4	72-WTP-06-SB2
Sample ID:							072SB-0073-0001-SO	072SB-0093-0001-SO	072SB-0097-0001-SO	072SB-0095-0001-SO	072SB-0094-0001-SO	072SB-0096-0001-SO
Lab Sample ID:							240-18581-16	240-28007-7	240-28007-6	240-28007-3	240-28007-4	240-28007-5
Sample Date:							12/7/2012	08/14/2013	08/14/2013	08/14/2013	08/14/2013	08/14/2013
Location Type:							Discrete	Composite	Composite	Composite	Composite	Composite
Sample Depth:							8 ft	7-13	7-13	7-13	7-13	7-13
		Facility-Wide Cleanup Goals				**USEPA RSL**						
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**					
Volatile Organic Compounds (µg/kg)												
Benzene	None	None	None	None	149	-	-	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	None	None	None	None	NA	3,000	610	NR	NR	NR	NR	NR	NR
Chloroform	None	None	None	None	NA	1,500	290	NR	NR	NR	NR	NR	NR
1,2-Dichloroethane	None	None	None	None	NA	2,200	430	ND	NR	NR	NR	NR	NR
Ethylbenzene	None	None	None	None	45,500	-	-	ND	ND	ND	ND	ND	ND
Toluene	None	None	None	None	49,100	-	-	**1.0 J**	ND	ND	ND	ND	ND
Xylenes, Total	None	None	None	None	15,700	-	-	ND	ND	ND	ND	ND	ND
Semivolatile Organic Compounds (µg/kg)													
Acenaphthene	None	None	None	None	NA	3,300,000	340,000	ND	ND	ND	ND	ND	ND
Acenaphthylene	None	None	None	None	NA	None	None	ND	ND	ND	ND	ND	ND
Anthracene	None	None	None	None	NA	17,000,000	1,700,000	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	None	4,770	650	221	11,000	-	-	ND	**5.4 J**	ND	ND	ND	**10.0**
Benzo(a)pyrene	None	477	65	22	1,100	-	-	ND	**4.7 J**	ND	ND	ND	**7.7**
Benzo(b)fluoranthene	None	4,770	650	221	11,000	-	-	ND	**7.6**	**3.9 J**	**6.9 J**	ND	**12.0**
Benzo(g,h,i)perylene	None	None	None	None	NA	None	None	ND	**5.2 J**	ND	**16.0**	ND	**6.5 J**
Benzo(k)fluoranthene	None	47,700	6,500	2,210	110,000	-	-	ND	ND	ND	ND	ND	**3.7 J**
Chrysene	None	477,000	65,000	22,100	1,100,000	-	-	ND	**5.4 J**	**4.5 J**	**12.0**	ND	**8.8**
Dibenzofuran	None	1,192,000	15,300*	119,000*	NA	-	-	ND	NR	NR	NR	NR	NR
Dibenz(a,h)anthracene	None	477	65	22	1,100	-	-	ND	ND	ND	ND	ND	ND
Fluoranthene	None	5,087,000*	163,000*	276,000*	NA	-	-	ND	**16.0**	ND	**6.6 J**	ND	**19.0**
Fluorene	None	11,458,000*	243,000*	737,000*	NA	-	-	ND	ND	**6.5 J**	ND	ND	ND
Indeno(1,2,3-c,d)Pyrene	None	4,770	650	221	11,000	-	-	ND	**4.2 J**	ND	ND	ND	**4.9 J**
Naphthalene	None	1,541,000*	122,000*	368,000*	39,800	-	-	ND	**4.4 J**	**4.3 J**	**13.0**	**4.7 J**	**6.2 J**
Phenanthrene	None	None	None	None	NA	None	None	ND	**16.0**	**6.4 J**	**19.0**	**4.4 J**	**18.0**
Pyrene	None	3,815,000*	122,000*	207,000*	NA	-	-	ND	**11.0**	ND	**10.0**	ND	**17.0**
2-Methylnaphthalene	None	2,384,000*	30,600*	238,000*	NA	-	-	NR	NR	NR	NR	NR	NR
bis(2-Ethylhexyl) Phthalate	None	None	None	None	NA	120,000	35,000	NR	NR	NR	NR	NR	NR

Table 5-2: Summary of Analytical Results for Organic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:								Primary	Primary	Primary	Primary	Primary	Primary
UST No.:								CC-RVAAP-72-08	RV-88	RV-41	CC-RVAAP-72-01	CC-RVAAP-72-08	CC-RVAAP-72-06
Location ID:								72-SSP-08-SB4	72-1103-R88-SB5	72-2F11-R41-SB1	72-FS-01-SB5	72-SSP-08-SB4	72-WTP-06-SB2
Sample ID:								072SB-0073-0001-SO	072SB-0093-0001-SO	072SB-0097-0001-SO	072SB-0095-0001-SO	072SB-0094-0001-SO	072SB-0096-0001-SO
Lab Sample ID:								240-18581-16	240-28007-7	240-28007-6	240-28007-3	240-28007-4	240-28007-5
Sample Date:								12/7/2012	08/14/2013	08/14/2013	08/14/2013	08/14/2013	08/14/2013
Location Type:								Discrete	Composite	Composite	Composite	Composite	Composite
Sample Depth:								8 ft	7-13	7-13	7-13	7-13	7-13
		Facility-Wide Cleanup Goals				**USEPA RSL**							
			Resident Receptor										
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**BUSTR**	**Industrial**	**Residential**						
Diesel Range Petroleum Hydrocarbons (mg/kg)													
C10-C20	None	None	None	None	2,000	-	-	ND	ND	**15.0 J**	ND	ND	ND
C20-C34	None	None	None	None	5,000	-	-	ND	ND	ND	**13.0 J**	ND	**10.0 J**
Gasoline Range Petroleum Hydrocarbons (mg/kg)													
C6-C12	None	None	None	None	1,000	-	-	ND	ND	**8.2**	ND	ND	ND
Herbicides (µg/kg)													
Dalapon	None	None	None	None	NA	1,800,000	180,000	NR	NR	NR	NR	NR	NR

Notes:
Yellow shading of a result indicates a concentration is greater than an FWCUG.
All FWCUGs are carcinogenic FWCUGs (10^{-6} Risk), with the exception of the FWCUGs with an Asterisk (*).
Asterisk (*) indicates non-carcinogenic FWCUGs (Hazard Quotient = 0.1).
** Essential nutrient.
µg/kg = Micrograms per kilogram.
BKG = Background criteria.
BUSTR = Bureau of Underground Storage Tank Regulations.
C = Carbon.
ft = Feet.
FWCUG = Facility-Wide Cleanup Goal.
ID = Identification.
J = Estimated.
mg/kg = Milligrams per kilogram.
NA = Not available.
ND = Not-detected concentration reported at the Limit of Detection.
NR = Not reported.
RSL = Regional Screening Level (USEPA, November 2013).
USEPA = United States Environmental Protection Agency.

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Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary	Duplicate
						UST No.:	RV-46	RV-4	RV-4	RV-4	RV-4	RV-5	RV-5
						Location ID:	72-BM-RV46-SB4	72-1026-RV4-SB1	72-1026-RV4-SB1	72-1026-RV4- SB2	72-1026-RV4-SB3	72-1048-RV5-SB1	72-1048-RV5-SB1
						Sample ID:	072SB-0078-0001-SO	072SB-0007-0001-SO	072SB-0010-0001-SO	072SB-0008-0001-SO	072SB-0009-0001-SO	072SB-0001-0001-SO	072SB-0002-0001-SO
						Lab Sample ID:	240-18544-18	240-18441-1	240-18441-4	240-18441-2	240-18441-3	240-18297-9	240-18297-10
						Sample Date:	12/6/2012	12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/3/2012	12/3/2012
						Location Type:	Discrete	Discrete	Composite	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	13 ft	5-6 ft	7-13 ft	5-6 ft	5-6 ft	5-6 ft	5-6 ft
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**								
			Resident Receptor										
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**							
Metals (mg/kg)													
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**3500**	**6,800**	**9,700**	**9,900**	**8,900**	**12,000**	**12,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.180 J**	**0.095 J**	**0.13 J**	**0.13 J**	**0.12 J**	**0.075 J**	**0.083 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**15.0**	**3.2 J**	**2.7 J**	**4.5 J**	**4.0 J**	**14 J**	**7.8 J**
Barium	124	351*	1,413*	8,966*	-	-	**44.0**	**68 J**	**39 J**	**48 J**	**34 J**	**36 J**	**87 J**
Beryllium	0.88	None	None	None	200	16	**0.280**	**1.5**	**1.1**	**0.93**	**0.82**	**0.65**	**0.60**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.200**	**0.29**	**0.23**	**0.31**	**0.31**	**0.15**	**0.19**
Calcium**	35,500	None	None	None	None	None	**14000**	**460**	**660**	**630**	**430**	**2,900 J**	**28,000 J**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**5.90**	**15**	**20**	**20**	**19**	**18**	**19**
Cobalt	23.2	7.03	131*	803	-	-	**5.00**	**12**	**24**	**17**	**13**	**12**	**9.6**
Copper	32.3	25,368*	311*	2,714*	-	-	**17.0**	**22**	**33**	**31**	**31**	**16**	**17**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**31000**	**150,000**	**66,000**	**39,000**	**36,000**	**28,000**	**26,000**
Lead	19.1	None	None	None	800	400	**10.0**	**13**	**18**	**20**	**17**	**11**	**10**
Magnesium**	8,790	None	None	None	None	None	**3100**	**2,600**	**4,000**	**4,300**	**4,000**	**6,000**	**8,100**
Manganese	3,030	35.1*	293*	1,482*	-	-	**290**	**3,400 J**	**900 J**	**1,100 J**	**850 J**	**190**	**270**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.029 J**	**0.024 J**	**0.015 J**	**0.030 J**	**0.032 J**	**ND**	**ND**
Nickel	60.7	12,639*	155*	1,346*	-	-	**13.0**	**28**	**36**	**39**	**29**	**29**	**25**
Potassium**	3,350	None	None	None	None	None	**620**	**990**	**1,500**	**1,400**	**1,100**	**1,900 J**	**2,100**
Selenium	1.5	None	None	None	510	39.0	**0.280 J**	**0.88**	**1.1**	**0.87**	**0.88**	**0.90**	**0.90**
Silver	0	3,105*	38.6*	324*	-	-	**0.0600 J**	**0.033 J**	**0.040 J**	**0.039 J**	**0.034 J**	**0.033 J**	**0.034 J**
Sodium**	145	None	None	None	None	None	**35.0**	**28**	**38**	**40**	**32**	**85**	**100**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.140**	**0.093 J**	**0.10 J**	**0.14 J**	**0.099 J**	**0.18**	**0.15**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**7.40**	**19**	**20**	**19**	**18**	**17**	**20**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**49.0**	**55 J**	**71 J**	**88 J**	**94 J**	**59**	**52**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						UST No.:	RV-5	RV-5	RV-5	RV-41	RV-41	RV-41
						Location ID:	72-1048-RV5-SB2	72-1048-RV5-SB3	72-1048-RV5-SB1	72-2F11-R41-SB1	72-2F11-R41-SB2	72-2F11-R41-SB3
						Sample ID:	072SB-0003-0001-SO	072SB-0004-0001-SO	072SB-0005-0001-SO	072SB-0082-0001-SO	072SB-0083-0001-SO	072SB-0084-0001-SO
						Lab Sample ID:	240-18297-11	240-18297-12	240-18297-13	240-18703-8	240-18703-9	240-18703-10
						Sample Date:	12/3/2012	12/3/2012	12/3/2012	12/10/2012	12/10/2012	12/10/2012
						Location Type:	Discrete	Discrete	Composite	Discrete	Discrete	Discrete
						Sample Depth:	5-6 ft	5-6 ft	7-13 ft	5-6 ft	9-10 ft	9-10 ft
Method/Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**							
			Resident Receptor									
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**9,100**	**9,600**	**4,300**	**10,000**	**9,800**	**10,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.065 J**	**0.076 J**	**0.059 J**	ND	ND	**0.30**
Arsenic	19.8	2.78	0.524	0.425	-	-	**18**	**12**	**13**	**15**	**16**	**17**
Barium	124	351*	1,413*	8,966*	-	-	**40**	**36**	**13**	**38**	**33**	**35**
Beryllium	0.88	None	None	None	200	16	**0.44**	**0.48**	**0.21**	**0.47**	**0.46**	**0.48**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.17**	**0.16**	**0.12**	**0.14**	**0.14**	**0.14**
Calcium**	35,500	None	None	None	None	None	**16,000**	**8,100**	**4,300**	**7,500**	**11000 J**	**7,300**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**16**	**15**	**7.1**	**14**	**14 J**	**14**
Cobalt	23.2	7.03	131*	803	-	-	**10**	**9.2**	**5.6**	**12**	**11**	**12**
Copper	32.3	25,368*	311*	2,714*	-	-	**20**	**17**	**18**	**55**	**20**	**20**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**27,000**	**25,000**	**17,000**	**26,000**	**26,000**	**27,000**
Lead	19.1	None	None	None	800	400	**12**	**11**	**8.1**	**13**	**12**	**12**
Magnesium**	8,790	None	None	None	None	None	**6,100**	**5,800**	**3,300**	**5,500**	**8,700 J**	**5,300**
Manganese	3,030	35.1*	293*	1,482*	-	-	**230**	**190**	**200**	**440**	**400**	**420**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	**0.016 J**	ND	ND	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**23**	**24**	**13**	**27**	**25**	**26**
Potassium**	3,350	None	None	None	None	None	**1,300**	**1,500**	**630**	**1,600**	**1,600 J**	**1,700**
Selenium	1.5	None	None	None	510	39.0	**0.91**	**0.82**	**0.71**	**0.54 J**	**0.47 J**	**0.49 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.034 J**	**0.034 J**	**0.026 J**	**0.031 J**	**0.031 J**	**0.031 J**
Sodium**	145	None	None	None	None	None	**74**	**74**	**40**	**83**	**100**	**72**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.11**	**0.13**	**0.078 J**	**0.15**	**0.15**	**0.17**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**15**	**16**	**7.8**	**16**	**15**	**15**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**55**	**53**	**45**	**55**	**55**	**56**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Dup of 0085-0001-SO	Primary	Primary	Primary	Dup of 0063-0001-SO
						UST No.:	RV-41	RV-41	RV-41	RV-41	RV-46	RV-46
						Location ID:	72-2F11-R41-SB4	72-2F11-R41-SB4	72-2F11-R41-SB5	72-2F11-R41-SB6	72-BM-RV46-SB1	72-BM-RV46-SB1
						Sample ID:	072SB-0085-0001-SO	072SB-0086-0001-SO	072SB-0091-0001-SO	072SB-0092-0001-SO	072SB-0063-0001-SO	072SB-0064-0001-SO
						Lab Sample ID:	240-18703-11	240-18703-12	240-18703-17	240-18703-1	240-18544-1	240-18544-2
						Sample Date:	12/10/2012	12/10/2012	12/10/2012	12/10/2012	12/6/2012	12/6/2012
						Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	9-10 ft	9-10 ft	9-10 ft	9-10 ft	11.5 ft	11.5 ft
Method/Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**							
		National Guard Trainee	**Resident Receptor**		**Industrial**	**Residential**						
			Resident Child Farmer	**Resident Adult Farmer**								
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**9,600**	**8,900**	**10,000**	**7,700**	**5,400**	**5,500**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.077 J**	ND	ND	**0.053 J**	**0.069 J**	**0.061 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**18**	**13**	**16**	**15**	**11**	**10**
Barium	124	351*	1,413*	8,966*	-	-	**32**	**27**	**31**	**25**	**21**	**23**
Beryllium	0.88	None	None	None	200	16	**0.44**	**0.35**	**0.46**	**0.38**	**0.40**	**0.38**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.13**	**0.092 J**	**0.15**	**0.14**	**0.15 J**	**0.19**
Calcium**	35,500	None	None	None	None	None	**8,400**	**5,200**	**5,700**	**5,100**	**1200**	**1,100**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**13**	**11**	**14**	**12**	**9.2**	**9.0**
Cobalt	23.2	7.03	131*	803	-	-	**11**	**8.5**	**11**	**9.3**	**7.7**	**7.6**
Copper	32.3	25,368*	311*	2,714*	-	-	**19**	**15**	**20**	**16**	**15**	**14**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**25,000**	**22,000**	**26,000**	**23,000**	**17,000**	**18,000**
Lead	19.1	None	None	None	800	400	**13**	**9.3**	**12**	**9.3**	**11**	**9.7**
Magnesium**	8,790	None	None	None	None	None	**5,300**	**4,200**	**5,400**	**4,200**	**1600**	**1,700**
Manganese	3,030	35.1*	293*	1,482*	-	-	**380**	**260**	**380**	**260**	**270 J**	**420 J**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	ND	ND	ND	**0.017 J**	**0.024 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	**23**	**19**	**24**	**21**	**16**	**19**
Potassium**	3,350	None	None	None	None	None	**1,600**	**1,400**	**1,700**	**1,100**	**950**	**960**
Selenium	1.5	None	None	None	510	39.0	**0.46 J**	**0.40 J**	**0.49 J**	**0.32 J**	**0.38 J**	**0.21 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.030 J**	**0.022 J**	**0.025 J**	**0.025 J**	**0.024 J**	**0.028 J**
Sodium**	145	None	None	None	None	None	**72**	**63**	**72**	**43**	**32**	**27**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.14**	**0.10**	**0.14**	**0.11**	**0.12**	**0.13**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**15**	**13**	**15**	**12**	**9.8**	**9.6**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**52**	**44**	**55**	**48**	**59**	**52**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:						Primary	Primary	Primary	Primary	Primary	Dup of 0012-0001-SO
UST No.:						RV-46	RV-46	RV-46	RV-46	RV-86	RV-86
Location ID:						72-BM-RV46-SB1	72-BM-RV46-SB2	72-BM-RV46-SB3	72-BM-RV46-SB4	72-1026-R86-SB1	72-1026-R86-SB1
Sample ID:						072SB-0068-0001-SO	072SB-0065-0001-SO	072SB-0066-0001-SO	072SB-0067-0001-SO	072SB-0012-0001-SO	072SB-0013-0001-SO
Lab Sample ID:						240-18544-6	240-18544-3	240-18544-4	240-18544-5	240-18297-15	240-18297-16
Sample Date:						12/6/2012	12/6/2012	12/6/2012	12/6/2012	12/3/2012	12/3/2012
Location Type:						Composite	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:						7-13 ft	10 ft	10 ft	10 ft	6-7 ft	6-7 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**5,100**	**5,600**	**7,000**	**5,100**	**8,500**	**9,600**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.073 J**	**0.062 J**	**0.062 J**	**0.057 J**	**0.20 J**	**0.14 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**10**	**9.7**	**17**	**7.9**	**5.6 J**	**4.7**
Barium	124	351*	1,413*	8,966*	-	-	**21**	**20**	**35**	**21**	**55**	**53**
Beryllium	0.88	None	None	None	200	16	**0.38**	**0.37**	**0.44**	**0.34**	**0.88**	**0.81**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.14**	**0.12**	**0.22**	**0.15**	**0.20**	**0.23**
Calcium**	35,500	None	None	None	None	None	**1,800**	**18,000**	**1,600**	**6,500**	**400**	**450**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**8.9**	**9.4**	**14**	**8.4**	**18**	**20**
Cobalt	23.2	7.03	131*	803	-	-	**7.0**	**6.4**	**7.7**	**6.6**	**18**	**17**
Copper	32.3	25,368*	311*	2,714*	-	-	**15**	**13**	**19**	**14**	**31**	**33**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**18,000**	**18,000**	**25,000**	**16,000**	**37,000**	**36,000**
Lead	19.1	None	None	None	800	400	**8.9**	**10**	**15**	**15**	**20**	**17**
Magnesium**	8,790	None	None	None	None	None	**2,000**	**3,300**	**2,400**	**2,500**	**4,000**	**4,300**
Manganese	3,030	35.1*	293*	1,482*	-	-	**220 J**	**230**	**270**	**260**	**910**	**700**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.022 J**	ND	**0.020 J**	**0.020 J**	**0.040 J**	**0.021 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	**15**	**15**	**21**	**15**	**31**	**32**
Potassium**	3,350	None	None	None	None	None	**890**	**1,100**	**1,200**	**950**	**1,000**	**1,200**
Selenium	1.5	None	None	None	510	39.0	**0.20 J**	**0.38 J**	**0.26 J**	**0.17 J**	**1.0**	**1.1**
Silver	0	3,105*	38.6*	324*	-	-	**0.024 J**	**0.028 J**	**0.050 J**	**0.025 J**	**0.032 J**	**0.037 J**
Sodium**	145	None	None	None	None	None	**27**	**54**	**33**	**33**	**60**	**66**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.089 J**	**0.083 J**	**0.14**	**0.10**	**0.14**	**0.11**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**9.3**	**10**	**11**	**9.6**	**17**	**18**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**59**	**50**	**86**	**52**	**69**	**80**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-86	RV-86	RV-86	RV-86	RV-86	RV-86
Location ID:							72-1026-R86-SB1	72-1026-R86-SB2	72-1026-R86-SB3	72-1026-R86-SB4	72-1026-R86-SB5	72-1026-R86-SB6
Sample ID:							072SB-0019-0001-SO	072SB-0014-0001-SO	072SB-0015-0001-SO	072SB-0016-0001-SO	072SB-0017-0001-SO	072SB-0018-0001-SO
Lab Sample ID:							240-18297-22	240-18297-17	240-18297-18	240-18297-19	240-18297-20	240-18297-21
Sample Date:							12/3/2012	12/3/2012	12/3/2012	12/3/2012	12/3/2012	12/3/2012
Location Type:							Composite	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							7-13 ft	6-7 ft	6-7 ft	6-7 ft	6-7 ft	6-7 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**9,000**	**9,500**	**9,500**	**9,700**	**9,400**	**10,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.073 J**	**0.13 J**	**0.13 J**	**0.12 J**	**0.087 J**	**0.13 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**2.2**	**5.6**	**3.6**	**3.9**	**2.8**	**4.4**
Barium	124	351*	1,413*	8,966*	-	-	**56**	**61**	**57**	**54**	**61**	**55**
Beryllium	0.88	None	None	None	200	16	**0.83**	**0.91**	**0.82**	**0.85**	**0.91**	**0.91**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.24**	**0.26**	**0.20**	**0.19**	**0.24**	**0.25**
Calcium**	35,500	None	None	None	None	None	**550**	**430**	**420**	**470**	**310**	**480**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**18**	**19**	**18**	**19**	**19**	**20**
Cobalt	23.2	7.03	131*	803	-	-	**14**	**17**	**15**	**13**	**17**	**16**
Copper	32.3	25,368*	311*	2,714*	-	-	**27**	**34**	**31**	**32**	**31**	**34**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**35,000**	**40,000**	**34,000**	**33,000**	**35,000**	**37,000**
Lead	19.1	None	None	None	800	400	**15**	**23**	**16**	**15**	**16**	**19**
Magnesium**	8,790	None	None	None	None	None	**4,000**	**4,200**	**4,200**	**4,300**	**4,200**	**4,500**
Manganese	3,030	35.1*	293*	1,482*	-	-	**520**	**840**	**650**	**490**	**870**	**500**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.020 J**	**0.027 J**	**0.026 J**	**0.026 J**	**0.022 J**	**0.041 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	**26**	**34**	**30**	**27**	**33**	**30**
Potassium**	3,350	None	None	None	None	None	**1,300**	**1,200**	**1,200**	**1,200**	**1,200**	**1,300**
Selenium	1.5	None	None	None	510	39.0	**0.82**	**1.1**	**0.85**	**0.85**	**0.89**	**1.1**
Silver	0	3,105*	38.6*	324*	-	-	**0.043 J**	**0.036 J**	**0.029 J**	**0.034 J**	**0.028 J**	**0.039 J**
Sodium**	145	None	None	None	None	None	**52**	**61**	**61**	**65**	**58**	**62**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.098**	**0.12**	**0.10**	**0.093**	**0.13**	**0.10 J**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**17**	**19**	**17**	**18**	**17**	**19**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**61**	**87**	**70**	**58**	**81**	**75**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						UST No.:	RV-87	RV-87	RV-87	RV-87	RV-88	RV-88
						Location ID:	72-1026-R87-SB1	72-1026-R87-SB1	72-1026-R87-SB2	72-1026-R87-SB3	72-1103-R88-SB1	72-1103-R88-SB2
						Sample ID:	072SB-0021-0001-SO	072SB-0024-0001-SO	072SB-0022-0001-SO	072SB-0023-0001-SO	072SB-0056-0001-SO	072SB-0057-0001-SO
						Lab Sample ID:	240-18441-6	240-18441-9	240-18441-7	240-18441-8	240-18581-7	240-18581-8
						Sample Date:	12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/7/2012	12/7/2012
						Location Type:	Discrete	Composite	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	6-7 ft	7-13 ft	6-7 ft	6-7 ft	6 ft	7 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**10,000**	**8,900**	**9,300**	**9,000**	**14,000**	**9,600**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.091 J**	**0.14 J**	**0.094 J**	**0.094 J**	**0.078 J**	**0.056 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**2.4 J**	**3.1 J**	**2.5 J**	**3.0 J**	**11**	**12**
Barium	124	351*	1,413*	8,966*	-	-	**49 J**	**48 J**	**54 J**	**42 J**	**150**	**41**
Beryllium	0.88	None	None	None	200	16	**0.90**	**1.3**	**0.86**	**1.0**	**0.74**	**0.51**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.27**	**0.27**	**0.24**	**0.26**	**0.24**	**0.18**
Calcium**	35,500	None	None	None	None	None	**650**	**580**	**440**	**490**	**2,100**	**8,200**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**22**	**19**	**20**	**19**	**20**	**15**
Cobalt	23.2	7.03	131*	803	-	-	**15**	**15**	**15**	**13**	**11**	**10**
Copper	32.3	25,368*	311*	2,714*	-	-	**31**	**30**	**29**	**30**	**18**	**17**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**52,000**	**92,000**	**50,000**	**54,000**	**27,000**	**24,000**
Lead	19.1	None	None	None	800	400	**15**	**15**	**16**	**14**	**13**	**11**
Magnesium**	8,790	None	None	None	None	None	**3,900**	**3400**	**4,200**	**3,900**	**4,800**	**4,400**
Manganese	3,030	35.1*	293*	1,482*	-	-	**1,100 J**	**1,400 J**	**1,100 J**	**960 J**	**300**	**340**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.020 J**	**0.018 J**	**0.029 J**	**0.020 J**	**0.018 J**	**0.018 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	**36**	**35**	**41**	**31**	**42**	**25**
Potassium**	3,350	None	None	None	None	None	**1,400**	**1,300**	**1,100**	**1,200**	**1,500**	**1,200**
Selenium	1.5	None	None	None	510	39.0	**0.91**	**1.1**	**0.80**	**0.89**	**0.44 J**	**0.43 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.033 J**	**0.039 J**	**0.028 J**	**0.032 J**	**0.039 J**	**0.030 J**
Sodium**	145	None	None	None	None	None	**35**	**35**	**34**	**37**	**110**	**58**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.099 J**	**0.11 J**	**0.089 J**	**0.13 J**	**0.17**	**0.13**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**21**	**21**	**19**	**20**	**21**	**15**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**83 J**	**67 J**	**79 J**	**70 J**	**57**	**53**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Dup of 0026-0001-SO	Primary
						UST No.:	RV-88	RV-88	RV-88	RV-89	RV-89	RV-89
						Location ID:	72-1103-R88-SB3	72-1103-R88-SB4	72-1103-R88-SB5	72-1026-R89-SB1	72-1026-R89-SB1	72-1026-R89-SB2
						Sample ID:	072SB-0058-0001-SO	072SB-0059-0001-SO	072SB-0060-0001-SO	072SB-0026-0001-SO	072SB-0027-0001-SO	072SB-0028-0001-SO
						Lab Sample ID:	240-18581-9	240-18581-10	240-18581-11	240-18441-11	240-18441-12	240-18441-13
						Sample Date:	12/7/2012	12/7/2012	12/7/2012	12/4/2012	12/4/2012	12/4/2012
						Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	7 ft	7 ft	7 ft	10-11 ft	10-11 ft	10-11 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**9,200**	**9,700**	**9,400**	**6,000**	**5,900**	**5,600**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.061 J**	**0.077 J**	**0.062 J**	ND*	**0.082 J**	ND*
Arsenic	19.8	2.78	0.524	0.425	-	-	**13**	**13**	**12**	**0.51 J**	**1.1 J**	**0.45 J**
Barium	124	351*	1,413*	8,966*	-	-	**40**	**47**	**42**	**31 J**	**16 J**	**36 J**
Beryllium	0.88	None	None	None	200	16	**0.52**	**0.54**	**0.52**	**0.69**	**0.58**	**0.59**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.16**	**0.20**	**0.15**	**0.19**	**0.15**	**0.17**
Calcium**	35,500	None	None	None	None	None	**3,700**	**1,800**	**1,700**	**750**	**710**	**700**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**15**	**15**	**14**	**13**	**13**	**12**
Cobalt	23.2	7.03	131*	803	-	-	**9.7**	**11**	**9.4**	**5.5**	**6.2**	**5.4**
Copper	32.3	25,368*	311*	2,714*	-	-	**18**	**18**	**18**	**17**	**17**	**14**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**23,000**	**24,000**	**23,000**	**11,000**	**12,000**	**10,000**
Lead	19.1	None	None	None	800	400	**9.9**	**10**	**10**	**8.7**	**10**	**7.8**
Magnesium**	8,790	None	None	None	None	None	**4,400**	**3,400**	**3,300**	**2,300**	**2,100**	**2,100**
Manganese	3,030	35.1*	293*	1,482*	-	-	**280**	**390**	**290**	**210 J**	**84 J**	**180 J**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.020 J**	**0.019 J**	**0.017 J**	ND	**0.022 J**	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**23**	**27**	**23**	**16**	**25**	**15**
Potassium**	3,350	None	None	None	None	None	**1,200**	**1,200**	**1,200**	**1,300**	**1,100**	**1,100**
Selenium	1.5	None	None	None	510	39.0	**0.37 J**	**0.31 J**	**0.37 J**	**0.74**	**0.68**	**0.62**
Silver	0	3,105*	38.6*	324*	-	-	**0.031 J**	**0.031 J**	**0.025 J**	**0.030 J**	**0.061 J**	**0.031 J**
Sodium**	145	None	None	None	None	None	**68**	**60**	**63**	**71**	**69**	**65**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.12**	**0.14**	**0.16**	**0.12 J**	**0.11 J**	**0.084 J**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**14**	**15**	**14**	**8.9**	**9.7**	**7.8**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**51**	**58**	**50**	**45 J**	**33 J**	**41 J**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							RV-89	RV-89	RV-89	RV-89	CC-RVAAP-72-01	CC-RVAAP-72-01
Location ID:							72-1026-R89-SB3	72-1026-R89-SB4	72-1026-R89-SB5	72-1026-R89-SB5	72-FS-01-SB1	72-FS-01-SB2
Sample ID:							072SB-0029-0001-SO	072SB-0030-0001-SO	072SB-0031-0001-SO	072SB-0032-0001-SO	072SB-0075-0001-SO	072SB-0076-0001-SO
Lab Sample ID:							240-18441-14	240-18441-15	240-18441-16	240-18441-17	240-18703-18	240-18703-19
Sample Date:							12/4/2012	12/4/2012	12/4/2012	12/4/2012	12/10/2012	12/10/2012
Location Type:							Discrete	Discrete	Discrete	Composite	Discrete	Discrete
Sample Depth:							10-11 ft	10-11 ft	10-11 ft	7-13 ft	9-10 ft	5-6 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**4,900**	**5,800**	**6,300**	**5,200**	**14,000**	**12,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	ND*	ND*	ND*	ND*	ND	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	**0.40 J**	**0.45 J**	**0.38 J**	**0.43 J**	**12**	**14**
Barium	124	351*	1,413*	8,966*	-	-	**29 J**	**26 J**	**30 J**	**29 J**	**53**	**56 J**
Beryllium	0.88	None	None	None	200	16	**0.52**	**0.59**	**0.66**	**0.57**	**0.63**	**0.55**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.18**	**0.17**	**0.14**	**0.20**	**0.16**	**0.18**
Calcium**	35,500	None	None	None	None	None	**630**	**650**	**680**	**700**	**2,000**	**1,300**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**9.9**	**12**	**12**	**11**	**19**	**14**
Cobalt	23.2	7.03	131*	803	-	-	**4.5**	**5.1**	**5.0**	**4.8**	**11**	**9.2**
Copper	32.3	25,368*	311*	2,714*	-	-	**13**	**14**	**14**	**14**	**19**	**14**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**9,100**	**10,000**	**10,000**	**10,000**	**28,000**	**24,000**
Lead	19.1	None	None	None	800	400	**8.5**	**7.4**	**7.0**	**7.6**	**12**	**20**
Magnesium**	8,790	None	None	None	None	None	**2,000**	**2,000**	**2,100**	**2,000**	**4,800**	**2,600**
Manganese	3,030	35.1*	293*	1,482*	-	-	**130 J**	**210 J**	**160 J**	**110 J**	**180**	**330 J**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	ND	ND	ND	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**12**	**16**	**15**	**14**	**28**	**19**
Potassium**	3,350	None	None	None	None	None	**1,100**	**1,200**	**1,300**	**1,200**	**2,100**	**1,200**
Selenium	1.5	None	None	None	510	39.0	**0.68**	**0.58**	**0.66**	**0.59**	**0.50 J**	**0.56**
Silver	0	3,105*	38.6*	324*	-	-	**0.029 J**	**0.031 J**	**0.021 J**	**0.033 J**	**0.044 J**	**0.037 J**
Sodium**	145	None	None	None	None	None	**63**	**62**	**69**	**62**	**77**	**45**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.074 J**	**0.077 J**	**0.068 J**	**0.078 J**	**0.17**	**0.15**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**7.0**	**7.9**	**8.1**	**8.0**	**19**	**19**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**38 J**	**39 J**	**47 J**	**41 J**	**66**	**52**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Dup of 0076-0001-SO	Primary	Primary	Primary	Primary	Primary
						UST No.:	CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-01	CC-RVAAP-72-02	CC-RVAAP-72-02
						Location ID:	72-FS-01-SB2	72-FS-01-SB3	72-FS-01-SB4	72-FS-01-SB5	72-ASY-02-SB1	72-ASY-02-SB2
						Sample ID:	072SB-0077-0001-SO	072SB-0079-0001-SO	072SB-0080-0001-SO	072SB-0081-0001-SO	072SB-0043-0001-SO	072SB-0044-0001-SO
						Lab Sample ID:	240-18703-20	240-18703-21	240-18703-22	240-18703-23	240-18449-10	240-18449-11
						Sample Date:	12/10/2012	12/10/2012	12/10/2012	12/10/2012	12/5/2012	12/5/2012
						Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	5-6 ft	5-6 ft	9-10 ft	9-10 ft	9 ft	9 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**11,000**	**13,000**	**13,000**	**14,000**	**12,000**	**13,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	ND	ND	ND	ND	**0.082 J**	**0.074 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**15**	**14**	**17**	**17**	**13 J**	**12 J**
Barium	124	351*	1,413*	8,966*	-	-	**95 J**	**69**	**47**	**44**	**80 J**	**49 J**
Beryllium	0.88	None	None	None	200	16	**0.56**	**0.60**	**0.63**	**0.66**	**0.70**	**0.69**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.22**	**0.20**	**0.25**	**0.15**	**0.28**	**0.21**
Calcium**	35,500	None	None	None	None	None	**1,400**	**1,600**	**4,600**	**4,300**	**2,400**	**21,000**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**13**	**16**	**18**	**18**	**18 J**	**20 J**
Cobalt	23.2	7.03	131*	803	-	-	**15**	**10**	**14**	**12**	**16**	**14**
Copper	32.3	25,368*	311*	2,714*	-	-	**9.9**	**14**	**19**	**18**	**21**	**18**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**24,000**	**30,000**	**31,000**	**30,000**	**29,000**	**27,000**
Lead	19.1	None	None	None	800	400	**19**	**46**	**13**	**12**	**12 J**	**12 J**
Magnesium**	8,790	None	None	None	None	None	**2,000**	**2,700**	**5,800**	**5,800**	**4,000**	**7,100**
Manganese	3,030	35.1*	293*	1,482*	-	-	**1,700 J**	**660**	**350**	**250**	**630**	**310**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	**0.034 J**	ND	ND	**0.016 J**	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**15**	**19**	**30**	**28**	**44**	**28**
Potassium**	3,350	None	None	None	None	None	**820**	**1,100**	**2,200**	**2,200**	**1,400 J**	**2,500 J**
Selenium	1.5	None	None	None	510	39.0	**0.70**	**0.76**	**0.46 J**	**0.51**	**0.28 J**	**0.46 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.045 J**	**0.042 J**	**0.032 J**	**0.033 J**	**0.028 J**	**0.044 J**
Sodium**	145	None	None	None	None	None	**36**	**44**	**74**	**80**	**52**	**90**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.16**	**0.18**	**0.14**	**0.14**	**0.16**	**0.15**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**21**	**24**	**18**	**19**	**18 J**	**21 J**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**45**	**57**	**130**	**60**	**66**	**61**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Dup of 0035-0001-SO	Primary
						UST No.:	CC-RVAAP-72-02	CC-RVAAP-72-02	CC-RVAAP-72-02	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-03
						Location ID:	72-ASY-02-SB3	72-ASY-02-SB4	72-ASY-02-SB5	72-ASY-03-SB1	72-ASY-03-SB1	72-ASY-03-SB1
						Sample ID:	072SB-0045-0001-SO	072SB-0046-0001-SO	072SB-0047-0001-SO	072SB-0035-0001-SO	072SB-0036-0001-SO	072SB-0041-0001-SO
						Lab Sample ID:	240-18449-12	240-18449-13	240-18449-14	240-18449-2	240-18449-3	240-18449-8
						Sample Date:	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012
						Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Composite
						Sample Depth:	9 ft	9 ft	5 ft	8-9 ft	8-9 ft	7-13 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**13,000**	**11,000**	**11,000**	**11,000**	**9,600**	**9,700**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.080 J**	**0.058 J**	**0.077 J**	**0.11 J**	ND	**0.055 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**9.5 J**	**9.6 J**	**18 J**	**13 J**	**15 J**	**18 J**
Barium	124	351*	1,413*	8,966*	-	-	**48 J**	**47 J**	**57 J**	**27 J**	**23 J**	**18 J**
Beryllium	0.88	None	None	None	200	16	**0.67**	**0.58**	**0.61**	**0.58**	**0.56**	**0.46**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.18**	**0.19**	**0.18**	**0.15**	**0.15**	**0.13**
Calcium**	35,500	None	None	None	None	None	**19,000**	**17,000**	**1,800**	**7,500**	**6,300**	**7,300**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**18 J**	**17 J**	**16 J**	**16 J**	**14 J**	**15 J**
Cobalt	23.2	7.03	131*	803	-	-	**10**	**10**	**10**	**11**	**9.9**	**11**
Copper	32.3	25,368*	311*	2,714*	-	-	**16**	**18**	**20**	**18**	**16**	**18**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**26,000**	**24,000**	**28,000**	**26,000**	**25,000**	**28,000**
Lead	19.1	None	None	None	800	400	**11 J**	**11 J**	**13 J**	**11 J**	**9.1 J**	**9.8 J**
Magnesium**	8,790	None	None	None	None	None	**6,800**	**6,400**	**3,500**	**6,000**	**5,200**	**6,400**
Manganese	3,030	35.1*	293*	1,482*	-	-	**250**	**260**	**240**	**290**	**280**	**360**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	ND	**0.016 J**	ND	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**26**	**25**	**29**	**26**	**24**	**26**
Potassium**	3,350	None	None	None	None	None	**2,400 J**	**2,000 J**	**1,200 J**	**2,300 J**	**1,800 J**	**1,500 J**
Selenium	1.5	None	None	None	510	39.0	**0.19 J**	**0.42 J**	**0.27 J**	**0.28 J**	**0.71 J**	**0.28 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.035 J**	**0.037 J**	**0.028 J**	**0.036 J**	**0.031 J**	**0.031 J**
Sodium**	145	None	None	None	None	None	**92**	**80**	**54**	**97**	**78**	**90**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.15**	**0.14**	**0.15**	**0.15**	**0.11**	**0.13**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**20 J**	**18 J**	**16 J**	**18 J**	**14 J**	**13 J**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**55**	**53**	**67**	**54**	**67**	**63**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						UST No.:	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-03	CC-RVAAP-72-04	CC-RVAAP-72-04
						Location ID:	72-ASY-03-SB2	72-ASY-03-SB3	72-ASY-03-SB4	72-ASY-03-SB5	72-ASY-04-SB1	72-ASY-04-SB2
						Sample ID:	072SB-0037-0001-SO	072SB-0038-0001-SO	072SB-0039-0001-SO	072SB-0040-0001-SO	072SB-0049-0001-SO	072SB-0050-0001-SO
						Lab Sample ID:	240-18449-4	240-18449-5	240-18449-6	240-18449-7	240-18449-16	240-18449-17
						Sample Date:	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/5/2012
						Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	8-9 ft	8-9 ft	8-9 ft	8-9 ft	9 ft	9 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**9,900**	**10,000**	**12,000**	**12,000**	**10,000**	**12,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.049 J**	**0.063 J**	ND*	**0.098 J**	**0.062 J**	**0.066 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**16 J**	**16 J**	**9.4 J**	**15 J**	**17 J**	**12 J**
Barium	124	351*	1,413*	8,966*	-	-	**44 J**	**46 J**	**50 J**	**38 J**	**34 J**	**50 J**
Beryllium	0.88	None	None	None	200	16	**0.55**	**0.57**	**0.64**	**0.62**	**0.53**	**0.63**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.17**	**0.16**	**0.19**	**0.17**	**0.15**	**0.20**
Calcium**	35,500	None	None	None	None	None	**7,300**	**3,800**	**20,000**	**3,300**	**3,700**	**17,000**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**16 J**	**16 J**	**18 J**	**17 J**	**15 J**	**18 J**
Cobalt	23.2	7.03	131*	803	-	-	**12**	**11**	**8.5**	**12**	**8.7**	**12**
Copper	32.3	25,368*	311*	2,714*	-	-	**16**	**15**	**18**	**18**	**17**	**17**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**27,000**	**27,000**	**24,000**	**29,000**	**28,000**	**26,000**
Lead	19.1	None	None	None	800	400	**10 J**	**11 J**	**9.7 J**	**11 J**	**10 J**	**11 J**
Magnesium**	8,790	None	None	None	None	None	**4,800**	**4,700**	**6,000**	**5,000**	**4,500**	**6,200**
Manganese	3,030	35.1*	293*	1,482*	-	-	**260**	**200**	**270**	**230**	**200**	**260**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	ND	ND	ND	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**28**	**26**	**24**	**29**	**23**	**26**
Potassium**	3,350	None	None	None	None	None	**1,500 J**	**1,600 J**	**2,500 J**	**1,900 J**	**1,500 J**	**2,100 J**
Selenium	1.5	None	None	None	510	39.0	**0.73 J**	**0.76 J**	**0.78 J**	**0.26 J**	**0.20 J**	**0.46 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.034 J**	**0.031 J**	**0.029 J**	**0.032 J**	**0.037 J**	**0.040 J**
Sodium**	145	None	None	None	None	None	**57**	**74**	**84**	**72**	**58**	**81**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.14**	**0.13**	**0.14**	**0.13**	**0.12**	**0.13**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**15 J**	**16 J**	**20 J**	**16 J**	**14 J**	**19 J**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**61**	**56**	**53**	**64**	**60**	**56**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary	Primary	Primary	Primary
UST No.:							CC-RVAAP-72-05	CC-RVAAP-72-05	CC-RVAAP-72-05	CC-RVAAP-72-05	CC-RVAAP-72-06	CC-RVAAP-72-06
Location ID:							72-ASY-05-SB1	72-ASY-05-SB2	72-ASY-05-SB3	72-ASY-05-SB4	72-WTP-06-SB1	72-WTP-06-SB2
Sample ID:							072SB-0051-0001-SO	072SB-0052-0001-SO	072SB-0053-0001-SO	072SB-0054-0001-SO	072SB-0087-0001-SO	072SB-0088-0001-SO
Lab Sample ID:							240-18449-18	240-18449-19	240-18449-20	240-18449-21	240-18703-13	240-18703-14
Sample Date:							12/5/2012	12/5/2012	12/5/2012	12/5/2012	12/10/2012	12/10/2012
Location Type:							Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
Sample Depth:							8-9 ft	8-9 ft	8-9 ft	8-9 ft	9-10 ft	9-10 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**13,000**	**12,000**	**12,000**	**11,000**	**7,400**	**5,500**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.063 J**	**0.061 J**	**0.074 J**	**0.069 J**	ND	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	**12 J**	**8.1 J**	**17 J**	**22 J**	**8.9**	**6.2**
Barium	124	351*	1,413*	8,966*	-	-	**55 J**	**46 J**	**45 J**	**49 J**	**39**	**30**
Beryllium	0.88	None	None	None	200	16	**0.66**	**0.58**	**0.69**	**0.63**	**0.41**	**0.36**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.20**	**0.19**	**0.16**	**0.19**	**0.16**	**0.14**
Calcium**	35,500	None	None	None	None	None	**20,000**	**20,000**	**4,300**	**15,000**	**1,600**	**1,300**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**19 J**	**17 J**	**17 J**	**17 J**	**10**	**7.2**
Cobalt	23.2	7.03	131*	803	-	-	**11**	**8.9**	**11**	**11**	**7.7**	**5.4**
Copper	32.3	25,368*	311*	2,714*	-	-	**18**	**17**	**17**	**18**	**13**	**9.1**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**26,000**	**24,000**	**29,000**	**28,000**	**19,000**	**16,000**
Lead	19.1	None	None	None	800	400	**10 J**	**11 J**	**11 J**	**12 J**	**13**	**12**
Magnesium**	8,790	None	None	None	None	None	**6,400**	**6,200**	**5,300**	**5,800**	**2,000**	**1,400**
Manganese	3,030	35.1*	293*	1,482*	-	-	**350**	**240**	**190**	**250**	**360**	**230**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	ND	ND	ND	ND	**0.016 J**
Nickel	60.7	12,639*	155*	1,346*	-	-	**27**	**24**	**28**	**27**	**16**	**12**
Potassium**	3,350	None	None	None	None	None	**2,500 J**	**2,000 J**	**2,100 J**	**1,900 J**	**1,000**	**830**
Selenium	1.5	None	None	None	510	39.0	**0.17 J**	**0.20 J**	**0.37 J**	**0.21 J**	**0.41 J**	**0.32 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.033 J**	**0.036 J**	**0.034 J**	**0.039 J**	**0.022 J**	**0.018 J**
Sodium**	145	None	None	None	None	None	**91**	**78**	**74**	**71**	**47**	**54**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.17**	**0.14**	**0.12**	**0.13**	**0.13**	**0.11**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**20 J**	**18 J**	**17 J**	**17 J**	**13**	**9.6**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**62**	**51**	**61**	**57**	**53**	**46**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary	Primary
						UST No.:	CC-RVAAP-72-06	CC-RVAAP-72-06	CC-RVAAP-72-08	CC-RVAAP-72-08	CC-RVAAP-72-08	CC-RVAAP-72-08
						Location ID:	72-WTP-06-SB3	72-WTP-06-SB4	72-SSP-08-SB1	72-SSP-08-SB2	72-SSP-08-SB3	72-SSP-08-SB4
						Sample ID:	072SB-0089-0001-SO	072SB-0090-0001-SO	072SB-0070-0001-SO	072SB-0071-0001-SO	072SB-0072-0001-SO	072SB-0073-0001-SO
						Lab Sample ID:	240-18703-15	240-18703-16	240-18581-13	240-18581-14	240-18581-15	240-18581-16
						Sample Date:	12/10/2012	12/10/2012	12/7/2012	12/7/2012	12/7/2012	12/7/2012
						Location Type:	Discrete	Discrete	Discrete	Discrete	Discrete	Discrete
						Sample Depth:	9-10 ft	9-10 ft	8 ft	8 ft	8 ft	8 ft
		Facility-Wide Cleanup Goals			**USEPA RSL**							
			Resident Receptor									
Method/Chemical	**BKG**	**National Guard Trainee**	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**						
Metals (mg/kg)												
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**10,000**	**4,100**	**9,600**	**9,700**	**9,600**	**10,000**
Antimony	0.96	175*	2.82*	13.6*	-	-	ND	ND	**0.053 J**	**0.065 J**	**0.069 J**	**0.060 J**
Arsenic	19.8	2.78	0.524	0.425	-	-	**13**	**4.2**	**12**	**15**	**16**	**15**
Barium	124	351*	1,413*	8,966*	-	-	**47**	**23**	**29**	**31**	**33**	**32**
Beryllium	0.88	None	None	None	200	16	**0.48**	**0.28**	**0.49**	**0.52**	**0.51**	**0.55**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.18**	**0.11**	**0.13**	**0.15**	**0.15**	**0.16**
Calcium**	35,500	None	None	None	None	None	**1,400**	**870**	**8,200**	**4,300**	**11,000**	**3,700**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**14**	**5.8**	**14**	**14**	**14**	**15**
Cobalt	23.2	7.03	131*	803	-	-	**9.3**	**4.5**	**9.2**	**9.9**	**10**	**11**
Copper	32.3	25,368*	311*	2,714*	-	-	**18**	**7.0**	**17**	**19**	**18**	**19**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**23,000**	**13,000**	**23,000**	**26,000**	**26,000**	**26,000**
Lead	19.1	None	None	None	800	400	**14**	**9.6**	**11**	**10**	**11**	**10**
Magnesium**	8,790	None	None	None	None	None	**2,900**	**1,200**	**5,800**	**4,500**	**4,700**	**4,600**
Manganese	3,030	35.1*	293*	1,482*	-	-	**330**	**220**	**210**	**200**	**310**	**190**
Mercury	0.044	172*	2.27*	16.5*	-	-	**0.014 J**	ND	**0.016 J**	**0.017 J**	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**22**	**9.2**	**19**	**24**	**24**	**26**
Potassium**	3,350	None	None	None	None	None	**1,200**	**670**	**1,600**	**1,600**	**1,600**	**1,800**
Selenium	1.5	None	None	None	510	39.0	**0.46 J**	**0.28 J**	**0.40 J**	**0.38 J**	**0.34 J**	**0.42 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.023 J**	**0.013 J**	**0.028 J**	**0.034 J**	**0.032 J**	**0.034 J**
Sodium**	145	None	None	None	None	None	**60**	**33**	**71**	**53**	**54**	**56**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.14**	**0.075 J**	**0.097**	**0.11**	**0.11**	**0.12**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**16**	**7.8**	**14**	**15**	**14**	**15**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**55**	**38**	**49**	**57**	**52**	**59**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary	Primary	Primary
						UST No.:	RV-88	RV-41	CC-RVAAP-72-01	CC-RVAAP-72-08	CC-RVAAP-72-06
						Location ID:	72-1103-R88-SB5	72-2F11-R41-SB1	72-FS-01-SB5	72-SSP-08-SB4	72-WTP-06-SB2
						Sample ID:	072SB-0093-0001-SO	072SB-0097-0001-SO	072SB-0095-0001-SO	072SB-0094-0001-SO	072SB-0096-0001-SO
						Lab Sample ID:	240-28007-7	240-28007-6	240-28007-5	240-28007-4	240-28007-3
						Sample Date:	08/14/2013	08/14/2013	08/14/2013	08/14/2013	08/14/2013
						Location Type:	Composite	Composite	Composite	Composite	Composite
						Sample Depth:	7-13	7-13	7-13	7-13	7-13
Method/Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**						
		National Guard Trainee	**Resident Receptor**								
			Resident Child Farmer	**Resident Adult Farmer**	**Industrial**	**Residential**					
Metals (mg/kg)											
Aluminum	19,500	3,496*	7,380*	52,923*	-	-	**13,000**	**7,300**	**11,000**	**10,000**	**6,300**
Antimony	0.96	175*	2.82*	13.6*	-	-	**0.052 J**	**0.057 J**	**0.086 J**	**0.29**	ND
Arsenic	19.8	2.78	0.524	0.425	-	-	**8.9**	**13.0**	**11.0**	**20.0**	**9.9**
Barium	124	351*	1,413*	8,966*	-	-	**80.0**	**24.0**	**29.0**	**31.0**	**36.0**
Beryllium	0.88	None	None	None	200	16	**0.59**	**0.37**	**0.54**	**0.46**	**0.36**
Cadmium	0	10.9	6.41*	22.3*	-	-	**0.14**	**0.13**	**0.13**	**0.13**	**0.14**
Calcium**	35,500	None	None	None	None	None	**5,300**	**7,400 0000**	**11,000**	**5,800**	**1,500**
Chromium	27.2	329,763*	8,174*	19,694*	-	-	**13.0**	**10.0**	**14.0**	**14.0**	**8.8**
Cobalt	23.2	7.03	131*	803	-	-	**8.3**	**8.1**	**11.0**	**11.0**	**7.4**
Copper	32.3	25,368*	311*	2,714*	-	-	**18.0**	**17.0**	**16.0**	**21.0**	**14.0**
Iron**	35,200	184,370*	2,313*	19,010*	-	-	**23,000**	**22,000**	**26,000**	**30,000**	**19,000**
Lead	19.1	None	None	None	800	400	**10.0**	**11.0**	**10.0**	**13.0**	**12.0**
Magnesium**	8,790	None	None	None	None	None	**4,000**	**4,300**	**8,600**	**5,600**	**2,000**
Manganese	3,030	35.1*	293*	1,482*	-	-	**290**	**380**	**280**	**450**	**390**
Mercury	0.044	172*	2.27*	16.5*	-	-	ND	ND	ND	ND	ND
Nickel	60.7	12,639*	155*	1,346*	-	-	**23.0**	**19.0**	**25.0**	**25.0**	**16.0**
Potassium**	3,350	None	None	None	None	None	**990**	**1,000**	**1,700**	**1,300**	**680**
Selenium	1.5	None	None	None	510	39.0	**0.22 J**	**0.10 J**	**0.12 J**	**0.12 J**	**0.11 J**
Silver	0	3,105*	38.6*	324*	-	-	**0.52**	**0.043 J**	**0.057 J**	**0.25**	**0.39**
Sodium**	145	None	None	None	None	None	**180**	**72.0**	**110**	**91.0**	**63.0**
Thallium	0.91	47.7*	0.612*	4.76*	-	-	**0.15**	**0.10 J**	**0.13**	**0.12**	**0.11**
Vanadium	37.6	2,304*	44.9*	156*	-	-	**17.0**	**10.0**	**14.0**	**13.0**	**10.0**
Zinc	93.3	187,269*	2,321*	19,659*	-	-	**51.0**	**50.0**	**55.0**	**56.0**	**49.0**

Table 5-3: Summary of Analytical Results for Inorganic Chemicals Detected in Subsurface Soil Samples Collected December 2012 – August 2013, 15 Former Underground Storage Tanks with No Records of Previous Samples, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Notes:

Yellow shading of a result indicates a concentration is greater than an FWCUG.
All FWCUGs are carcinogenic FWCUGs (10^{-6} Risk), with the exception of the FWCUGs with an Asterisk (*).
Asterisk (*) indicates non-carcinogenic FWCUGs (Hazard Quotient = 0.1).
** Essential nutrient.
BKG = Background criteria.
ft = Feet.
FWCUG = Facility-Wide Cleanup Goal.
ID = Identification.
J = Estimated.
mg/kg = Milligrams per kilogram.
NA = Not available.
ND = Not detected concentration reported at the Limit of Detection.
ND* = Rejected data reported as not-detected
No. = Number.
NR = Not reported.
RSL = Regional Screening Level (USEPA, November 2013).
USEPA = United States Environmental Protection Agency.

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Table 5-4: Summary of Hexavalent Chromium Detected in Subsurface Soil Samples Collected November–December 2012, 9 Former No Further Action Underground Storage Tanks, CC RVAAP-72 Facility-Wide Underground Storage Tanks

						Sample Type:	Primary	Primary	Primary
						UST No.:	RV-13	RV-13	RV-13
						Location ID:	76-U6-UST-SB1	76-U6-UST-SB5	76-U6-UST-SB6
						Sample ID:	076SB-0125-0001-SO	076SB-0130-0001-SO	076SB-0131-0001-SO
						Lab Sample ID:	240-18735-14	240-18735-19	240-18735-20
						Sample Date:	12/12/2012	12/12/2012	12/12/2012
						Sample Depth (ft):	19-20	19-20	19-20
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Residential Child Farmer**	**Residential Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	ND	ND	ND

						Sample Type:	Primary	Dup. of 0126-0001-SB2	Primary
						UST No.:	RV-14	RV-14	RV-14
						Location ID:	76-U6-UST-SB2	76-U6-UST-SB2	76-U6-UST-SB3
						Sample ID:	076SB-0126-0001-SO	076SB-0127-0001-SO	076SB-0128-0001-SO
						Lab Sample ID:	240-18735-15	240-18735-16	240-18735-17
						Sample Date:	12/11/2012	12/11/2012	12/11/2012
						Sample Depth (ft):	19-20	19-20	19-20
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	**0.31 J**	ND	ND

Table 5-4: Summary of Hexavalent Chromium Detected in Subsurface Soil Samples Collected November–December 2012, 9 Former No Further Action Underground Storage Tanks, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary	Primary
						UST No.:	RV-14	RV-16	RV-15
						Location ID:	76-U6-UST-SB4	76-U3-UST-SB1	76-U3-UST-SB2
						Sample ID:	076SB-0129-0001-SO	076SB-0119-0001-SO	076SB-0120-0001-SO
						Lab Sample ID:	240-18735-18	240-18735-8	240-18735-9
						Sample Date:	12/11/2012	12/11/2012	12/11/2012
						Sample Depth (ft):	19-20	15-16	15-16
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals`**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	ND	ND	**0.34 J**

						Sample Type:	Primary	Primary	Primary
						UST No.:	RV-16	RV-15	RV-15
						Location ID:	76-U3-UST-SB3	76-U3-UST-SB4	76-U3-UST-SB5
						Sample ID:	076SB-0121-0001-SO	076SB-0122-0001-SO	076SB-0123-0001-SO
						Lab Sample ID:	240-18735-10	240-18735-11	240-18735-12
						Sample Date:	12/11/2012	12/11/2012	12/11/2012
						Sample Depth (ft):	15-16	15-16	15-16
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	ND	ND	ND

Table 5-4: Summary of Hexavalent Chromium Detected in Subsurface Soil Samples Collected November–December 2012, 9 Former No Further Action Underground Storage Tanks, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Sample Type:							Primary	Primary	Primary
UST No.:							RV-15	RV-17	RV-17
Location ID:							76-U3-UST-SB6	76-A6-UST-SB4	76-A6-UST-SB5
Sample ID:							076SB-0124-0001-SO	076SB-0079-0001-SO	076SB-0080-0001-SO
Lab Sample ID:							240-18735-13	240-17810-12	240-17810-13
Sample Date:							12/11/2012	11/16/2012	11/16/2012
Sample Depth (ft):							15-16	7-8	7-8
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	ND	ND	ND

Sample Type:							Primary	Primary	Primary
UST No. :							RV-17	RV-17	RV-18
Location ID:							76-A6-UST-SB6	76-A6-UST-SB7	76-A6-UST-SB8
Sample ID:							076SB-0081-0001-SO	076SB-0082-0001-SO	076SB-0083-0001-SO
Lab Sample ID:							240-17810-14	240-17810-15	240-17810-16
Sample Date:							11/16/2012	11/16/2012	11/16/2012
Sample Depth (ft):							7-8	7-8	7-8
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	ND	ND	ND

Table 5-4: Summary of Hexavalent Chromium Detected in Subsurface Soil Samples Collected November–December 2012, 9 Former No Further Action Underground Storage Tanks, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

Method/ Chemical	BKG	Facility-Wide Cleanup Goals			USEPA RSL				
			Resident Receptor						
		National Guard Trainee	Resident Child Farmer	Resident Adult Farmer	Industrial	Residential			
Sample Type:							Primary	Primary	Primary
UST No.:							RV-19	RV-19	RV-19
Location ID:							76-A6-UST-SB9	76-A6-UST-SB10	76-A6-UST-SB11
Sample ID:							076SB-0084-0001-SO	076SB-0085-0001-SO	076SB-0086-0001-SO
Lab Sample ID:							240-17810-17	240-17810-18	240-17810-19
Sample Date:							11/16/2012	11/16/2012	11/16/2012
Sample Depth (ft):							7-8	7-8	7-8
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	**1.8 J**	**1.4 J**	ND

Method/ Chemical	BKG	Facility-Wide Cleanup Goals			USEPA RSL				
			Resident Receptor						
		National Guard Trainee	Resident Child Farmer	Resident Adult Farmer	Industrial	Residential			
Sample Type:							Primary	Primary	Primary
UST No.:							RV-19	RV-19	RV-37
Location ID:							76-A6-UST-SB12	76-A6-UST-SB11A	76-A1-UST-SB1
Sample ID:							076SB-0088-0001-SO	076SB-0087-0001-SO	076SB-0132-0001-SO
Lab Sample ID:							240-17810-21	240-17810-20	240-18735-21
Sample Date:							11/16/2012	11/16/2012	12/11/2012
Sample Depth (ft):							7-8	7-8	19-20
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	**7.1 J**	**0.50 J**	ND

Table 5-4: Summary of Hexavalent Chromium Detected in Subsurface Soil Samples Collected November–December 2012, 9 Former No Further Action Underground Storage Tanks, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Dup. of 0132-0001-SB1	Primary	Primary
						UST No.:	RV-37	RV-37	RV-37
						Location ID:	76-A1-UST-SB1	76-A1-UST-SB2	76-A1-UST-SB3
						Sample ID:	076SB-0133-0001-SO	076SB-0134-0001-SO	076SB-0135-0001-SO
						Lab Sample ID:	240-18735-22	240-18735-23	240-18735-24
						Sample Date:	12/11/2012	12/11/2012	12/11/2012
						Sample Depth(ft):	19-20	19-20	19-20
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	**0.39 J**	**0.37 J**	ND

						Sample Type:	Primary	Dup. of 0076-0001-SB1	Primary
						UST No.:	RV-97	RV-97	RV-97
						Location ID:	76-A6-UST-SB1	76-A6-UST-SB1	76-A6-UST-SB2
						Sample ID:	076SB-0076-0001-SO	076SB-0089-0001-SO	076SB-0077-0001-SO
						Lab Sample ID:	240-17810-9	240-17810-22	240-17810-10
						Sample Date:	11/16/2012	11/16/2012	11/16/2012
						Sample Depth (ft):	7-8	7-8	7-8
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**				
			Resident Receptor						
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**			
Hexavalent Chromium (mg/kg)									
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	**0.33 J**	**0.45 J**	**0.61 J**

Table 5-4: Summary of Hexavalent Chromium Detected in Subsurface Soil Samples Collected November–December 2012, 9 Former No Further Action Underground Storage Tanks, CC RVAAP-72 Facility-Wide Underground Storage Tanks (continued)

						Sample Type:	Primary	Primary
						UST No.:	RV-97	RV-97
						Location ID:	76-A6-UST-SB3	76-A6-UST-SB13
						Sample ID:	076SB-0078-0001-SO	076SB-0136-0001-SO
						Lab Sample ID:	240-17810-11	240-18735-25
						Sample Date:	11/16/2012	12/11/2012
						Sample Depth (ft):	7-8	7-8
Method/ Chemical	**BKG**	**Facility-Wide Cleanup Goals**			**USEPA RSL**			
			Resident Receptor					
		National Guard Trainee	**Resident Child Farmer**	**Resident Adult Farmer**	**Industrial**	**Residential**		
Hexavalent Chromium (mg/kg)								
Chromium, Hexavalent	None	1.64	19.9	90.4	-	-	ND	ND

Notes:
All FWCUGs are carcinogenic FWCUGs (10^{-6} Risk).
National Guard Trainee FWCUG not used to determine potential contamination; only shown for comparison purposes.
BKG = Background.
Dup = Duplicate.
ft = Feet.
FWCUG = Facility-Wide Cleanup Goal.
ID = Identification.
J = Estimated value less than reporting limits.
mg/kg = Milligrams per kilogram.
ND = Not detected.
No. = Number.
RSL = Regional Screening Level.

Table 5-5: Surface Geophysical Survey Results

Former UST Identification	Geophysical Methods Used	Findings	Figure Number of Geophysical Survey Results
RV-4 and RV-87	GPR-EM	UST not identified	Figure 5-1
RV-41	GPR-EM	UST not identified	Figure 5-6
RV-46	GPR-EM	GPR anomaly suggests a concrete UST remains in-place	Figure 5-6
RV-86	GPR-EM	UST not identified	Figure 5-2
RV-88	GPR-EM	UST not identified	Figure 5-7
RV-89	GPR-EM	UST not identified	Figure 5-8

Notes:
EM = Electromagnetic.
GPR = Ground penetrating radar.
UST = Underground storage tank.

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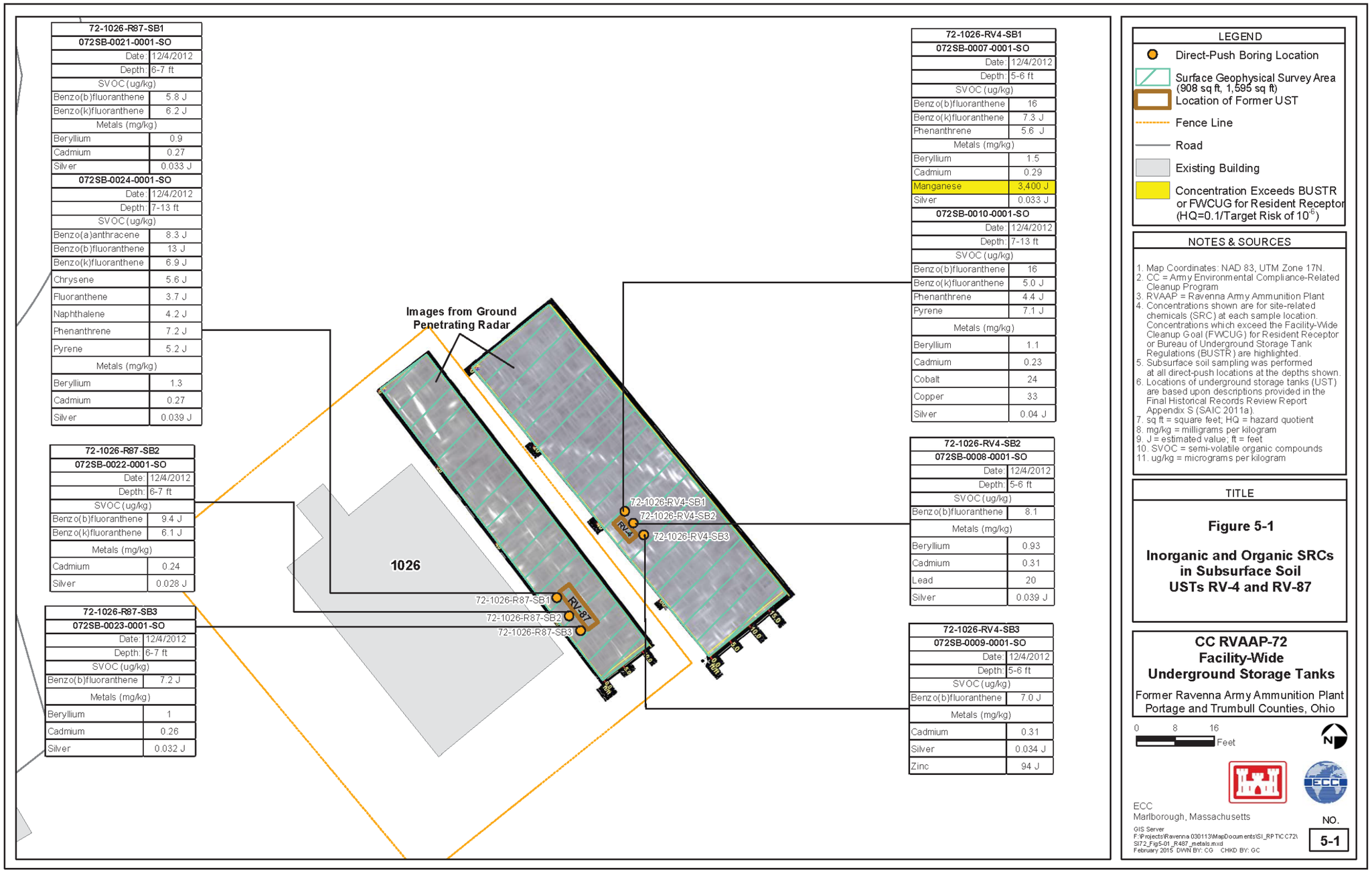
72-1026-R87-SB1
072SB-0021-0001-SO
Date: 12/4/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 5.8 J
Benzo(k)fluoranthene 6.2 J
Metals (mg/kg)
Beryllium 0.9
Cadmium 0.27
Silver 0.033 J
072SB-0024-0001-SO
Date: 12/4/2012
Depth: 7-13 ft
SVOC (ug/kg)
Benzo(a)anthracene 8.3 J
Benzo(b)fluoranthene 13 J
Benzo(k)fluoranthene 6.9 J
Chrysene 5.6 J
Fluoranthene 3.7 J
Naphthalene 4.2 J
Phenanthrene 7.2 J
Pyrene 5.2 J
Metals (mg/kg)
Beryllium 1.3
Cadmium 0.27
Silver 0.039 J
72-1026-R87-SB2
072SB-0022-0001-SO
Date: 12/4/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 9.4 J
Benzo(k)fluoranthene 6.1 J
Metals (mg/kg)
Cadmium 0.24
Silver 0.028 J
72-1026-R87-SB3
072SB-0023-0001-SO
Date: 12/4/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 7.2 J
Metals (mg/kg)
Beryllium 1
Cadmium 0.26
Silver 0.032 J
Images from Ground Penetrating Radar
1026
RV-87
RV4
72-1026-R87-SB1
72-1026-R87-SB2
72-1026-R87-SB3
72-1026-RV4-SB1
72-1026-RV4-SB2
72-1026-RV4-SB3
72-1026-RV4-SB1
072SB-0007-0001-SO
Date: 12/4/2012
Depth: 5-6 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 16
Benzo(k)fluoranthene 7.3 J
Phenanthrene 5.6 J
Metals (mg/kg)
Beryllium 1.5
Cadmium 0.29
Manganese 3,400 J
Silver 0.033 J
072SB-0010-0001-SO
Date: 12/4/2012
Depth: 7-13 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 16
Benzo(k)fluoranthene 5.0 J
Phenanthrene 4.4 J
Pyrene 7.1 J
Metals (mg/kg)
Beryllium 1.1
Cadmium 0.23
Cobalt 24
Copper 33
Silver 0.04 J
72-1026-RV4-SB2
072SB-0008-0001-SO
Date: 12/4/2012
Depth: 5-6 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 8.1
Metals (mg/kg)
Beryllium 0.93
Cadmium 0.31
Lead 20
Silver 0.039 J
72-1026-RV4-SB3
072SB-0009-0001-SO
Date: 12/4/2012
Depth: 5-6 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 7.0 J
Metals (mg/kg)
Cadmium 0.31
Silver 0.034 J
Zinc 94 J
LEGEND
Direct-Push Boring Location
Surface Geophysical Survey Area (908 sq ft, 1,595 sq ft)
Location of Former UST
Fence Line
Road
Existing Building
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-5)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations at the depths shown.
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S (SAIC 2011a).
7. sq ft = square feet; HQ = hazard quotient
8. mg/kg = milligrams per kilogram
9. J = estimated value; ft = feet
10. SVOC = semi-volatile organic compounds
11. ug/kg = micrograms per kilogram
TITLE
Figure 5-1
Inorganic and Organic SRCs in Subsurface Soil
USTs RV-4 and RV-87
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0 8 16
Feet
N
ECC
Marlborough, Massachusetts
GIS Server
F:\Projects\Ravenna 030113\MapDocuments\SI_RPT\C72\SI72_Fig5-01_R487_metals.mxd
February 2015 DWN BY: CG CHKD BY: GC
NO.
5-1

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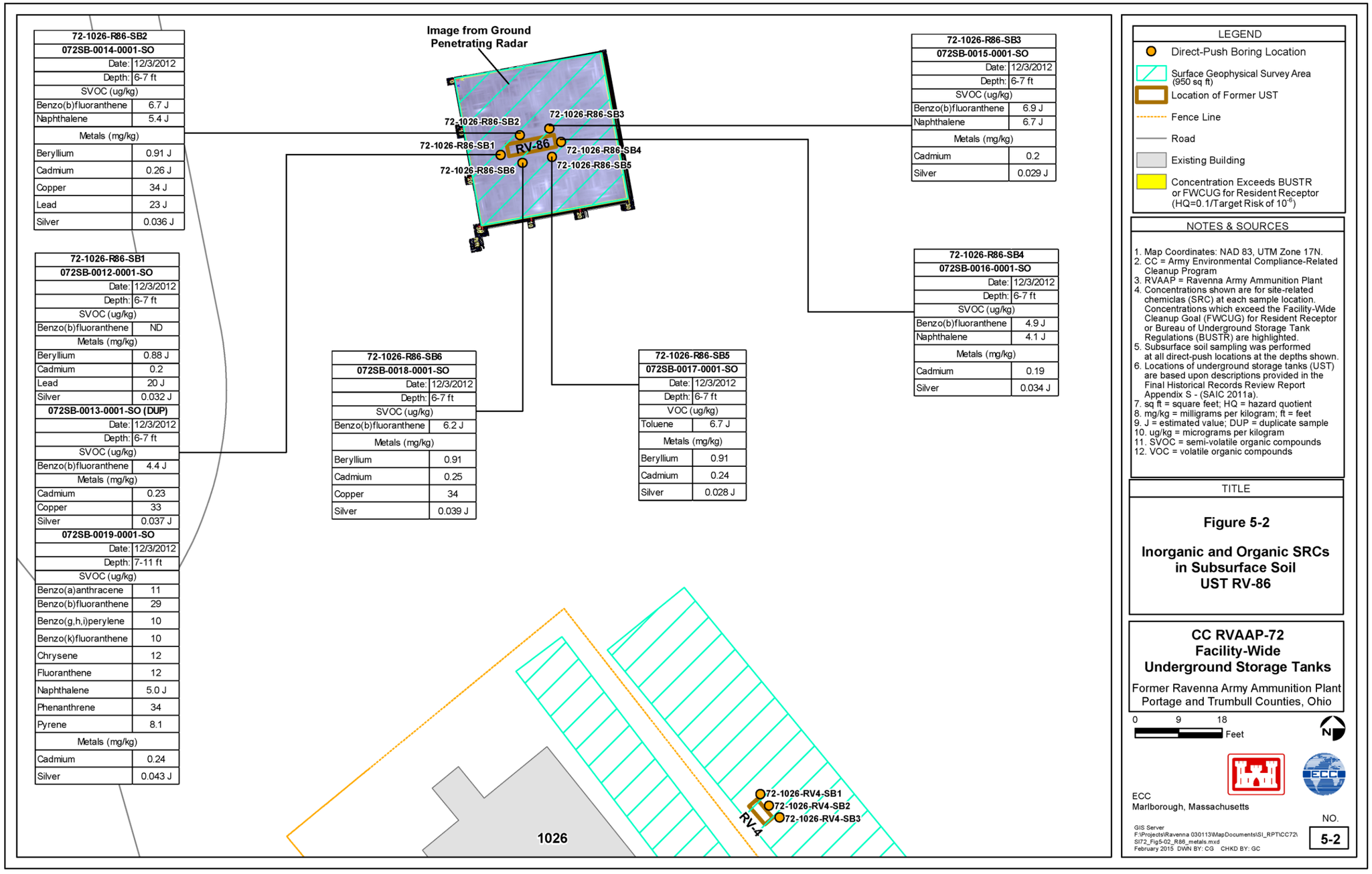
Image from Ground Penetrating Radar
RV-86
72-1026-R86-SB1
72-1026-R86-SB2
72-1026-R86-SB3
72-1026-R86-SB4
72-1026-R86-SB5
72-1026-R86-SB6
RV-4
72-1026-RV4-SB1
72-1026-RV4-SB2
72-1026-RV4-SB3
1026
72-1026-R86-SB2
072SB-0014-0001-SO
Date: 12/3/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 6.7 J
Naphthalene 5.4 J
Metals (mg/kg)
Beryllium 0.91 J
Cadmium 0.26 J
Copper 34 J
Lead 23 J
Silver 0.036 J
72-1026-R86-SB1
072SB-0012-0001-SO
Date: 12/3/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene ND
Metals (mg/kg)
Beryllium 0.88 J
Cadmium 0.2
Lead 20 J
Silver 0.032 J
072SB-0013-0001-SO (DUP)
Date: 12/3/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 4.4 J
Metals (mg/kg)
Cadmium 0.23
Copper 33
Silver 0.037 J
072SB-0019-0001-SO
Date: 12/3/2012
Depth: 7-11 ft
SVOC (ug/kg)
Benzo(a)anthracene 11
Benzo(b)fluoranthene 29
Benzo(g,h,i)perylene 10
Benzo(k)fluoranthene 10
Chrysene 12
Fluoranthene 12
Naphthalene 5.0 J
Phenanthrene 34
Pyrene 8.1
Metals (mg/kg)
Cadmium 0.24
Silver 0.043 J
72-1026-R86-SB6
072SB-0018-0001-SO
Date: 12/3/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 6.2 J
Metals (mg/kg)
Beryllium 0.91
Cadmium 0.25
Copper 34
Silver 0.039 J
72-1026-R86-SB5
072SB-0017-0001-SO
Date: 12/3/2012
Depth: 6-7 ft
VOC (ug/kg)
Toluene 6.7 J
Metals (mg/kg)
Beryllium 0.91
Cadmium 0.24
Silver 0.028 J
72-1026-R86-SB3
072SB-0015-0001-SO
Date: 12/3/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 6.9 J
Naphthalene 6.7 J
Metals (mg/kg)
Cadmium 0.2
Silver 0.029 J
72-1026-R86-SB4
072SB-0016-0001-SO
Date: 12/3/2012
Depth: 6-7 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 4.9 J
Naphthalene 4.1 J
Metals (mg/kg)
Cadmium 0.19
Silver 0.034 J
LEGEND
Direct-Push Boring Location
Surface Geophysical Survey Area (950 sq ft)
Location of Former UST
Fence Line
Road
Existing Building
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemiclas (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations at the depths shown.
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. sq ft = square feet; HQ = hazard quotient
8. mg/kg = milligrams per kilogram; ft = feet
9. J = estimated value; DUP = duplicate sample
10. ug/kg = micrograms per kilogram
11. SVOC = semi-volatile organic compounds
12. VOC = volatile organic compounds
TITLE
Figure 5-2
Inorganic and Organic SRCs in Subsurface Soil UST RV-86
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 9 18
Feet
N
ECC
Marlborough, Massachusetts
NO.
5-2
GIS Server
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February 2015 DWN BY: CG CHKD BY: GC

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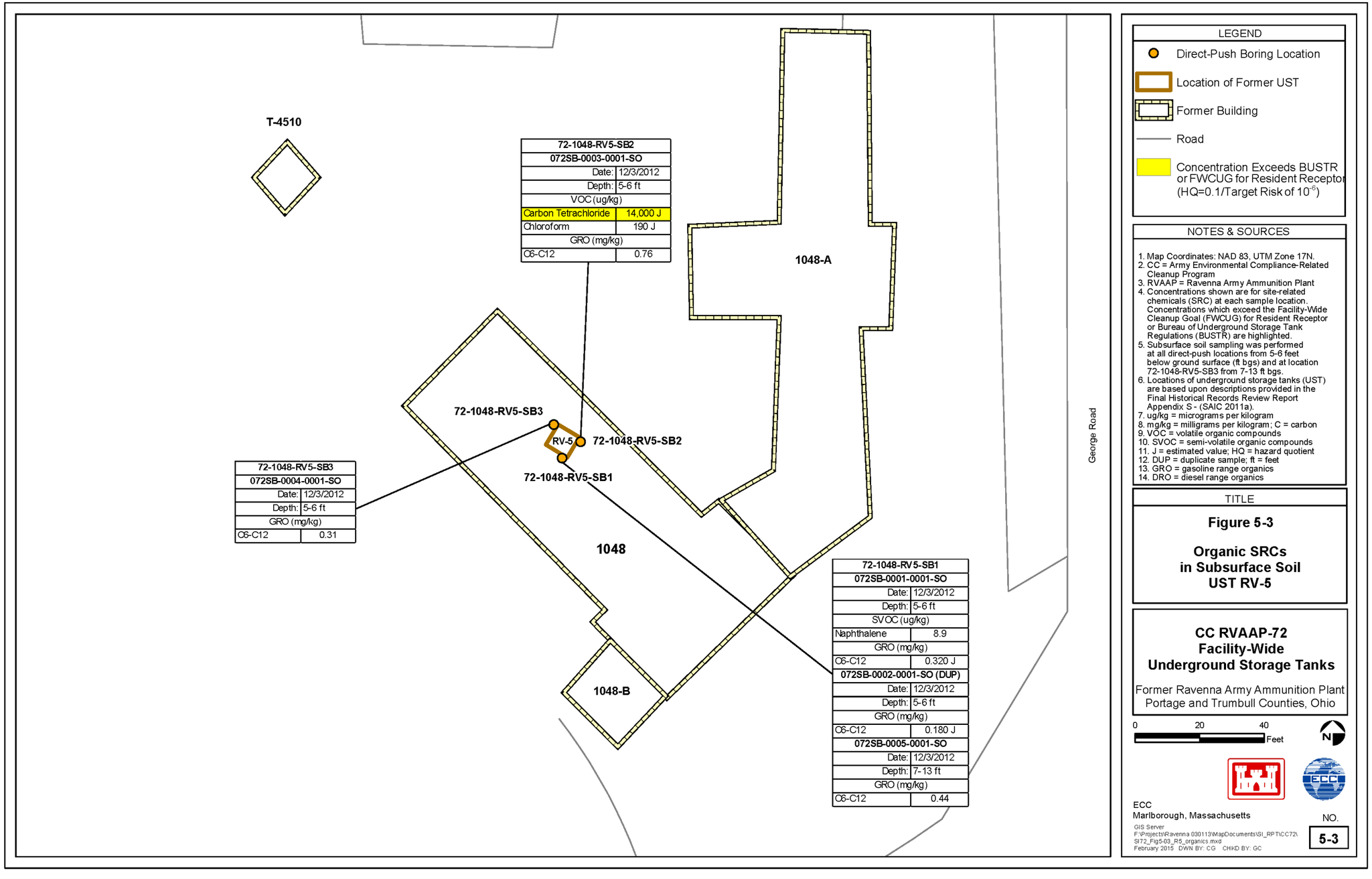
T-4510
72-1048-RV5-SB2
072SB-0003-0001-SO
Date: 12/3/2012
Depth: 5-6 ft
VOC (ug/kg)
Carbon Tetrachloride 14,000 J
Chloroform 190 J
GRO (mg/kg)
C6-C12 0.76
1048-A
72-1048-RV5-SB3
RV-5
72-1048-RV5-SB2
72-1048-RV5-SB1
72-1048-RV5-SB3
072SB-0004-0001-SO
Date: 12/3/2012
Depth: 5-6 ft
GRO (mg/kg)
C6-C12 0.31
1048
1048-B
72-1048-RV5-SB1
072SB-0001-0001-SO
Date: 12/3/2012
Depth: 5-6 ft
SVOC (ug/kg)
Naphthalene 8.9
GRO (mg/kg)
C6-C12 0.320 J
072SB-0002-0001-SO (DUP)
Date: 12/3/2012
Depth: 5-6 ft
GRO (mg/kg)
C6-C12 0.180 J
072SB-0005-0001-SO
Date: 12/3/2012
Depth: 7-13 ft
GRO (mg/kg)
C6-C12 0.44
George Road
LEGEND
Direct-Push Boring Location
Location of Former UST
Former Building
Road
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-5)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 5-6 feet below ground surface (ft bgs) and at location 72-1048-RV5-SB3 from 7-13 ft bgs.
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. ug/kg = micrograms per kilogram
8. mg/kg = milligrams per kilogram; C = carbon
9. VOC = volatile organic compounds
10. SVOC = semi-volatile organic compounds
11. J = estimated value; HQ = hazard quotient
12. DUP = duplicate sample; ft = feet
13. GRO = gasoline range organics
14. DRO = diesel range organics
TITLE
Figure 5-3
Organic SRCs in Subsurface Soil UST RV-5
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0 20 40 Feet
N
ECC
Marlborough, Massachusetts
GIS Server
F:\Projects\Ravenna 030113\MapDocuments\SI_RPT\CC72\SI72_Fig5-03_R5_organics.mxd
February 2015 DWN BY: CG CHKD BY: GC
NO.
5-3

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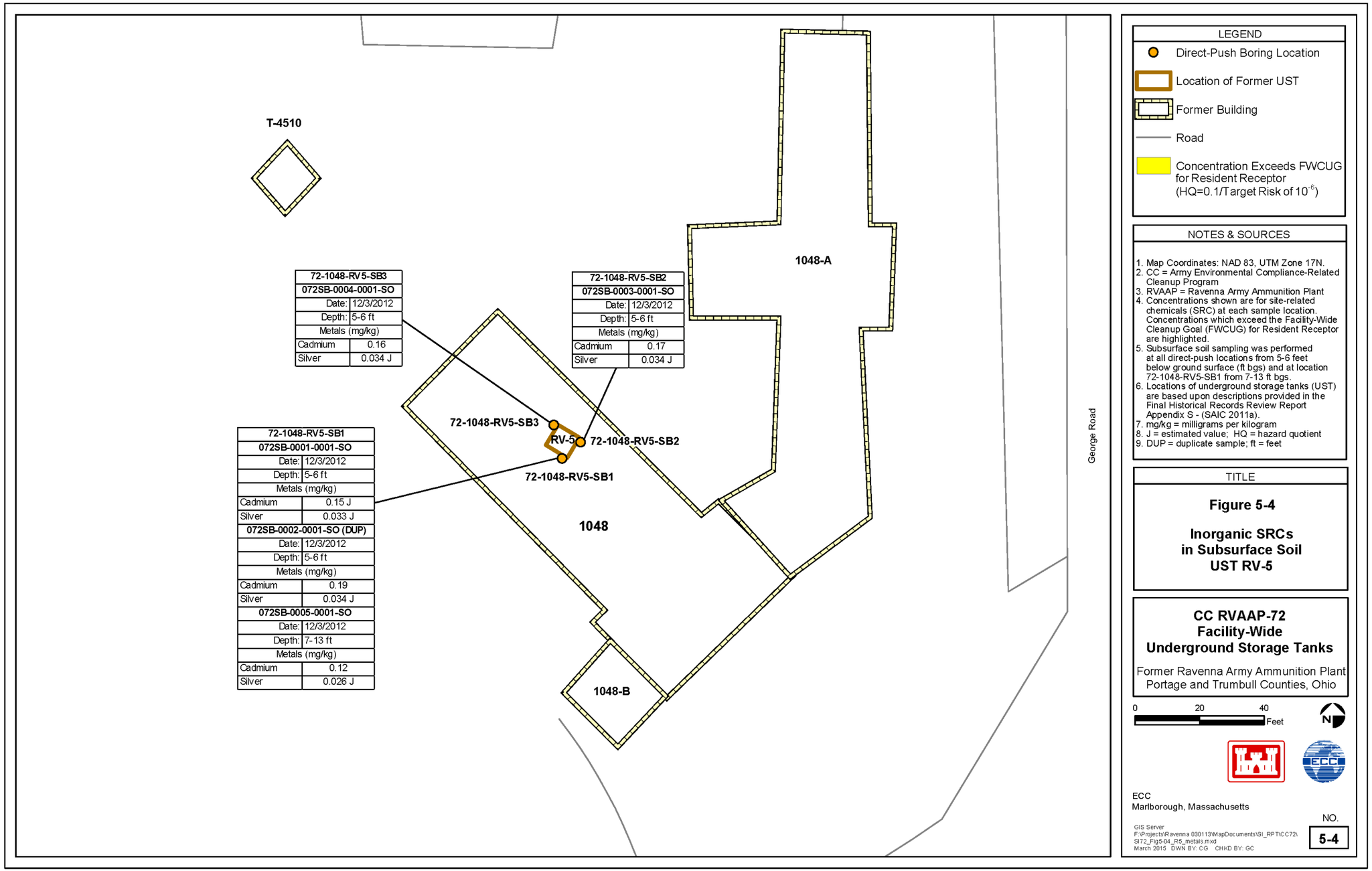
T-4510
1048-A
72-1048-RV5-SB3
072SB-0004-0001-SO
Date: 12/3/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.16
Silver 0.034 J
72-1048-RV5-SB2
072SB-0003-0001-SO
Date: 12/3/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.17
Silver 0.034 J
72-1048-RV5-SB1
072SB-0001-0001-SO
Date: 12/3/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.15 J
Silver 0.033 J
072SB-0002-0001-SO (DUP)
Date: 12/3/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.19
Silver 0.034 J
072SB-0005-0001-SO
Date: 12/3/2012
Depth: 7-13 ft
Metals (mg/kg)
Cadmium 0.12
Silver 0.026 J
72-1048-RV5-SB3
RV-5
72-1048-RV5-SB2
72-1048-RV5-SB1
1048
1048-B
George Road
LEGEND
Direct-Push Boring Location
Location of Former UST
Former Building
Road
Concentration Exceeds FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 5-6 feet below ground surface (ft bgs) and at location 72-1048-RV5-SB1 from 7-13 ft bgs.
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. J = estimated value; HQ = hazard quotient
9. DUP = duplicate sample; ft = feet
TITLE
Figure 5-4
Inorganic SRCs in Subsurface Soil UST RV-5
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 20 40 Feet
N
ECC
Marlborough, Massachusetts
NO.
5-4
GIS Server
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March 2015 DWN BY: CG CHKD BY: GC

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72-2F11-R41-SB1
072SB-0082-0001-SO
Date: 12/10/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.14
Copper 55
Silver 0.031 J
VOC (ug/kg)
Toluene 1.7 J
SVOC (ug/kg)
Anthracene 8.8
Benzo(a)anthracene 17
Benzo(a)pyrene 9.6
Benzo(b)fluoranthene 13
Benzo(g,h,i)perylene 17
Benzo(k)fluoranthene 5.6 J
Chrysene 9.2
Dibenzofuran 12 J
Fluoranthene 15
Fluorene 11
Indeno(1,2,3-c,d)pyrene 7.6 J
Naphthalene 7.0 J
Phenanthrene 20
Pyrene 22
2-Methylnaphthalene 17
DRO (mg/kg)
C10-C20 220
C20-C34 25
GRO (mg/kg)
C6-C12 37
072SB-0097-0001-SO
Date: 8/14/2013
Depth: 7-13 ft
Metals (mg/kg)
Cadmium 0.13
Silver 0.043
SVOC (ug/kg)
Benzo(b)fluoranthene 3.9 J
Chrysene 4.5 J
Fluorene 6.5 J
Naphthalene 4.3 J
Phenanthrene 6.4 J
DRO (mg/kg)
C10-C20 15.0 J
GRO (mg/kg)
C6-C12 8.2
72-2F11-R41-SB2
072SB-0083-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.14
Silver 0.031 J
VOC (ug/kg)
Toluene 2.7 J
Image from Ground Penetrating Radar
2F-11
72-2F11-R41-SB1
72-2F11-R41-SB2
72-2F11-R41-SB6
RV-41
72-2F11-R41-SB3
72-2F11-R41-SB5
72-2F11-R41-SB4
72-2F11-R41-SB3
072SB-0084-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.14
Silver 0.031 J
VOC (ug/kg)
Toluene 3.5 J
SVOC (ug/kg)
Chrysene 5.3 J
Phenanthrene 8.9
72-2F11-R41-SB6
072SB-0092-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.14
Silver 0.025 J
VOC (ug/kg)
Toluene 3.1 J
72-2F11-R41-SB5
072SB-0091-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.15
Silver 0.025 J
VOC (ug/kg)
Toluene 5.0 J
72-2F11-R41-SB4
072SB-0085-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.13
Silver 0.03 J
VOC (ug/kg)
Toluene 4.3 J
072SB-0086-0001-SO (DUP)
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.092 J
Silver 0.022 J
VOC (ug/kg)
Toluene 2.6 J
LEGEND
Direct-Push Boring Location
Surface Geophysical Survey Area (2,600 sq ft)
Location of Former UST
Road
Former Building
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 9-10 feet below ground surface (ft bgs) with the exception of location 72-2F11-R41-SB1 (5-6 ft bgs).
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. sq ft = square feet; ft = feet
10. J = estimated value; C = carbon
11. DUP = duplicate sample; HQ = hazard quotient
12. VOC = volatile organic compounds
13. SVOC = semi-volatile organic compounds
14. GRO = gasoline range organics
15. DRO = deisel range organics
TITLE
Figure 5-5
Inorganic and Organic SRCs in Subsurface Soil UST RV-41
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 10 20 Feet
N
ECC
Marlborough, Massachusetts
NO.
5-5
GIS Server
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February 2015 DWN BY: CG CHKD BY: GC

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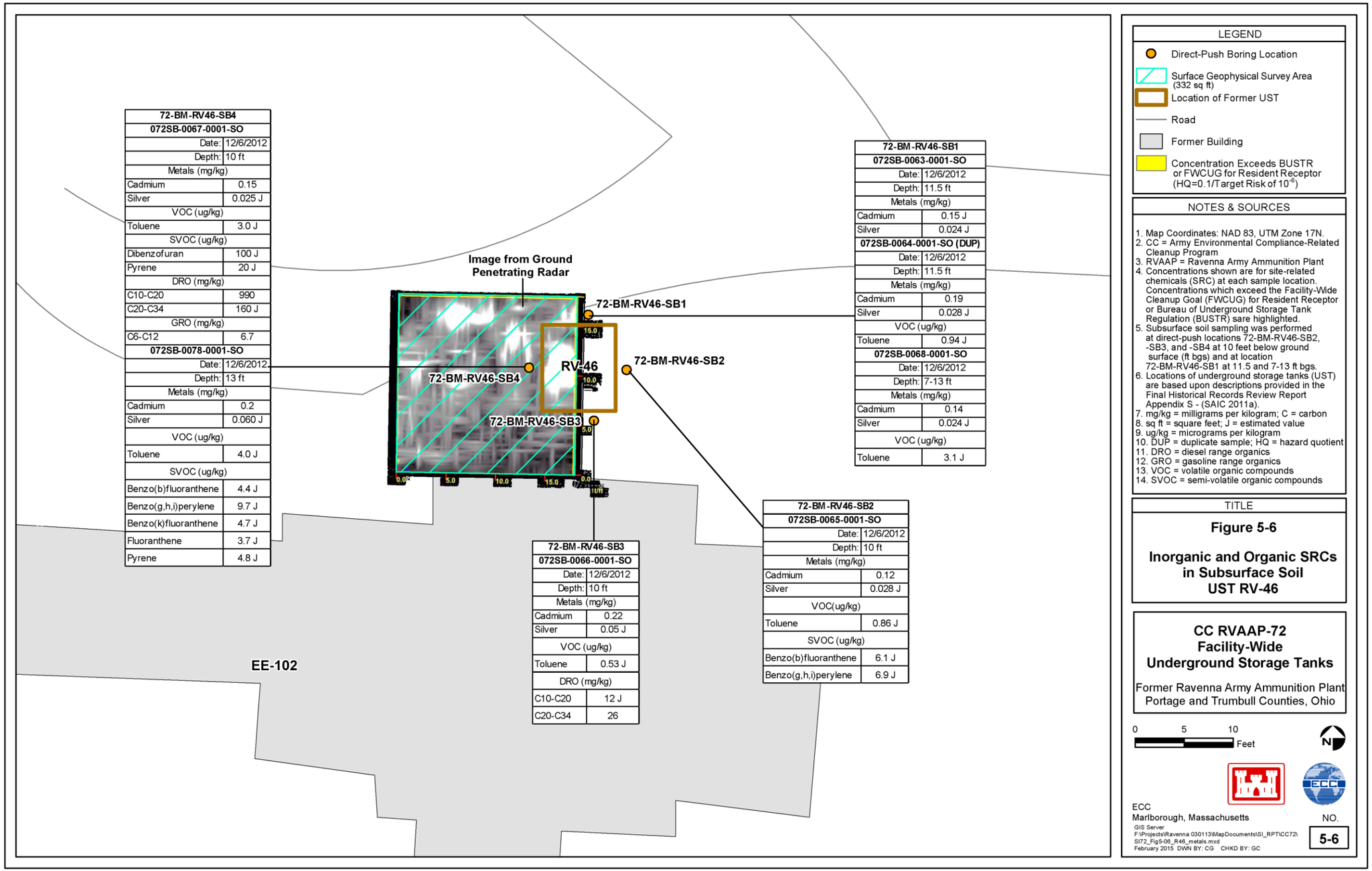
Image from Ground Penetrating Radar
72-BM-RV46-SB1
72-BM-RV46-SB2
72-BM-RV46-SB3
72-BM-RV46-SB4
RV-46
EE-102
72-BM-RV46-SB4
072SB-0067-0001-SO
Date: 12/6/2012
Depth: 10 ft
Metals (mg/kg)
Cadmium 0.15
Silver 0.025 J
VOC (ug/kg)
Toluene 3.0 J
SVOC (ug/kg)
Dibenzofuran 100 J
Pyrene 20 J
DRO (mg/kg)
C10-C20 990
C20-C34 160 J
GRO (mg/kg)
C6-C12 6.7
072SB-0078-0001-SO
Date: 12/6/2012
Depth: 13 ft
Metals (mg/kg)
Cadmium 0.2
Silver 0.060 J
VOC (ug/kg)
Toluene 4.0 J
SVOC (ug/kg)
Benzo(b)fluoranthene 4.4 J
Benzo(g,h,i)perylene 9.7 J
Benzo(k)fluoranthene 4.7 J
Fluoranthene 3.7 J
Pyrene 4.8 J
72-BM-RV46-SB1
072SB-0063-0001-SO
Date: 12/6/2012
Depth: 11.5 ft
Metals (mg/kg)
Cadmium 0.15 J
Silver 0.024 J
072SB-0064-0001-SO (DUP)
Date: 12/6/2012
Depth: 11.5 ft
Metals (mg/kg)
Cadmium 0.19
Silver 0.028 J
VOC (ug/kg)
Toluene 0.94 J
072SB-0068-0001-SO
Date: 12/6/2012
Depth: 7-13 ft
Metals (mg/kg)
Cadmium 0.14
Silver 0.024 J
VOC (ug/kg)
Toluene 3.1 J
72-BM-RV46-SB3
072SB-0066-0001-SO
Date: 12/6/2012
Depth: 10 ft
Metals (mg/kg)
Cadmium 0.22
Silver 0.05 J
VOC (ug/kg)
Toluene 0.53 J
DRO (mg/kg)
C10-C20 12 J
C20-C34 26
72-BM-RV46-SB2
072SB-0065-0001-SO
Date: 12/6/2012
Depth: 10 ft
Metals (mg/kg)
Cadmium 0.12
Silver 0.028 J
VOC(ug/kg)
Toluene 0.86 J
SVOC (ug/kg)
Benzo(b)fluoranthene 6.1 J
Benzo(g,h,i)perylene 6.9 J
LEGEND
Direct-Push Boring Location
Surface Geophysical Survey Area (332 sq ft)
Location of Former UST
Road
Former Building
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulation (BUSTR) sare highlighted.
5. Subsurface soil sampling was performed at direct-push locations 72-BM-RV46-SB2, -SB3, and -SB4 at 10 feet below ground surface (ft bgs) and at location 72-BM-RV46-SB1 at 11.5 and 7-13 ft bgs.
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram; C = carbon
8. sq ft = square feet; J = estimated value
9. ug/kg = micrograms per kilogram
10. DUP = duplicate sample; HQ = hazard quotient
11. DRO = diesel range organics
12. GRO = gasoline range organics
13. VOC = volatile organic compounds
14. SVOC = semi-volatile organic compounds
TITLE
Figure 5-6
Inorganic and Organic SRCs in Subsurface Soil UST RV-46
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 5 10
Feet
N
ECC
Marlborough, Massachusetts
GIS Server
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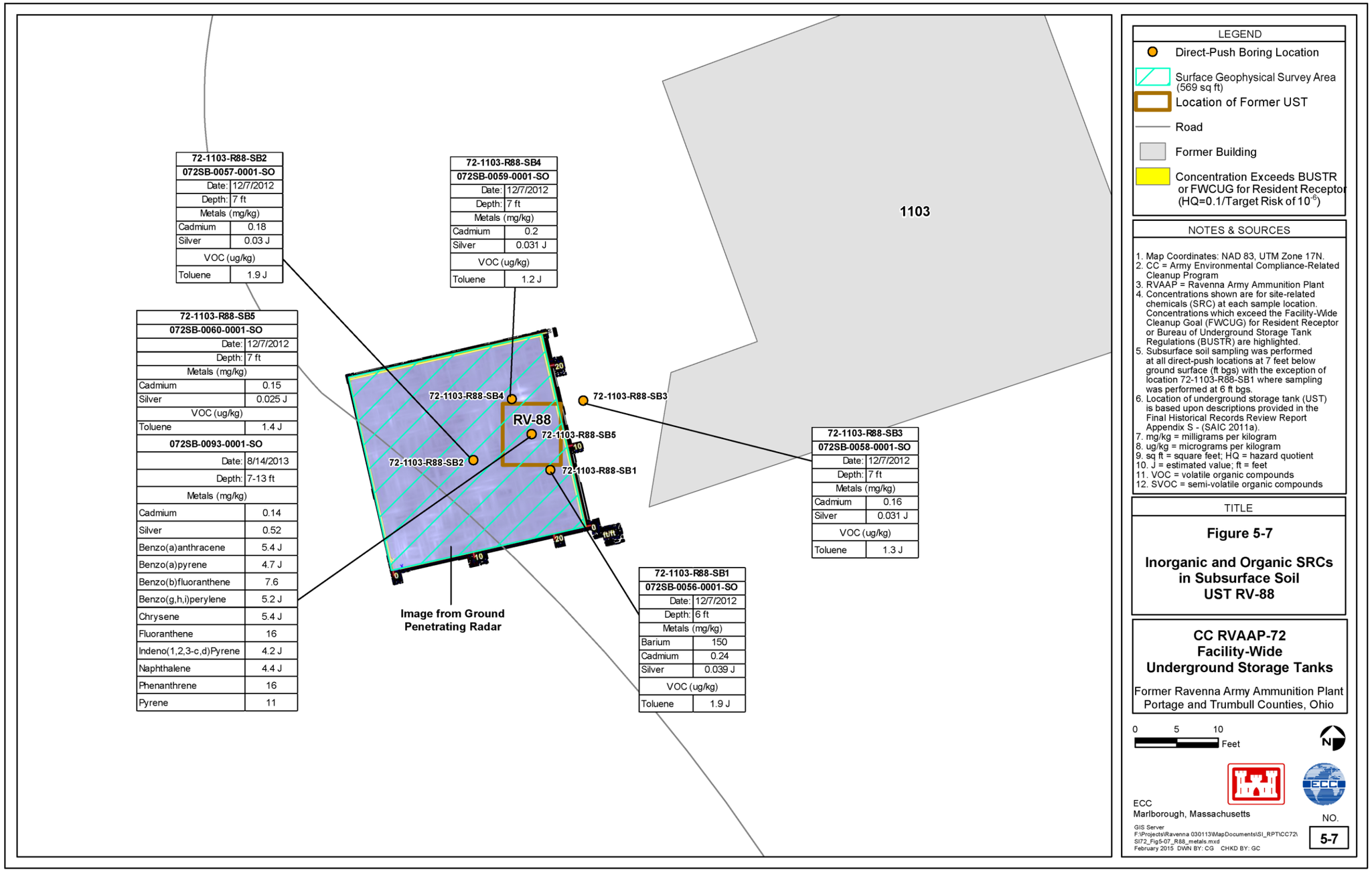
72-1103-R88-SB2
072SB-0057-0001-SO
Date: 12/7/2012
Depth: 7 ft
Metals (mg/kg)
Cadmium 0.18
Silver 0.03 J
VOC (ug/kg)
Toluene 1.9 J
72-1103-R88-SB4
072SB-0059-0001-SO
Date: 12/7/2012
Depth: 7 ft
Metals (mg/kg)
Cadmium 0.2
Silver 0.031 J
VOC (ug/kg)
Toluene 1.2 J
72-1103-R88-SB5
072SB-0060-0001-SO
Date: 12/7/2012
Depth: 7 ft
Metals (mg/kg)
Cadmium 0.15
Silver 0.025 J
VOC (ug/kg)
Toluene 1.4 J
072SB-0093-0001-SO
Date: 8/14/2013
Depth: 7-13 ft
Metals (mg/kg)
Cadmium 0.14
Silver 0.52
Benzo(a)anthracene 5.4 J
Benzo(a)pyrene 4.7 J
Benzo(b)fluoranthene 7.6
Benzo(g,h,i)perylene 5.2 J
Chrysene 5.4 J
Fluoranthene 16
Indeno(1,2,3-c,d)Pyrene 4.2 J
Naphthalene 4.4 J
Phenanthrene 16
Pyrene 11
72-1103-R88-SB1
072SB-0056-0001-SO
Date: 12/7/2012
Depth: 6 ft
Metals (mg/kg)
Barium 150
Cadmium 0.24
Silver 0.039 J
VOC (ug/kg)
Toluene 1.9 J
72-1103-R88-SB3
072SB-0058-0001-SO
Date: 12/7/2012
Depth: 7 ft
Metals (mg/kg)
Cadmium 0.16
Silver 0.031 J
VOC (ug/kg)
Toluene 1.3 J
1103
RV-88
72-1103-R88-SB4
72-1103-R88-SB3
72-1103-R88-SB5
72-1103-R88-SB2
72-1103-R88-SB1
Image from Ground Penetrating Radar
0
10
20
ft
LEGEND
Direct-Push Boring Location
Surface Geophysical Survey Area (569 sq ft)
Location of Former UST
Road
Former Building
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations at 7 feet below ground surface (ft bgs) with the exception of location 72-1103-R88-SB1 where sampling was performed at 6 ft bgs.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. sq ft = square feet; HQ = hazard quotient
10. J = estimated value; ft = feet
11. VOC = volatile organic compounds
12. SVOC = semi-volatile organic compounds
TITLE
Figure 5-7
Inorganic and Organic SRCs in Subsurface Soil UST RV-88
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 5 10
Feet
N
ECC
Marlborough, Massachusetts
NO.
5-7
GIS Server
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February 2015 DWN BY: CG CHKD BY: GC

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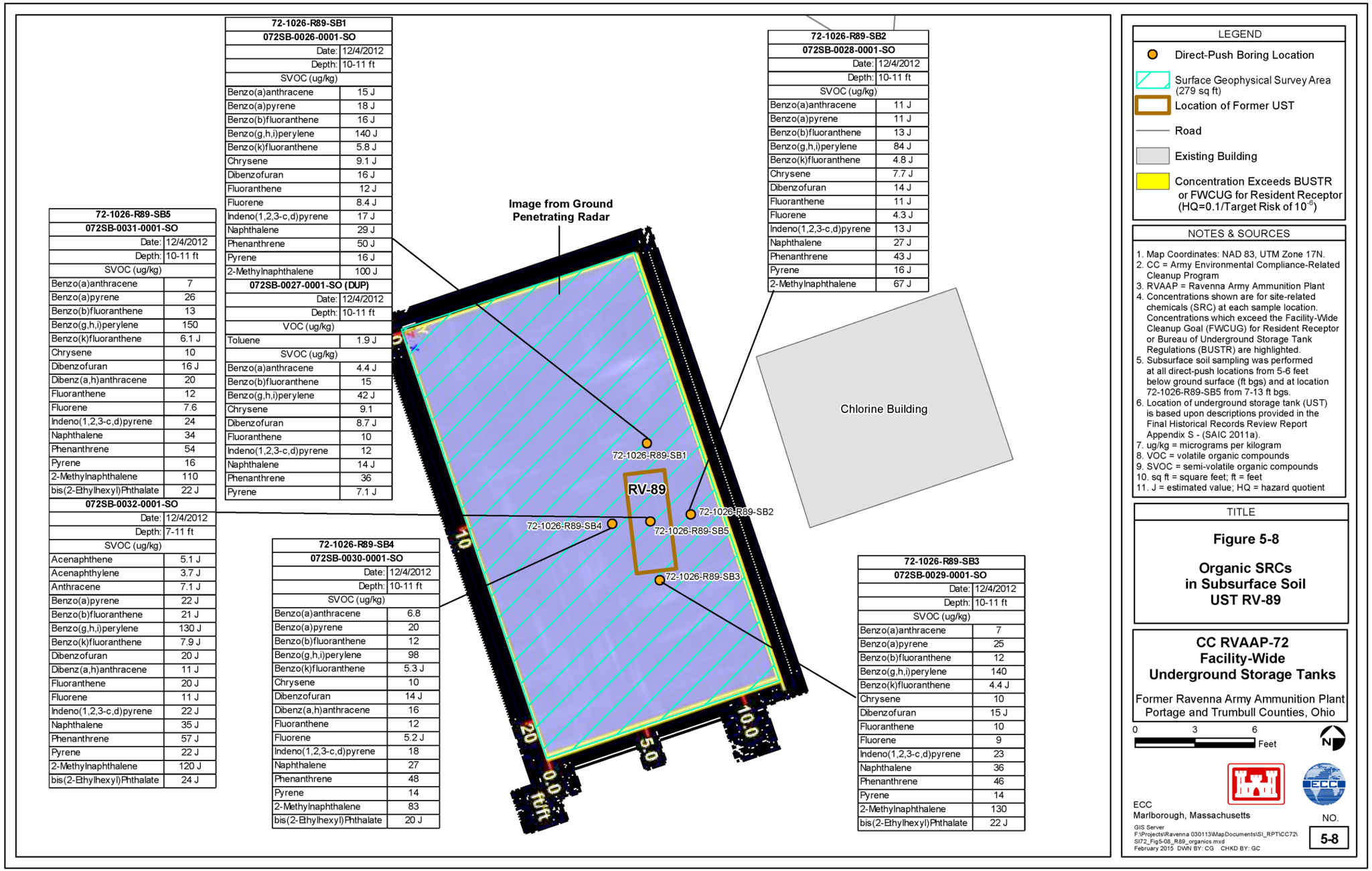

72-1026-R89-SB5	
072SB-0031-0001-SO	
Date:	12/4/2012
Depth:	10-11 ft
SVOC (ug/kg)	
Benzo(a)anthracene	7
Benzo(a)pyrene	26
Benzo(b)fluoranthene	13
Benzo(g,h,i)perylene	150
Benzo(k)fluoranthene	6.1 J
Chrysene	10
Dibenzofuran	16 J
Dibenz(a,h)anthracene	20
Fluoranthene	12
Fluorene	7.6
Indeno(1,2,3-c,d)pyrene	24
Naphthalene	34
Phenanthrene	54
Pyrene	16
2-Methylnaphthalene	110
bis(2-Ethylhexyl)Phthalate	22 J
072SB-0032-0001-SO	
Date:	12/4/2012
Depth:	7-11 ft
SVOC (ug/kg)	
Acenaphthene	5.1 J
Acenaphthylene	3.7 J
Anthracene	7.1 J
Benzo(a)pyrene	22 J
Benzo(b)fluoranthene	21 J
Benzo(g,h,i)perylene	130 J
Benzo(k)fluoranthene	7.9 J
Dibenzofuran	20 J
Dibenz(a,h)anthracene	11 J
Fluoranthene	20 J
Fluorene	11 J
Indeno(1,2,3-c,d)pyrene	22 J
Naphthalene	35 J
Phenanthrene	57 J
Pyrene	22 J
2-Methylnaphthalene	120 J
bis(2-Ethylhexyl)Phthalate	24 J

72-1026-R89-SB1	
072SB-0026-0001-SO	
Date:	12/4/2012
Depth:	10-11 ft
SVOC (ug/kg)	
Benzo(a)anthracene	15 J
Benzo(a)pyrene	18 J
Benzo(b)fluoranthene	16 J
Benzo(g,h,i)perylene	140 J
Benzo(k)fluoranthene	5.8 J
Chrysene	9.1 J
Dibenzofuran	16 J
Fluoranthene	12 J
Fluorene	8.4 J
Indeno(1,2,3-c,d)pyrene	17 J
Naphthalene	29 J
Phenanthrene	50 J
Pyrene	16 J
2-Methylnaphthalene	100 J
072SB-0027-0001-SO (DUP)	
Date:	12/4/2012
Depth:	10-11 ft
VOC (ug/kg)	
Toluene	1.9 J
SVOC (ug/kg)	
Benzo(a)anthracene	4.4 J
Benzo(b)fluoranthene	15
Benzo(g,h,i)perylene	42 J
Chrysene	9.1
Dibenzofuran	8.7 J
Fluoranthene	10
Indeno(1,2,3-c,d)pyrene	12
Naphthalene	14 J
Phenanthrene	36
Pyrene	7.1 J

72-1026-R89-SB4	
072SB-0030-0001-SO	
Date:	12/4/2012
Depth:	10-11 ft
SVOC (ug/kg)	
Benzo(a)anthracene	6.8
Benzo(a)pyrene	20
Benzo(b)fluoranthene	12
Benzo(g,h,i)perylene	98
Benzo(k)fluoranthene	5.3 J
Chrysene	10
Dibenzofuran	14 J
Dibenz(a,h)anthracene	16
Fluoranthene	12
Fluorene	5.2 J
Indeno(1,2,3-c,d)pyrene	18
Naphthalene	27
Phenanthrene	48
Pyrene	14
2-Methylnaphthalene	83
bis(2-Ethylhexyl)Phthalate	20 J

72-1026-R89-SB2	
072SB-0028-0001-SO	
Date:	12/4/2012
Depth:	10-11 ft
SVOC (ug/kg)	
Benzo(a)anthracene	11 J
Benzo(a)pyrene	11 J
Benzo(b)fluoranthene	13 J
Benzo(g,h,i)perylene	84 J
Benzo(k)fluoranthene	4.8 J
Chrysene	7.7 J
Dibenzofuran	14 J
Fluoranthene	11 J
Fluorene	4.3 J
Indeno(1,2,3-c,d)pyrene	13 J
Naphthalene	27 J
Phenanthrene	43 J
Pyrene	16 J
2-Methylnaphthalene	67 J

72-1026-R89-SB3	
072SB-0029-0001-SO	
Date:	12/4/2012
Depth:	10-11 ft
SVOC (ug/kg)	
Benzo(a)anthracene	7
Benzo(a)pyrene	25
Benzo(b)fluoranthene	12
Benzo(g,h,i)perylene	140
Benzo(k)fluoranthene	4.4 J
Chrysene	10
Dibenzofuran	15 J
Fluoranthene	10
Fluorene	9
Indeno(1,2,3-c,d)pyrene	23
Naphthalene	36
Phenanthrene	46
Pyrene	14
2-Methylnaphthalene	130
bis(2-Ethylhexyl)Phthalate	22 J

LEGEND

- Direct-Push Boring Location
- Surface Geophysical Survey Area (279 sq ft)
- Location of Former UST
- Road
- Existing Building
- Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10^{-5})

NOTES & SOURCES

1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 5-6 feet below ground surface (ft bgs) and at location 72-1026-R89-SB5 from 7-13 ft bgs.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. ug/kg = micrograms per kilogram
8. VOC = volatile organic compounds
9. SVOC = semi-volatile organic compounds
10. sq ft = square feet; ft = feet
11. J = estimated value; HQ = hazard quotient

TITLE

Figure 5-8

Organic SRCs in Subsurface Soil UST RV-89

CC RVAAP-72 Facility-Wide Underground Storage Tanks

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

0 3 6 Feet

N

ECC
Marlborough, Massachusetts

NO. 5-8

GIS Server
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February 2015 DWN BY: CG CHKD BY: GC

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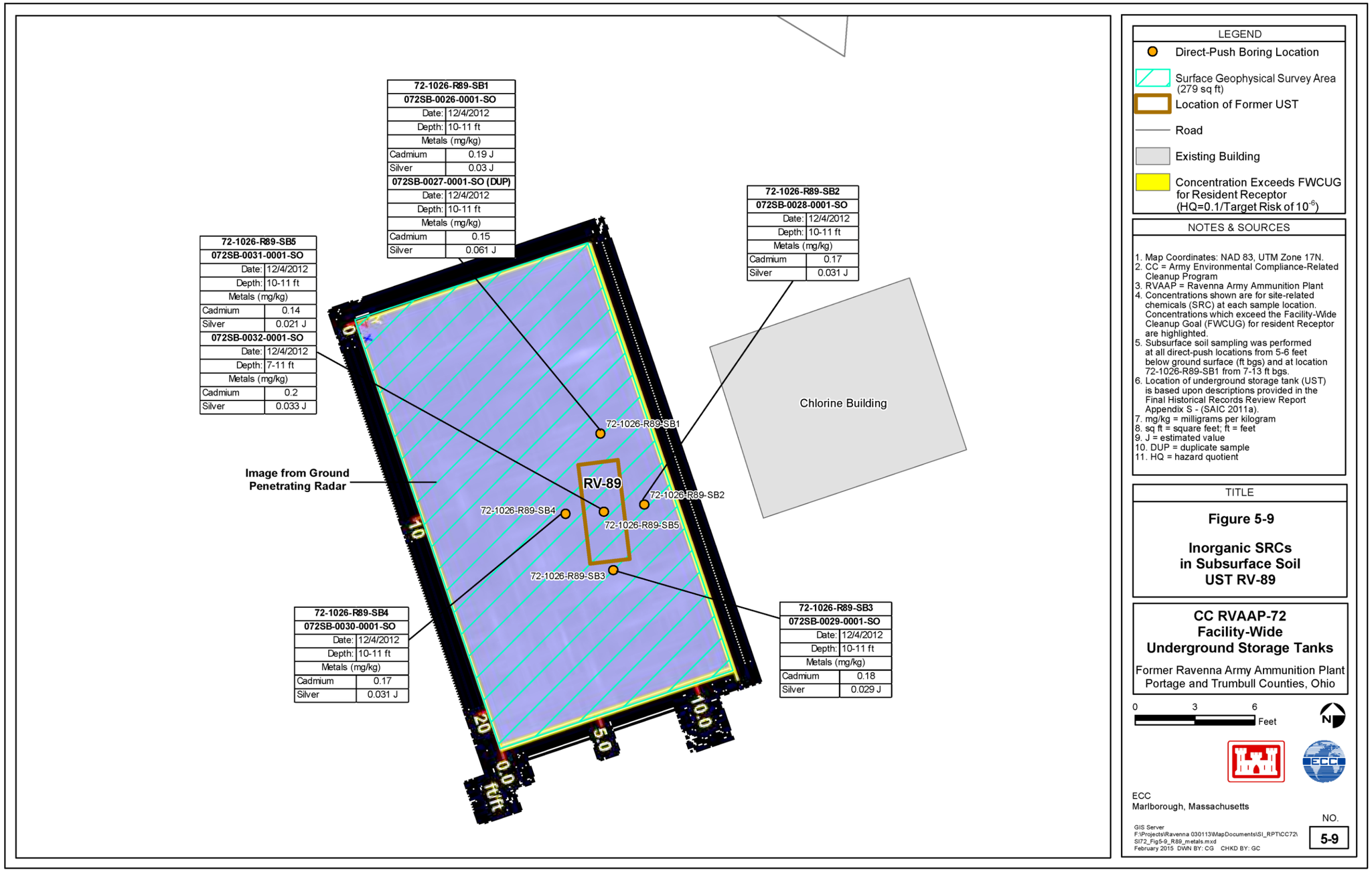
72-1026-R89-SB1
072SB-0026-0001-SO
Date: 12/4/2012
Depth: 10-11 ft
Metals (mg/kg)
Cadmium 0.19 J
Silver 0.03 J
072SB-0027-0001-SO (DUP)
Date: 12/4/2012
Depth: 10-11 ft
Metals (mg/kg)
Cadmium 0.15
Silver 0.061 J
72-1026-R89-SB2
072SB-0028-0001-SO
Date: 12/4/2012
Depth: 10-11 ft
Metals (mg/kg)
Cadmium 0.17
Silver 0.031 J
72-1026-R89-SB5
072SB-0031-0001-SO
Date: 12/4/2012
Depth: 10-11 ft
Metals (mg/kg)
Cadmium 0.14
Silver 0.021 J
072SB-0032-0001-SO
Date: 12/4/2012
Depth: 7-11 ft
Metals (mg/kg)
Cadmium 0.2
Silver 0.033 J
Chlorine Building
Image from Ground Penetrating Radar
RV-89
72-1026-R89-SB1
72-1026-R89-SB2
72-1026-R89-SB4
72-1026-R89-SB5
72-1026-R89-SB3
72-1026-R89-SB4
072SB-0030-0001-SO
Date: 12/4/2012
Depth: 10-11 ft
Metals (mg/kg)
Cadmium 0.17
Silver 0.031 J
72-1026-R89-SB3
072SB-0029-0001-SO
Date: 12/4/2012
Depth: 10-11 ft
Metals (mg/kg)
Cadmium 0.18
Silver 0.029 J
10
20
5.0
10.0
0.0 ft/ft
LEGEND
Direct-Push Boring Location
Surface Geophysical Survey Area (279 sq ft)
Location of Former UST
Road
Existing Building
Concentration Exceeds FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-5)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for resident Receptor are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 5-6 feet below ground surface (ft bgs) and at location 72-1026-R89-SB1 from 7-13 ft bgs.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. sq ft = square feet; ft = feet
9. J = estimated value
10. DUP = duplicate sample
11. HQ = hazard quotient
TITLE
Figure 5-9
Inorganic SRCs in Subsurface Soil UST RV-89
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 3 6
Feet
N
ECC
Marlborough, Massachusetts
NO.
5-9
GIS Server
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February 2015 DWN BY: CG CHKD BY: GC

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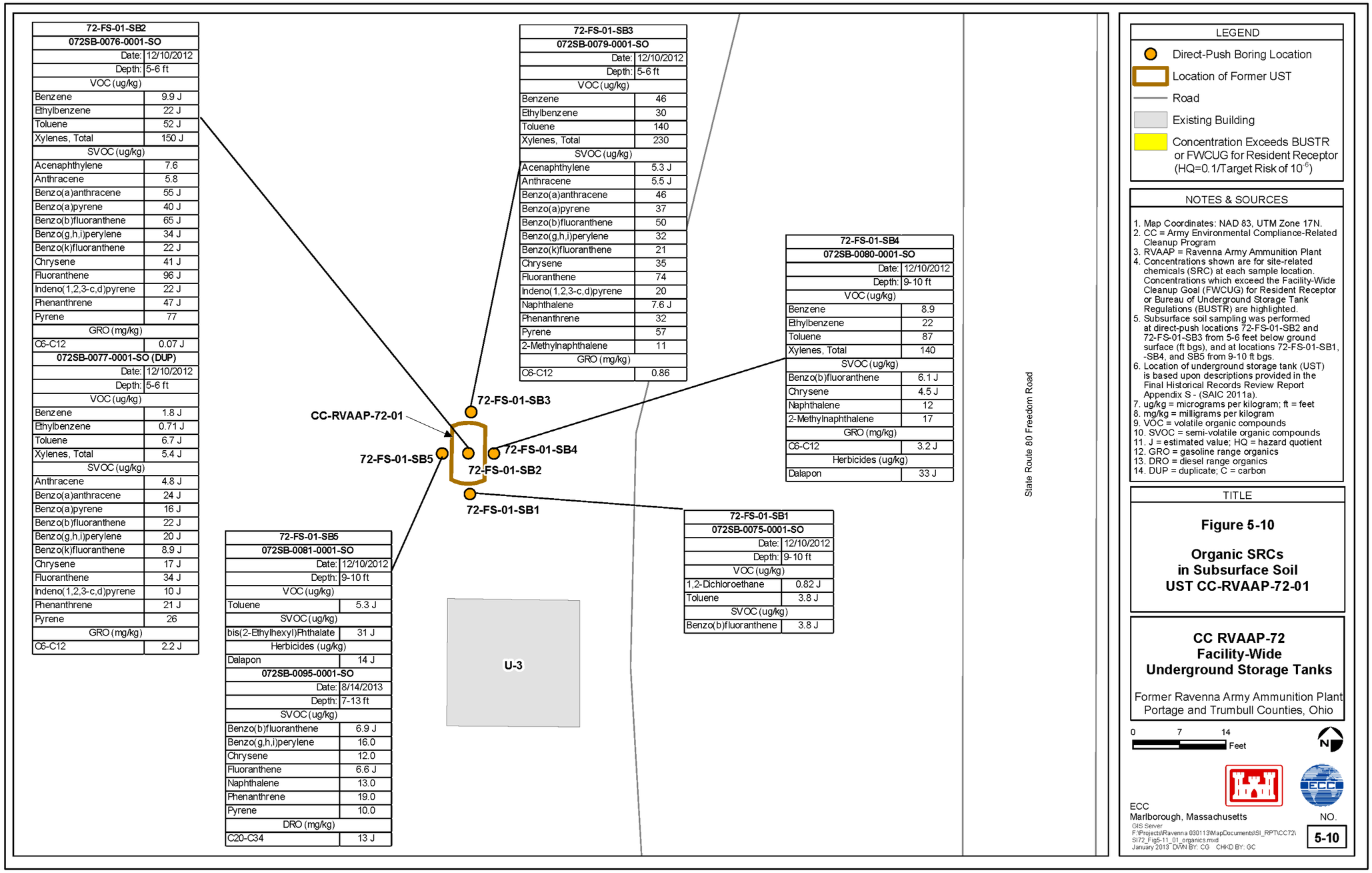
72-FS-01-SB2
072SB-0076-0001-SO
Date: 12/10/2012
Depth: 5-6 ft
VOC (ug/kg)
Benzene 9.9 J
Ethylbenzene 22 J
Toluene 52 J
Xylenes, Total 150 J
SVOC (ug/kg)
Acenaphthylene 7.6
Anthracene 5.8
Benzo(a)anthracene 55 J
Benzo(a)pyrene 40 J
Benzo(b)fluoranthene 65 J
Benzo(g,h,i)perylene 34 J
Benzo(k)fluoranthene 22 J
Chrysene 41 J
Fluoranthene 96 J
Indeno(1,2,3-c,d)pyrene 22 J
Phenanthrene 47 J
Pyrene 77
GRO (mg/kg)
C6-C12 0.07 J
072SB-0077-0001-SO (DUP)
Date: 12/10/2012
Depth: 5-6 ft
VOC (ug/kg)
Benzene 1.8 J
Ethylbenzene 0.71 J
Toluene 6.7 J
Xylenes, Total 5.4 J
SVOC (ug/kg)
Anthracene 4.8 J
Benzo(a)anthracene 24 J
Benzo(a)pyrene 16 J
Benzo(b)fluoranthene 22 J
Benzo(g,h,i)perylene 20 J
Benzo(k)fluoranthene 8.9 J
Chrysene 17 J
Fluoranthene 34 J
Indeno(1,2,3-c,d)pyrene 10 J
Phenanthrene 21 J
Pyrene 26
GRO (mg/kg)
C6-C12 2.2 J
72-FS-01-SB3
072SB-0079-0001-SO
Date: 12/10/2012
Depth: 5-6 ft
VOC (ug/kg)
Benzene 46
Ethylbenzene 30
Toluene 140
Xylenes, Total 230
SVOC (ug/kg)
Acenaphthylene 5.3 J
Anthracene 5.5 J
Benzo(a)anthracene 46
Benzo(a)pyrene 37
Benzo(b)fluoranthene 50
Benzo(g,h,i)perylene 32
Benzo(k)fluoranthene 21
Chrysene 35
Fluoranthene 74
Indeno(1,2,3-c,d)pyrene 20
Naphthalene 7.6 J
Phenanthrene 32
Pyrene 57
2-Methylnaphthalene 11
GRO (mg/kg)
C6-C12 0.86
72-FS-01-SB4
072SB-0080-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
Benzene 8.9
Ethylbenzene 22
Toluene 87
Xylenes, Total 140
SVOC (ug/kg)
Benzo(b)fluoranthene 6.1 J
Chrysene 4.5 J
Naphthalene 12
2-Methylnaphthalene 17
GRO (mg/kg)
C6-C12 3.2 J
Herbicides (ug/kg)
Dalapon 33 J
72-FS-01-SB1
072SB-0075-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
1,2-Dichloroethane 0.82 J
Toluene 3.8 J
SVOC (ug/kg)
Benzo(b)fluoranthene 3.8 J
72-FS-01-SB5
072SB-0081-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
Toluene 5.3 J
SVOC (ug/kg)
bis(2-Ethylhexyl)Phthalate 31 J
Herbicides (ug/kg)
Dalapon 14 J
072SB-0095-0001-SO
Date: 8/14/2013
Depth: 7-13 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 6.9 J
Benzo(g,h,i)perylene 16.0
Chrysene 12.0
Fluoranthene 6.6 J
Naphthalene 13.0
Phenanthrene 19.0
Pyrene 10.0
DRO (mg/kg)
C20-C34 13 J
CC-RVAAP-72-01
72-FS-01-SB3
72-FS-01-SB5
72-FS-01-SB4
72-FS-01-SB2
72-FS-01-SB1
U-3
State Route 80 Freedom Road
LEGEND
Direct-Push Boring Location
Location of Former UST
Road
Existing Building
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at direct-push locations 72-FS-01-SB2 and 72-FS-01-SB3 from 5-6 feet below ground surface (ft bgs), and at locations 72-FS-01-SB1, -SB4, and SB5 from 9-10 ft bgs.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. ug/kg = micrograms per kilogram; ft = feet
8. mg/kg = milligrams per kilogram
9. VOC = volatile organic compounds
10. SVOC = semi-volatile organic compounds
11. J = estimated value; HQ = hazard quotient
12. GRO = gasoline range organics
13. DRO = diesel range organics
14. DUP = duplicate; C = carbon
TITLE
Figure 5-10
Organic SRCs in Subsurface Soil
UST CC-RVAAP-72-01
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0 7 14
Feet
N
ECC
Marlborough, Massachusetts
GIS Server
F:\Projects\Ravenna 030113\MapDocuments\SI_RPT\CC72\SI72_Fig5-11_01_organics.mxd
January 2013 DWN BY: CG CHKD BY: GC
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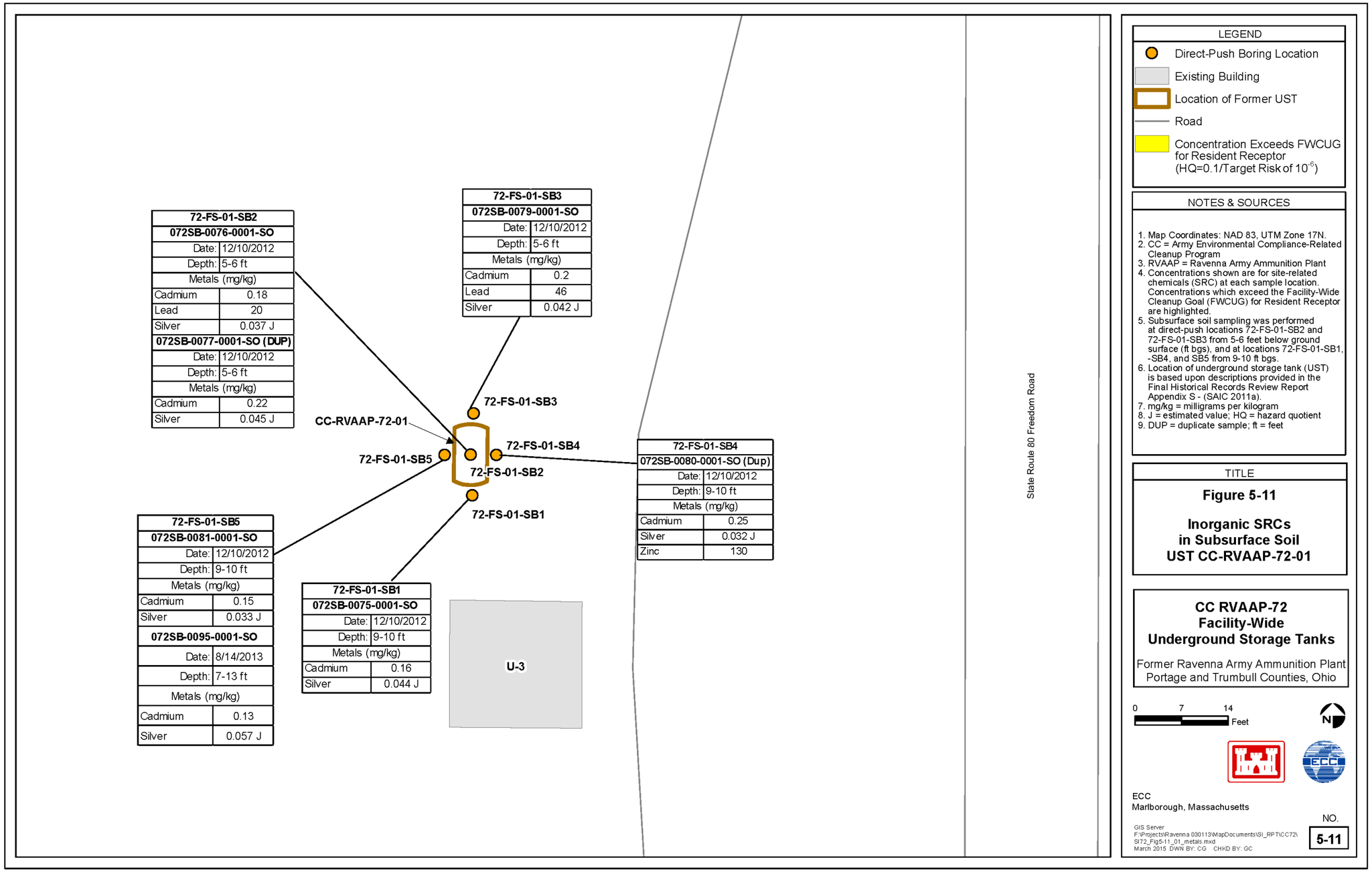
72-FS-01-SB2
072SB-0076-0001-SO
Date: 12/10/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.18
Lead 20
Silver 0.037 J
072SB-0077-0001-SO (DUP)
Date: 12/10/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.22
Silver 0.045 J
72-FS-01-SB3
072SB-0079-0001-SO
Date: 12/10/2012
Depth: 5-6 ft
Metals (mg/kg)
Cadmium 0.2
Lead 46
Silver 0.042 J
72-FS-01-SB3
CC-RVAAP-72-01
72-FS-01-SB4
72-FS-01-SB5
72-FS-01-SB2
72-FS-01-SB1
72-FS-01-SB4
072SB-0080-0001-SO (Dup)
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.25
Silver 0.032 J
Zinc 130
72-FS-01-SB5
072SB-0081-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.15
Silver 0.033 J
072SB-0095-0001-SO
Date: 8/14/2013
Depth: 7-13 ft
Metals (mg/kg)
Cadmium 0.13
Silver 0.057 J
72-FS-01-SB1
072SB-0075-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
Metals (mg/kg)
Cadmium 0.16
Silver 0.044 J
U-3
State Route 80 Freedom Road
LEGEND
Direct-Push Boring Location
Existing Building
Location of Former UST
Road
Concentration Exceeds FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor are highlighted.
5. Subsurface soil sampling was performed at direct-push locations 72-FS-01-SB2 and 72-FS-01-SB3 from 5-6 feet below ground surface (ft bgs), and at locations 72-FS-01-SB1, -SB4, and SB5 from 9-10 ft bgs.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. J = estimated value; HQ = hazard quotient
9. DUP = duplicate sample; ft = feet
TITLE
Figure 5-11
Inorganic SRCs in Subsurface Soil UST CC-RVAAP-72-01
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 7 14
Feet
N
ECC
Marlborough, Massachusetts
NO.
5-11
GIS Server
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March 2015 DWN BY: CG CHKD BY: GC

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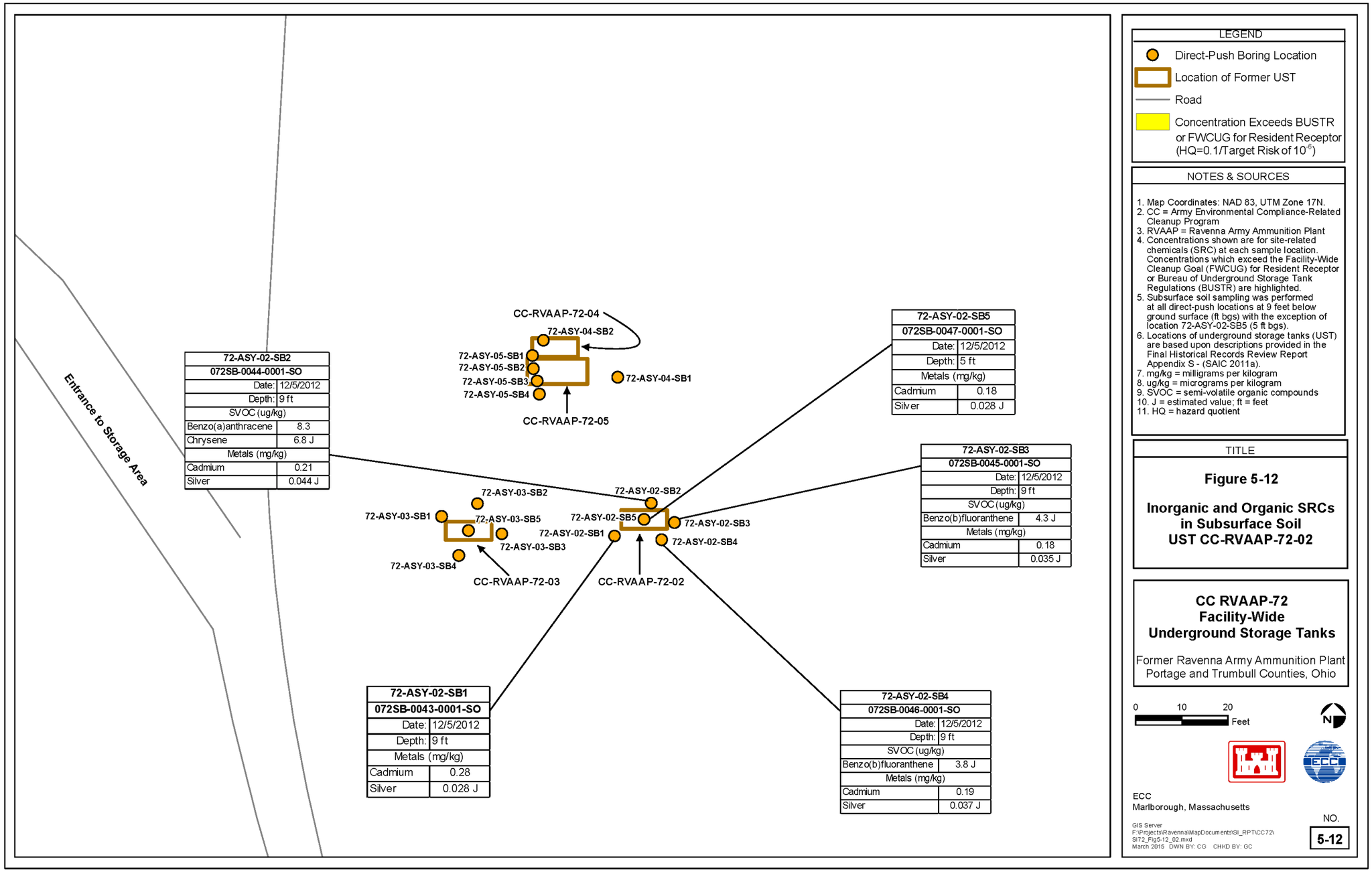
Entrance to Storage Area
CC-RVAAP-72-04
72-ASY-04-SB2
72-ASY-05-SB1
72-ASY-05-SB2
72-ASY-05-SB3
72-ASY-05-SB4
72-ASY-04-SB1
CC-RVAAP-72-05
72-ASY-02-SB2
072SB-0044-0001-SO
Date: 12/5/2012
Depth: 9 ft
SVOC (ug/kg)
Benzo(a)anthracene 8.3
Chrysene 6.8 J
Metals (mg/kg)
Cadmium 0.21
Silver 0.044 J
72-ASY-02-SB5
072SB-0047-0001-SO
Date: 12/5/2012
Depth: 5 ft
Metals (mg/kg)
Cadmium 0.18
Silver 0.028 J
72-ASY-02-SB3
072SB-0045-0001-SO
Date: 12/5/2012
Depth: 9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 4.3 J
Metals (mg/kg)
Cadmium 0.18
Silver 0.035 J
72-ASY-03-SB2
72-ASY-03-SB1
72-ASY-03-SB5
72-ASY-03-SB3
72-ASY-03-SB4
CC-RVAAP-72-03
72-ASY-02-SB2
72-ASY-02-SB5
72-ASY-02-SB1
72-ASY-02-SB3
72-ASY-02-SB4
CC-RVAAP-72-02
72-ASY-02-SB1
072SB-0043-0001-SO
Date: 12/5/2012
Depth: 9 ft
Metals (mg/kg)
Cadmium 0.28
Silver 0.028 J
72-ASY-02-SB4
072SB-0046-0001-SO
Date: 12/5/2012
Depth: 9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 3.8 J
Metals (mg/kg)
Cadmium 0.19
Silver 0.037 J
LEGEND
Direct-Push Boring Location
Location of Former UST
Road
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations at 9 feet below ground surface (ft bgs) with the exception of location 72-ASY-02-SB5 (5 ft bgs).
6. Locations of underground storage tanks (UST) are based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. SVOC = semi-volatile organic compounds
10. J = estimated value; ft = feet
11. HQ = hazard quotient
TITLE
Figure 5-12
Inorganic and Organic SRCs in Subsurface Soil UST CC-RVAAP-72-02
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 10 20 Feet
N
ECC
Marlborough, Massachusetts
GIS Server
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March 2015 DWN BY: CG CHKD BY: GC
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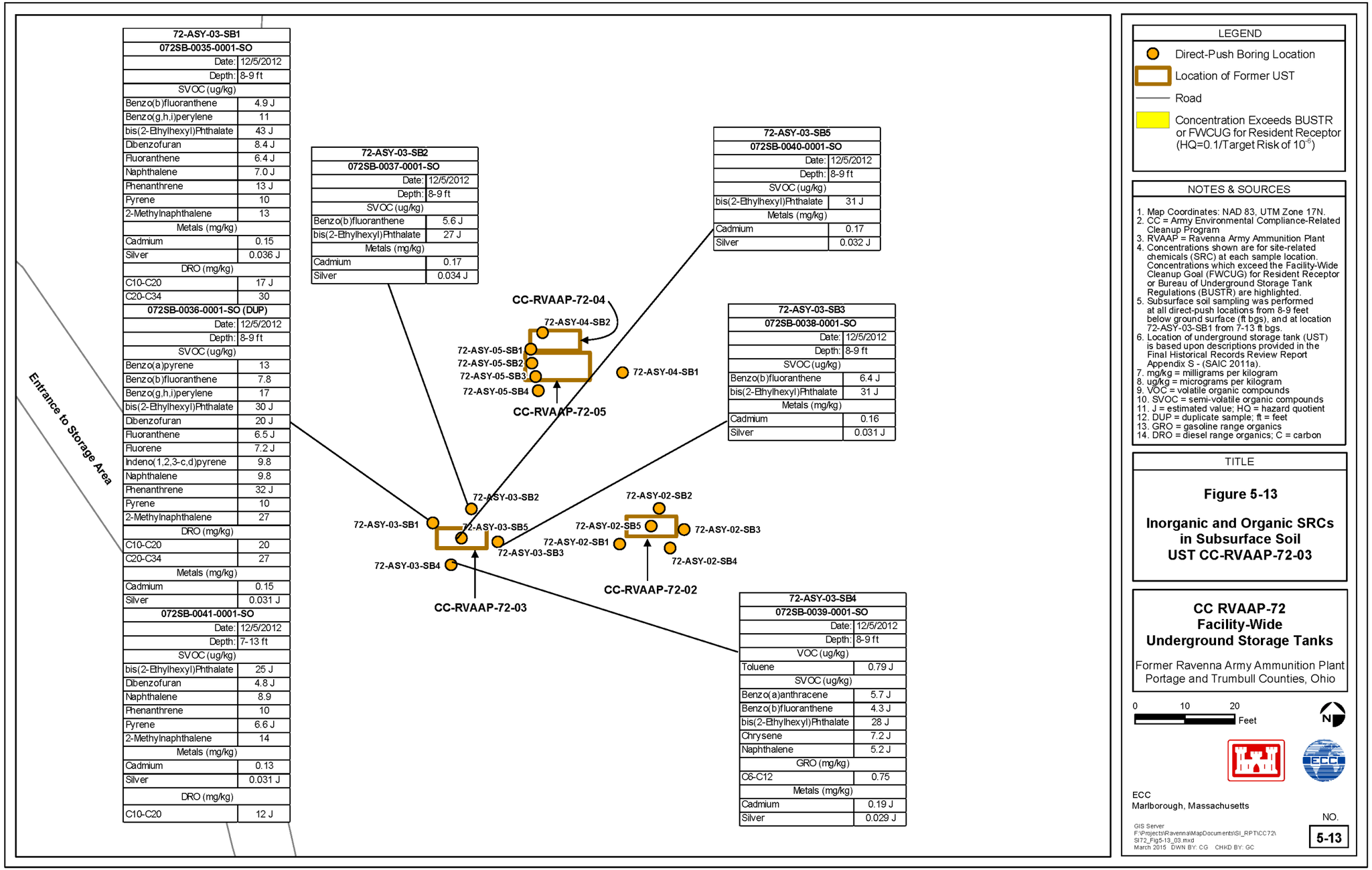
Entrance to Storage Area
72-ASY-03-SB1
072SB-0035-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 4.9 J
Benzo(g,h,i)perylene 11
bis(2-Ethylhexyl)Phthalate 43 J
Dibenzofuran 8.4 J
Fluoranthene 6.4 J
Naphthalene 7.0 J
Phenanthrene 13 J
Pyrene 10
2-Methylnaphthalene 13
Metals (mg/kg)
Cadmium 0.15
Silver 0.036 J
DRO (mg/kg)
C10-C20 17 J
C20-C34 30
072SB-0036-0001-SO (DUP)
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(a)pyrene 13
Benzo(b)fluoranthene 7.8
Benzo(g,h,i)perylene 17
bis(2-Ethylhexyl)Phthalate 30 J
Dibenzofuran 20 J
Fluoranthene 6.5 J
Fluorene 7.2 J
Indeno(1,2,3-c,d)pyrene 9.8
Naphthalene 9.8
Phenanthrene 32 J
Pyrene 10
2-Methylnaphthalene 27
DRO (mg/kg)
C10-C20 20
C20-C34 27
Metals (mg/kg)
Cadmium 0.15
Silver 0.031 J
072SB-0041-0001-SO
Date: 12/5/2012
Depth: 7-13 ft
SVOC (ug/kg)
bis(2-Ethylhexyl)Phthalate 25 J
Dibenzofuran 4.8 J
Naphthalene 8.9
Phenanthrene 10
Pyrene 6.6 J
2-Methylnaphthalene 14
Metals (mg/kg)
Cadmium 0.13
Silver 0.031 J
DRO (mg/kg)
C10-C20 12 J
72-ASY-03-SB2
072SB-0037-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 5.6 J
bis(2-Ethylhexyl)Phthalate 27 J
Metals (mg/kg)
Cadmium 0.17
Silver 0.034 J
72-ASY-03-SB5
072SB-0040-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
bis(2-Ethylhexyl)Phthalate 31 J
Metals (mg/kg)
Cadmium 0.17
Silver 0.032 J
72-ASY-03-SB3
072SB-0038-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 6.4 J
bis(2-Ethylhexyl)Phthalate 31 J
Metals (mg/kg)
Cadmium 0.16
Silver 0.031 J
72-ASY-03-SB4
072SB-0039-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
VOC (ug/kg)
Toluene 0.79 J
SVOC (ug/kg)
Benzo(a)anthracene 5.7 J
Benzo(b)fluoranthene 4.3 J
bis(2-Ethylhexyl)Phthalate 28 J
Chrysene 7.2 J
Naphthalene 5.2 J
GRO (mg/kg)
C6-C12 0.75
Metals (mg/kg)
Cadmium 0.19 J
Silver 0.029 J
CC-RVAAP-72-04
72-ASY-04-SB2
72-ASY-05-SB1
72-ASY-05-SB2
72-ASY-05-SB3
72-ASY-05-SB4
CC-RVAAP-72-05
72-ASY-04-SB1
72-ASY-03-SB2
72-ASY-03-SB1
72-ASY-03-SB5
72-ASY-03-SB3
72-ASY-03-SB4
CC-RVAAP-72-03
72-ASY-02-SB2
72-ASY-02-SB5
72-ASY-02-SB3
72-ASY-02-SB1
72-ASY-02-SB4
CC-RVAAP-72-02
LEGEND
Direct-Push Boring Location
Location of Former UST
Road
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 8-9 feet below ground surface (ft bgs), and at location 72-ASY-03-SB1 from 7-13 ft bgs.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. VOC = volatile organic compounds
10. SVOC = semi-volatile organic compounds
11. J = estimated value; HQ = hazard quotient
12. DUP = duplicate sample; ft = feet
13. GRO = gasoline range organics
14. DRO = diesel range organics; C = carbon
TITLE
Figure 5-13
Inorganic and Organic SRCs in Subsurface Soil UST CC-RVAAP-72-03
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0 10 20
Feet
N
ECC
Marlborough, Massachusetts
NO.
5-13
GIS Server
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March 2015 DWN BY: CG CHKD BY: GC

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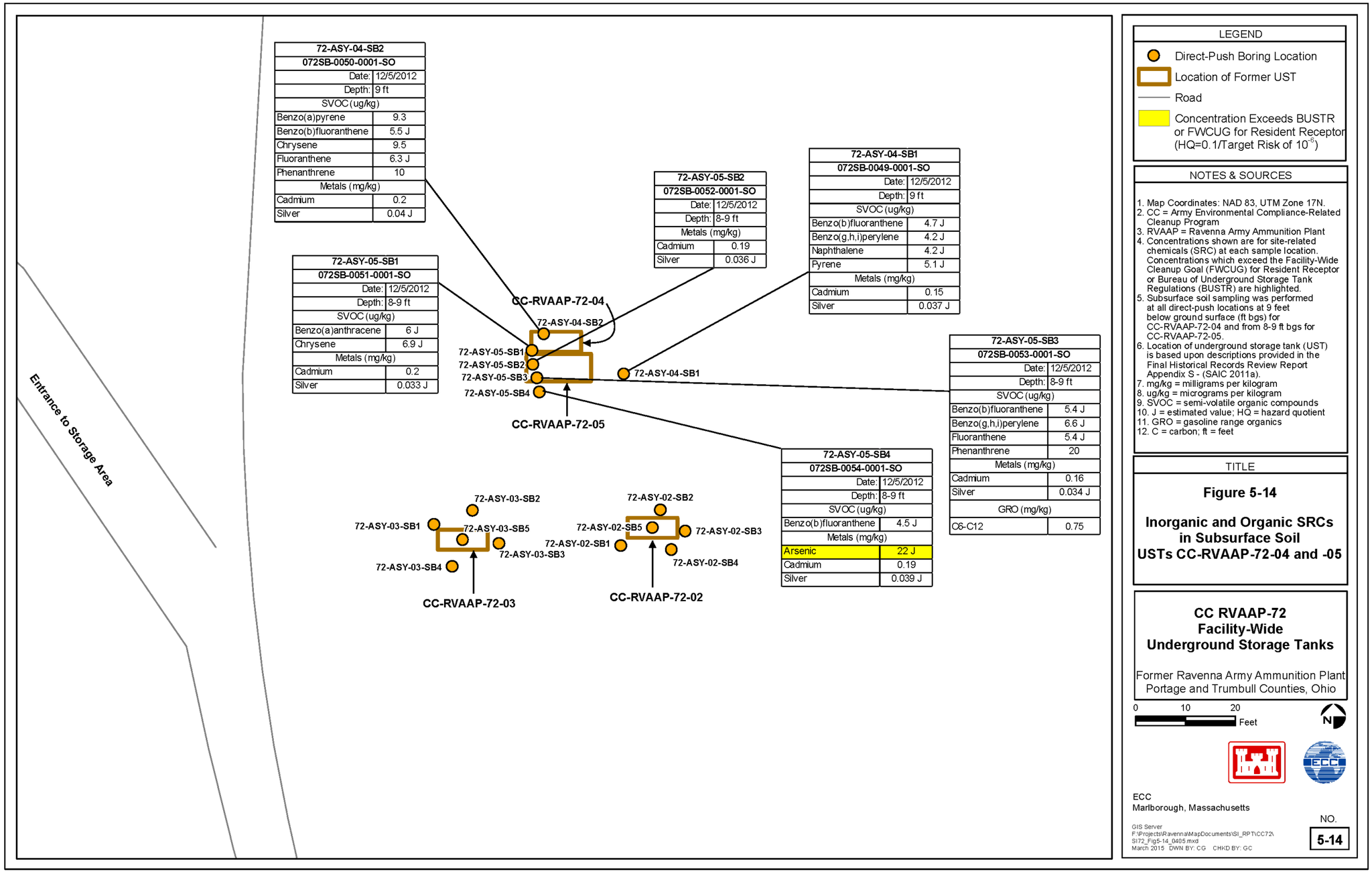
Entrance to Storage Area
72-ASY-04-SB2
072SB-0050-0001-SO
Date: 12/5/2012
Depth: 9 ft
SVOC (ug/kg)
Benzo(a)pyrene 9.3
Benzo(b)fluoranthene 5.5 J
Chrysene 9.5
Fluoranthene 6.3 J
Phenanthrene 10
Metals (mg/kg)
Cadmium 0.2
Silver 0.04 J
72-ASY-05-SB2
072SB-0052-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
Metals (mg/kg)
Cadmium 0.19
Silver 0.036 J
72-ASY-04-SB1
072SB-0049-0001-SO
Date: 12/5/2012
Depth: 9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 4.7 J
Benzo(g,h,i)perylene 4.2 J
Naphthalene 4.2 J
Pyrene 5.1 J
Metals (mg/kg)
Cadmium 0.15
Silver 0.037 J
72-ASY-05-SB1
072SB-0051-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(a)anthracene 6 J
Chrysene 6.9 J
Metals (mg/kg)
Cadmium 0.2
Silver 0.033 J
CC-RVAAP-72-04
72-ASY-04-SB2
72-ASY-05-SB1
72-ASY-05-SB2
72-ASY-05-SB3
72-ASY-05-SB4
72-ASY-04-SB1
CC-RVAAP-72-05
72-ASY-05-SB3
072SB-0053-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 5.4 J
Benzo(g,h,i)perylene 6.6 J
Fluoranthene 5.4 J
Phenanthrene 20
Metals (mg/kg)
Cadmium 0.16
Silver 0.034 J
GRO (mg/kg)
C6-C12 0.75
72-ASY-05-SB4
072SB-0054-0001-SO
Date: 12/5/2012
Depth: 8-9 ft
SVOC (ug/kg)
Benzo(b)fluoranthene 4.5 J
Metals (mg/kg)
Arsenic 22 J
Cadmium 0.19
Silver 0.039 J
72-ASY-03-SB2
72-ASY-03-SB1
72-ASY-03-SB5
72-ASY-03-SB3
72-ASY-03-SB4
CC-RVAAP-72-03
72-ASY-02-SB2
72-ASY-02-SB5
72-ASY-02-SB3
72-ASY-02-SB1
72-ASY-02-SB4
CC-RVAAP-72-02
LEGEND
Direct-Push Boring Location
Location of Former UST
Road
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-5)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations at 9 feet below ground surface (ft bgs) for CC-RVAAP-72-04 and from 8-9 ft bgs for CC-RVAAP-72-05.
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. SVOC = semi-volatile organic compounds
10. J = estimated value; HQ = hazard quotient
11. GRO = gasoline range organics
12. C = carbon; ft = feet
TITLE
Figure 5-14
Inorganic and Organic SRCs in Subsurface Soil
USTs CC-RVAAP-72-04 and -05
CC RVAAP-72
Facility-Wide
Underground Storage Tanks
Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio
0 10 20
Feet
N
ECC
Marlborough, Massachusetts
GIS Server
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March 2015 DWN BY: CG CHKD BY: GC
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5-14

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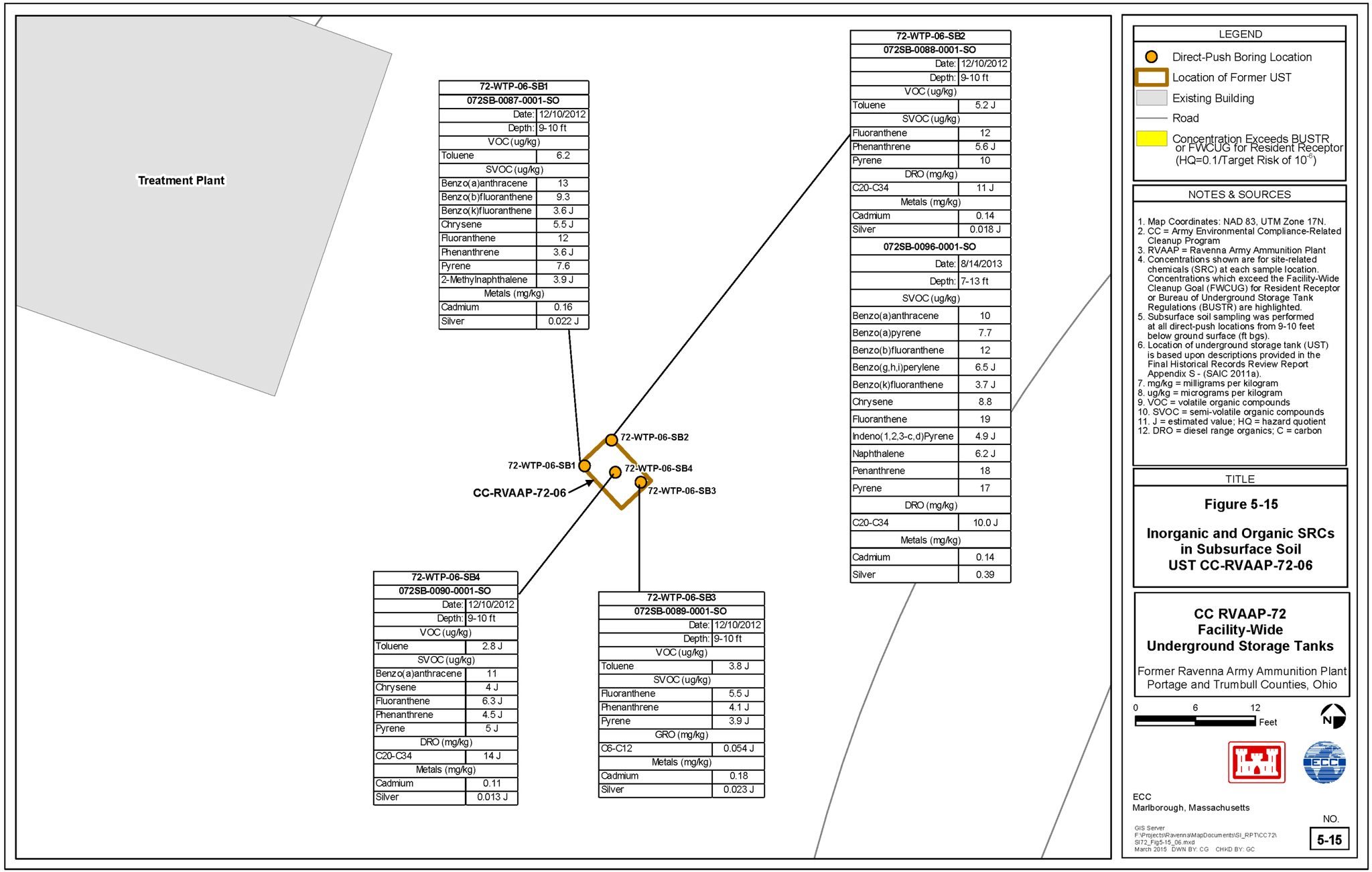
Treatment Plant
72-WTP-06-SB1
072SB-0087-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
Toluene 6.2
SVOC (ug/kg)
Benzo(a)anthracene 13
Benzo(b)fluoranthene 9.3
Benzo(k)fluoranthene 3.6 J
Chrysene 5.5 J
Fluoranthene 12
Phenanthrene 3.6 J
Pyrene 7.6
2-Methylnaphthalene 3.9 J
Metals (mg/kg)
Cadmium 0.16
Silver 0.022 J
72-WTP-06-SB2
072SB-0088-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
Toluene 5.2 J
SVOC (ug/kg)
Fluoranthene 12
Phenanthrene 5.6 J
Pyrene 10
DRO (mg/kg)
C20-C34 11 J
Metals (mg/kg)
Cadmium 0.14
Silver 0.018 J
072SB-0096-0001-SO
Date: 8/14/2013
Depth: 7-13 ft
SVOC (ug/kg)
Benzo(a)anthracene 10
Benzo(a)pyrene 7.7
Benzo(b)fluoranthene 12
Benzo(g,h,i)perylene 6.5 J
Benzo(k)fluoranthene 3.7 J
Chrysene 8.8
Fluoranthene 19
Indeno(1,2,3-c,d)Pyrene 4.9 J
Naphthalene 6.2 J
Penanthrene 18
Pyrene 17
DRO (mg/kg)
C20-C34 10.0 J
Metals (mg/kg)
Cadmium 0.14
Silver 0.39
72-WTP-06-SB2
72-WTP-06-SB1
72-WTP-06-SB4
72-WTP-06-SB3
CC-RVAAP-72-06
72-WTP-06-SB4
072SB-0090-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
Toluene 2.8 J
SVOC (ug/kg)
Benzo(a)anthracene 11
Chrysene 4 J
Fluoranthene 6.3 J
Phenanthrene 4.5 J
Pyrene 5 J
DRO (mg/kg)
C20-C34 14 J
Metals (mg/kg)
Cadmium 0.11
Silver 0.013 J
72-WTP-06-SB3
072SB-0089-0001-SO
Date: 12/10/2012
Depth: 9-10 ft
VOC (ug/kg)
Toluene 3.8 J
SVOC (ug/kg)
Fluoranthene 5.5 J
Phenanthrene 4.1 J
Pyrene 3.9 J
GRO (mg/kg)
C6-C12 0.054 J
Metals (mg/kg)
Cadmium 0.18
Silver 0.023 J
LEGEND
Direct-Push Boring Location
Location of Former UST
Existing Building
Road
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations from 9-10 feet below ground surface (ft bgs).
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. VOC = volatile organic compounds
10. SVOC = semi-volatile organic compounds
11. J = estimated value; HQ = hazard quotient
12. DRO = diesel range organics; C = carbon
TITLE
Figure 5-15
Inorganic and Organic SRCs in Subsurface Soil UST CC-RVAAP-72-06
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 6 12 Feet
N
ECC
Marlborough, Massachusetts
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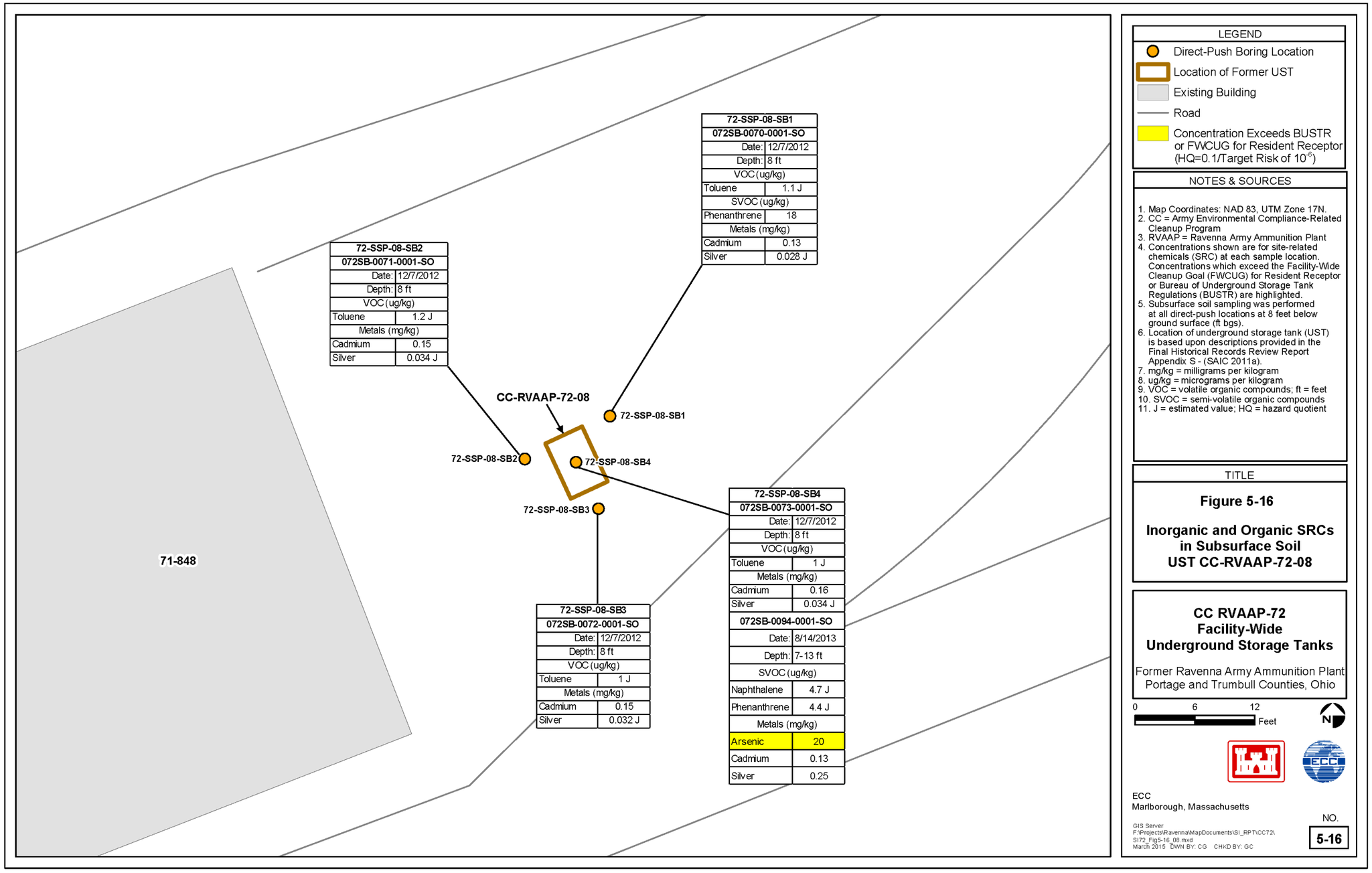
72-SSP-08-SB1
072SB-0070-0001-SO
Date: 12/7/2012
Depth: 8 ft
VOC (ug/kg)
Toluene 1.1 J
SVOC (ug/kg)
Phenanthrene 18
Metals (mg/kg)
Cadmium 0.13
Silver 0.028 J
72-SSP-08-SB2
072SB-0071-0001-SO
Date: 12/7/2012
Depth: 8 ft
VOC (ug/kg)
Toluene 1.2 J
Metals (mg/kg)
Cadmium 0.15
Silver 0.034 J
CC-RVAAP-72-08
72-SSP-08-SB1
72-SSP-08-SB2
72-SSP-08-SB4
72-SSP-08-SB3
71-848
72-SSP-08-SB3
072SB-0072-0001-SO
Date: 12/7/2012
Depth: 8 ft
VOC (ug/kg)
Toluene 1 J
Metals (mg/kg)
Cadmium 0.15
Silver 0.032 J
72-SSP-08-SB4
072SB-0073-0001-SO
Date: 12/7/2012
Depth: 8 ft
VOC (ug/kg)
Toluene 1 J
Metals (mg/kg)
Cadmium 0.16
Silver 0.034 J
072SB-0094-0001-SO
Date: 8/14/2013
Depth: 7-13 ft
SVOC (ug/kg)
Naphthalene 4.7 J
Phenanthrene 4.4 J
Metals (mg/kg)
Arsenic 20
Cadmium 0.13
Silver 0.25
LEGEND
Direct-Push Boring Location
Location of Former UST
Existing Building
Road
Concentration Exceeds BUSTR or FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10-6)
NOTES & SOURCES
1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for site-related chemicals (SRC) at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor or Bureau of Underground Storage Tank Regulations (BUSTR) are highlighted.
5. Subsurface soil sampling was performed at all direct-push locations at 8 feet below ground surface (ft bgs).
6. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
7. mg/kg = milligrams per kilogram
8. ug/kg = micrograms per kilogram
9. VOC = volatile organic compounds; ft = feet
10. SVOC = semi-volatile organic compounds
11. J = estimated value; HQ = hazard quotient
TITLE
Figure 5-16
Inorganic and Organic SRCs in Subsurface Soil UST CC-RVAAP-72-08
CC RVAAP-72 Facility-Wide Underground Storage Tanks
Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio
0 6 12
Feet
N
ECC
Marlborough, Massachusetts
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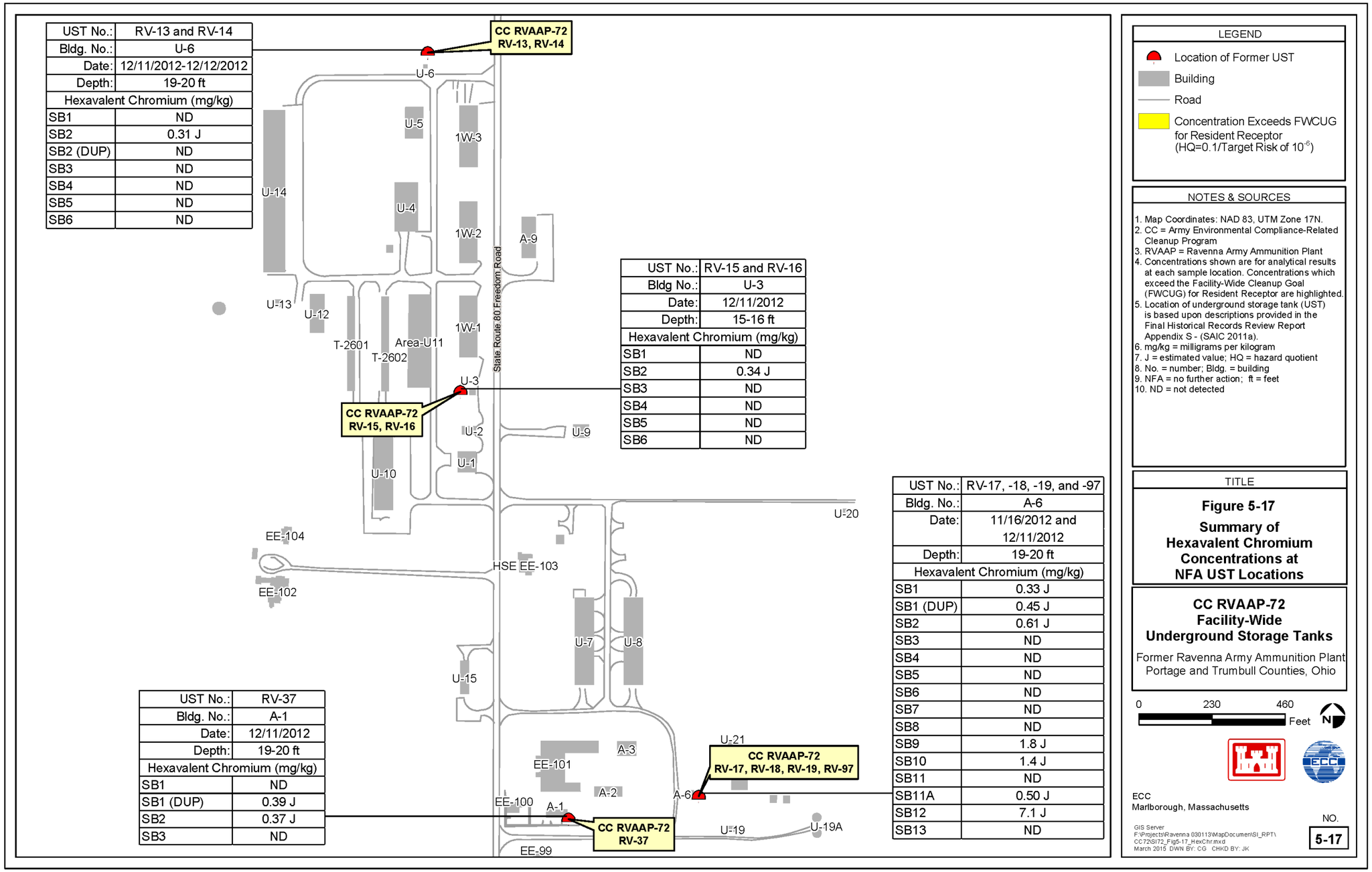

UST No.:	RV-13 and RV-14
Bldg. No.:	U-6
Date:	12/11/2012-12/12/2012
Depth:	19-20 ft
Hexavalent Chromium (mg/kg)	
SB1	ND
SB2	0.31 J
SB2 (DUP)	ND
SB3	ND
SB4	ND
SB5	ND
SB6	ND

UST No.:	RV-15 and RV-16
Bldg No.:	U-3
Date:	12/11/2012
Depth:	15-16 ft
Hexavalent Chromium (mg/kg)	
SB1	ND
SB2	0.34 J
SB3	ND
SB4	ND
SB5	ND
SB6	ND

UST No.:	RV-17, -18, -19, and -97
Bldg. No.:	A-6
Date:	11/16/2012 and 12/11/2012
Depth:	19-20 ft
Hexavalent Chromium (mg/kg)	
SB1	0.33 J
SB1 (DUP)	0.45 J
SB2	0.61 J
SB3	ND
SB4	ND
SB5	ND
SB6	ND
SB7	ND
SB8	ND
SB9	1.8 J
SB10	1.4 J
SB11	ND
SB11A	0.50 J
SB12	7.1 J
SB13	ND

UST No.:	RV-37
Bldg. No.:	A-1
Date:	12/11/2012
Depth:	19-20 ft
Hexavalent Chromium (mg/kg)	
SB1	ND
SB1 (DUP)	0.39 J
SB2	0.37 J
SB3	ND

LEGEND

- Location of Former UST
- Building
- Road
- Concentration Exceeds FWCUG for Resident Receptor (HQ=0.1/Target Risk of 10^{-6})

NOTES & SOURCES

1. Map Coordinates: NAD 83, UTM Zone 17N.
2. CC = Army Environmental Compliance-Related Cleanup Program
3. RVAAP = Ravenna Army Ammunition Plant
4. Concentrations shown are for analytical results at each sample location. Concentrations which exceed the Facility-Wide Cleanup Goal (FWCUG) for Resident Receptor are highlighted.
5. Location of underground storage tank (UST) is based upon descriptions provided in the Final Historical Records Review Report Appendix S - (SAIC 2011a).
6. mg/kg = milligrams per kilogram
7. J = estimated value; HQ = hazard quotient
8. No. = number; Bldg. = building
9. NFA = no further action; ft = feet
10. ND = not detected

TITLE

Figure 5-17
Summary of Hexavalent Chromium Concentrations at NFA UST Locations

CC RVAAP-72 Facility-Wide Underground Storage Tanks

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

0 230 460 Feet

N

ECC
Marlborough, Massachusetts

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6.0 EXPOSURE PATHWAYS

6.1 SOIL EXPOSURE AND AIR PATHWAYS

6.1.1 Physical Conditions

The 15 former UST locations with no record of previous sampling under CC RVAAP-72 FWUSTs are shown on Figure 2-1, and the 9 former NFA USTs are shown on Figure 2-2. With the exception of former UST locations RV-46 and CC-RVAAP-72-01, which are located in the Lavery Till, the 15 former UST locations are generally located on Hiram Till glacial deposits (Figure 1-4). There are four classifications (USDA 2010) of silty loam soils beneath these 15 former UST locations for CC RVAAP-72 FWUSTs as summarized in Table 6-1. All soil types are clay or silty-clay soils derived from glacial till. All but one soil type (MnB) is classified as low permeability soils. The soil type underlying the 9 former NFA UST sites is WaA or MnB as described in Table 6-1.

The inferred bedrock formation beneath the 24 former UST locations is the Pennsylvanian-age Pottsville Formation, Sharon Sandstone member, informally referred to as the Sharon Conglomerate (Winslow and White 1966). The elevation of the top of the Sharon Sandstone is estimated to range from 950 to 1150 ft above mean sea level at the various former UST locations, based on Ohio Department of Natural Resources bedrock topography maps (Figure 1-12). All of the former USTs were installed above the top of bedrock.

6.1.2 Soil and Air Targets

Current potential soil targets include human and ecological (animal and plant) receptors that may come into contact with subsurface soil, if contaminants are present within or adjacent to the former UST locations. All of the former USTs were installed below the ground surface, and any releases to soil would most likely have been to subsurface soil, which reduces the potential for exposure to ecological receptors via soil and air targets.

Airborne contamination (e.g., windblown dust) is not considered a viable migration or exposure pathway for the 24 former UST locations that are the subject of this SI. The primary mechanism for a contaminant release would be directly to subsurface soil from leaking USTs. The 9 former NFA USTs no longer remain in-place, and 14 of the 15 former UST locations with no record of previous soil sampling are documented as being removed or were shown to have been removed by the absence of any geophysical anomalies obtained during this SI at their suspected locations. Potassium dichromate (hexavalent chromium), the only likely contaminant associated with the 9 former NFA USTs, has a very low vapor pressure. At the 15 former UST locations, TPH DRO and PAH petroleum compounds also have low vapor pressure indicating low potential for release due to volatilization. BTEX components of fuels have high vapor pressures; however, all reported BTEX concentrations were low levels in the parts per billion range. Most former UST locations are currently well vegetated. RVAAP is located in a humid climate, and soil moisture content is typically high, reducing potential for dust generation.

6.1.3 Soil and Air Pathway Conclusions

The SI analytical results indicate that petroleum-related chemicals were not detected at concentrations greater than their respective BUSTR Soil Class 1 Action Levels or the most stringent FWCUGs in any of the subsurface soil samples collected at the 15 former UST locations at CC RVAAP-72 FWUSTs. Additionally, hexavalent chromium did not exceed the most stringent FWCUG at the 9 former NFA USTs locations. Therefore, the exposure pathways for soil and air are incomplete.

6.2 SURFACE WATER PATHWAY

6.2.1 Hydrological Setting

No surface water samples were collected as part of this SI, as surface water and sediment are not present at the 24 former UST locations. None of the former UST locations included in this SI were located immediately adjacent to perennial surface water features.

6.2.2 Surface Water Targets

Potential surface water targets would include human receptors that use surface water for potable water supply or recreation, as well as environmental (e.g., streams, wetlands, sensitive aquatic environments) and physical targets (e.g., public or private water distribution system intakes) that may be affected by potential groundwater contamination on, or adjacent to, former UST locations included under CC RVAAP-72. No perennial streams are located within the immediate vicinity of the USTs. There were no observed springs or groundwater discharge points to a surface water body in the immediate vicinity of the former UST locations. Therefore, there is no complete exposure pathway for human or ecological receptors to surface water.

6.2.3 Surface Water Pathway Conclusions

There are no perennial surface water streams or wetlands in the immediate vicinity of the 24 former UST locations subject of this SI at CC RVAAP-72 FWUSTs. There were no observed springs or groundwater discharge points to a surface water body in the immediate vicinity of the former UST locations. Surface water flow is not a migration pathway for potential contamination related to the AOC.

6.3 GROUNDWATER PATHWAY

6.3.1 Hydrogeological Setting

Section 1.4.4 presents the general hydrogeological setting for the facility. Flow of groundwater in both the unconsolidated surficial and bedrock aquifers is predominantly eastward across the facility. In April 2011, OHARNG installed two bedrock aquifer wells at the facility within the Sharon Conglomerate for use as a groundwater supply. These potable wells are located near Buildings 1067 and 1068 within the former Administration Area, and another potable water well is located west of Building 1034. There is also one inactive non-potable groundwater supply

well just south of Winklepeck Burning Grounds along the east side of George Road, which was formerly used to supply water for environmental restoration activities. These groundwater supply wells are used solely for onsite activities and are not used for public distribution or commercial groundwater potable supply. Former UST locations RV-5, RV-4, RV-86, and RV-87 are within the former Administrative Area. Former UST locations RV-4, RV-86, and RV-87 are within 300 ft of the potable water well located near Building 1068. Former UST RV-5 is located within 400 ft of the potable water wells near Building 1034 and Building 1067.

In the HRR (SAIC 2011a), for former UST locations in proximity to wells (i.e., within 300 ft, according to BUSTR regulations), VOC and SVOC data (compiled from groundwater sampling events) were reviewed to assess whether releases of fuel constituents from the former UST to groundwater were likely to have occurred at that location. For the three former UST areas where wells were present, available groundwater quality data are presented in Table 6-2. Based on this information, there is no evidence to suggest that these former UST locations released petroleum-type contaminants to the groundwater. Historical groundwater data are provided in Appendix I.

The HRR report also noted the following information regarding UST closures. During UST excavations, groundwater was observed in very few UST excavation cavities. In the few instances when groundwater was encountered in excavations, samples were collected and analyzed to assess the presence of fuel-related constituents in groundwater. Results of groundwater analysis are provided in the UST inventory summary forms (Appendix S of the HRR) and respective closure reports (Appendix G of the HRR).

Depth to groundwater and site-specific groundwater flow directions vary across the former RVAAP. Site-specific groundwater quality or elevation data from monitoring wells are typically unavailable at all of the 24 subject former UST locations. Saturated soils indicative of groundwater was not encountered in any of the soil borings completed during this SI. Therefore, the depth to groundwater is expected to be at least greater than 13 ft bgs at the 15 former UST locations.

6.3.2 Groundwater Targets

Groundwater targets include human receptors that use groundwater for potable water supply, as well as environmental receptors (e.g., livestock, fish farms) and physical targets (e.g., springs) that may be affected by potential groundwater contamination on or adjacent to the site. There are no public, livestock, or commercial groundwater supply wells within the facility. Groundwater in the vicinity of former UST locations RV-4, RV-86, and RV-87 is currently used for onsite activities by the OHARNG.

6.3.3 Groundwater Pathway Conclusion

The results of this SI indicate that the subsurface soil is not contaminated; therefore, soil is not a source of groundwater contamination at CC RVAAP-72 FWUSTs. The groundwater associated with CC RVAAP-72 FWUSTs is being evaluated under the RVAAP-66 Facility-Wide Groundwater.

Table 6-1: Soil Classification Types at CC RVAAP-72 Underground Storage Tank Sites

USDA Soil Series Classification	Parent Material	CC RVAAP-72 UST Locations	Permeability
Mahoning silt loams (MgB)	Formed in silty clay loam or clay loam glacial till	Former UST locations: RV-4, RV-87, RV-86, RV-89, CC-RVAAP-72-06, CC-RVAAP-72-02, CC-RVAAP-72-03, CC-RVAAP-72-04, and CC-RVAAP-72-05	Slow
Mahoning silt loams (MgA)	Formed in silty clay loam or clay loam glacial till	Former UST locations: RV-5, RV-41, and RV-88	Slow
Wadsworth silt loams (WaB)	Formed in silty clay loam and silt loam glacial till	Former UST locations: RV-46, CC-RVAAP-72-01, RV-13, RV-14, RV-15, and RV-16	Slow
Mahoning-Urban land complex (MnB)	Formed in silty clay loam or clay loam glacial till	Former UST location: CC-RVAAP-72-08	Varies
Wadsworth silt loams (WaA)	Formed in silty clay loam and silt loam glacial till	Former UST locations: RV-17, RV-18, RV-19, RV-37, and RV-97	Slow

Notes:
USDA = United States Department of Agriculture.

Table 6-2: Former Underground Storage Tank Locations with Available Nearby Groundwater Analytical Data

Former UST Identification	Monitoring Well Identification within 300 Feet of a Former UST	Groundwater Analytical Data Synopsis
Former UST Locations with No Record of Previous Sampling		
RV-41	LL6mw-003	Few estimated concentrations of acetone and bis(2-ethylhexyl-phalate)
CC-RVAAP-72-02, CC-RVAAP-72-03, CC-RVAAP-72-04, and CC-RVAAP-72-05	Multiple Atlas Scrap Yard monitoring wells	Few estimated concentrations of acetone and bis(2-ethylhexyl-phalate)
Former UST Locations Sampled for Hexavalent Chromium at Request of Ohio Environmental Protection Agency		
RV-17, RV-18, RV-19, and RV-97	FWGmw-008	Non-detect for hexavalent chromium

Notes:
Source: Historical Records Review (Science Applications International Corporation 2011a).
UST = Underground storage tank.

7.0 SUMMARY AND CONCLUSIONS

This SI report presents a summary of the findings and conclusions of this SI conducted by ECC at the 15 former UST locations without records of prior sampling and the 9 former NFA UST locations at which Ohio EPA requested analysis of subsurface soil samples for hexavalent chromium that are part of CC RVAAP-72 FWUSTs. Only subsurface soil samples were sampled as part of this SI, since any release from a UST would be to the subsurface soils, and there are no surface water bodies, wetlands, streams, or sediments at the 24 former UST locations (subject of this SI). No groundwater samples were collected as part of this SI, as the groundwater at the former RVAAP is being evaluated on a facility-wide basis under RVAAP-66 Facility-Wide Groundwater.

Table 7-1 provides a summary of findings and conclusions.

7.1 SUMMARY OF RESULTS

The SI Results for the 24 former UST locations subject of this SI are summarized below.

Subsurface Soil Results for 15 former UST locations without Any Record of Previous Sampling

- The following SRCs were identified at the former 15 UST locations: 5 petroleum-related VOCs (1,2-dichloroethane, benzene, ethylbenzene, toluene, and xylenes), 2 non-petroleum-related VOCs (chloroform and carbon tetrachloride), 19 SVOCs (primarily PAH compounds), 2 TPH DRO carbon chain compounds, 1 TPH GRO carbon chain compound, 1 herbicide, and 10 TAL metals.

- No explosives, propellants, PCBs, or pesticides were detected in the subsurface soil samples.

- The maximum concentrations detected for all SRCs identified at the former 15 UST locations were either less than BUSTR Soil Action Levels Class 1 (for petroleum-related compounds) or the most stringent resident receptor FWCUGs (for non-petroleum related compounds), except for one VOC (carbon tetracholoride) and two TAL metals (arsenic and manganese).

- One VOC (carbon tetrachloride) was reported in the subsurface soil sample at an estimated concentration of 14,000 J µg/kg, which exceeds the Residential RSL (610 µg/kg). Carbon tetrachloride was not related to the historical activities and use of former UST RV-5, which was used to store gasoline. Carbon tetrachloride is related to the aboveground use of fire extinguishers containing this compound. Therefore, carbon tetrachloride is not potential contamination at CC RVAAP-72 FWUSTs.

- Two TAL metals (arsenic and manganese) were reported at concentrations exceeding both the background values and the most stringent Resident Receptor FWCUGs in the subsurface soil samples collected at three former UST locations. Arsenic and manganese

were not related to the historical activities and use of former UST RV-4, CC-RVAAP-72-05, and CC-RVAAP-72-08 to store gasoline, kerosene, and No. 2 fuel oil, respectively. Arsenic and manganese are not potential contamination at CC RVAAP-72 FWUSTs.

- Therefore, no potential contamination was identified at the 15 former UST locations.

Subsurface Soil Results for 9 Former NFA USTs Sampled at Ohio EPA's Request for Hexavalent Chromium

- No hexavalent chromium was detected at a concentration exceeding the Resident Receptor FWCUG at any of the 9 former NFA USTs.

- Therefore, no potential contamination was identified at the 9 former NFA USTs.

Geophysical Survey Results for 7 Former UST Locations without Any Record of Previous Sampling

- The geophysical survey results indicate there are no USTs remaining in-place at former UST locations RV-4, RV-41, RV-86, RV-87, RV-88, and RV-89.

- At former UST RV-46, a GPR anomaly was identified that had the proper dimensions and features of a UST, but did not have any magnetic return. This feature was interpreted as a concrete UST approximately 7.5 ft in width and 8.8 ft in length.

7.2 CONCLUSIONS

The conclusions of this SI are as follows:

- No potential contamination was identified in the subsurface soil sampled at the 24 former UST locations that are the subject of this SI at CC RVAAP-72 FWUSTs.

- The results of this SI indicate that the subsurface soil is not contaminated; therefore, soil is not a source of groundwater contamination at CC RVAAP-72 FWUSTs.

- Twenty-three of the former 24 USTs (subject of this SI) have prior documentation, geophysical testing, or soil boring results showing that USTs no longer remain in-place.

Further action is warranted at the location of the former UST RV-46 in the area of the EM and GPR anomalies to confirm or complete UST removal from the site in accordance with BUSTR UST closure requirements.

The results of this SI indicate that NFA is warranted for soil at the CC RVAAP-72 FWUSTs.

3563 **Table 7-1: Summary of Findings and Conclusions**

Former UST Location	Regulated under BUSTR	Date Removed	Summary of Removal Documentation Available From Field Notes And Reports	SI Soil Analytical Data (mg/kg)	Location	Building	Size (gallons)	Contents/Purpose	Further Action Recommendation	Basis for Recommendation
RV-4	No	1987	Not regulated by BUSTR <110-gallon RVAAP UST inventory documentation states tank "removed" and two others "not found." The 2012 SI geophysical survey did not identify presence of tank RV-4.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 20	Administration Area	Building 1026-Telephone Building	100	Gasoline	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
RV-5	No	Removed Prior to 1990-date unknown	Not regulated by BUSTR <110-gallon RVAAP UST inventory documentation stating tank "removed and scrapped." The 2012 SI soil borings did not identify or locate a UST.	Max BTEX: ND Carbon tetrachloride: 14J Max DRO: ND Max GRO: 0.76 Max Lead: 12	Administration Area	Building 1048A	100	Gasoline	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place. Carbon tetrachloride detection has been addressed in the Remedial Investigation for CC RVAAP-69.
RV-41	No	June 1993	Tenant Tank (Physics International Company) UST removal inspection report indicates no visible signs of soil contamination or visible holes in UST upon removal	Max BTEX: 0.005 J Max DRO: 220 Max GRO: 37 Max Lead: 13	Load Line 6	Building 2F-11	6,000	No. 2 fuel oil for building and process heat	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
RV-46	No	1968, as listed in report, cannot verify	Nozzle New's report from December 1991 indicates a 20 ft x 20 ft grid search in potential area of tank. No tank was ever found. No Sampling was performed. Interviewees recollect removal of tank from Bolton Mansion. Tank identified during 2012 SI geophysical survey.	Max BTEX: 0.0031 J Max DRO: 990 Max GRO: 6.7 Max Lead: 15	Depot Area	Building EE-102 (Bolton Mansion)	1,500	No. 2 fuel oil for steam boiler	Yes	Further action is warranted at the location of the former UST RV-46, because EM and GPR anomalies can be interpreted as an in-place UST
RV-86	Unknown	Unknown	Nozzle New's report from December 1991 indicates a 20 ft x 20 ft grid search in potential area of tank. No tank was ever found. No Sampling was performed. A formal NFA status was not provided in the 1991 report. No visual evidence of above grade tank components observed during 2010 HRR site visit or during the 2012 SI. The 2012 geophysical survey did not identify the presence of RV-86. During 2012 SI field activities, observed depression in the ground surface at the location of RV-86.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 23	Administration Area	Building 1026 Telephone Building	Unknown	Unknown	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
RV-87	Unknown	Unknown	Nozzle New's report from December 1991 indicates a 20 ft x 20 ft grid search in potential area of tank. No tank was ever found. The exact location of the grid search area was not specified. No Sampling was performed. A formal NFA status was not provided in the 1991 report. No visual evidence of above grade tank components observed during the 2010 HRR site visit or during the 2012 SI. The 2012 geophysical survey did not identify the presence of RV-86.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 16	Administration Area	Building 1026 Telephone Building	Unknown	Unknown	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.

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3568 **Table 7-1: Summary of Findings and Conclusions (continued)**

Former UST Location	Regulated under BUSTR	Date Removed	Summary of Removal Documentation Available From Field Notes And Reports	SI Soil Analytical Data (mg/kg)	Location	Building	Size (gallons)	Contents/Purpose	Further Action Recommendation	Basis for Recommendation
RV-88	Unknown	Unknown	Nozzle New's report from December 1991 indicates a 20 ft by 20 x grid search in potential area of tank. No tank was ever found. The exact location of the grid search area was not specified. No Sampling was performed. A formal NFA status was not provided in the 1991 report. No visual evidence of above grade tank components observed during the 2010 HRR site visit or during the 2012 SI.	Max BTEX: 0.0019 J Max DRO: ND Max GRO: ND Max Lead: 13	Building 1103		Unknown	Diesel	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
RV-89	Unknown	Unknown	Nozzle New's report from December 1991 indicates a 20 ft x 20 ft grid search in potential area of tank. No tank was ever found. No Sampling was performed. A formal NFA status was not provided in the 1991 report. No visual evidence of above grade tank components observed during the 2010 HRR site visit or during the 2012 SI. Geophysical survey conducted during 2012 SI investigation did not identify tank.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 10	George Road Sewage Treatment Plant	Chlorine Building, tank was located along the west side of Chlorine Building	Unknown	Fuel Oil, for generator	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
CC-RVAAP-72-01	Yes	Unknown	Drawing 6698-RU A-10 indicates presence of a kerosene tank at Building U-3. Some aboveground piping was noted at Building U-3 during 2010 property visit. The 2012 SI soil borings did not identify or locate a UST.	Max BTEX: 0.230 Max DRO: ND Max GRO: 3.2 J Max Lead: 46	Depot Area	Building U-3	Unknown	Kerosene	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
CC-RVAAP-72-02	Yes	Unknown	No tank was located during a 2004 geophysical survey performed by MKM. No sampling performed prior to 2012. No visual evidence of tank components observed in 2010 site visit.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 13 J	Atlas Scrap Yard	Northern Service Station; Building T-15	1,000	Leaded Gasoline	NFA	Sample results less than BUSTR Soil Action Levels Class 1.
CC-RVAAP-72-03	Yes	Unknown	No tank was located during a 2004 geophysical survey performed by MKM. No sampling performed prior to 2012. No visual evidence of tank components observed in 2010 site visit.	Max BTEX: 0.0079 J Max DRO: 30 Max GRO: 0.75 Max Lead: 11 J	Atlas Scrap Yard	Northern Service Station; Building T-15	1,000	Leaded Gasoline	NFA	Sample results less than BUSTR Soil Action Levels Class 1.
CC-RVAAP-72-04	Yes	Unknown	No tank was located during a 2004 geophysical survey performed by MKM. No sampling performed prior to 2012. No visual evidence of tank components observed in 2010 site visit.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 11 J	Atlas Scrap Yard	Northern Service Station; Building T-15	1,000	Fuel Oil	NFA	Sample results less than BUSTR Soil Action Levels Class 1.
CC-RVAAP-72-05	Yes	Unknown	No tank was located during a 2004 geophysical survey performed by MKM. No sampling performed prior to 2012. No visual evidence of tank components observed in 2010 site visit.	Max BTEX: ND Max DRO: ND Max GRO: ND Max Lead: 12 J	Atlas Scrap Yard	Northern Service Station; Building T-15	2,000	Kerosene	NFA	Sample results less than BUSTR Soil Action Levels Class 1.
CC-RVAAP-72-06	Unknown	Unknown	Map for Water Works #3 indicated the presence of a UST at this area of concern. HRR report stated it is unknown whether this UST has been removed. The 2012 SI soil borings did not identify or locate a UST.	Max BTEX: 0.0062 Max DRO: 14 J Max GRO: 0.054 J Max Lead: 14	Water Works 3	Water Works 3	280	Fuel Oil	NFA	Sample results less than BUSTR Soil Action Levels Class 1. No UST remains in-place.
CC-RVAAP-72-08	No	December 10, 1971	Tank was installed in October 1971. UST was replaced with aboveground storage tank in December 1971 due to a tank malfunction in November that caused the release of 400 gallons of fuel oil.	Max BTEX: 0.0012 J Max DRO: ND Max GRO: ND Max Lead: 11	Inert Storage Area 8	Building 848	550	No. 2 Fuel Oil	NFA	Sample results less than BUSTR Soil Action Levels Class 1.

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Table 7-1: Summary of Findings and Conclusions (continued)

Notes:

1. Although HRR (SAIC 2011a) recommended NFA, these former UST locations sites were added to the SI effort under CC RVAAP-72 FWUST in response to Ohio Environmental Protection Agency's comment letter issued September 4, 2011 that requested additional subsurface soil sampling for hexavalent chromium only from these 9 USTs.
2. Two methods of surface geophysics were used; ground penetrating radar and electromagnetic at these noted former UST locations.
3. Target Analyte List Metal analysis includes total chromium. Additional sample volume was collected at these locations and held at the laboratory. If elevated total chromium concentrations were reported, hexavalent chromium analysis was conducted.
4. Table information obtained from Table 5-1 of the *Final Historical Records Review Report for the 2010 Phase I Remedial Investigation Services at Compliance Restoration Sites (9 Areas of Concern), Ravenna Army Ammunition Plant, Ravenna, Ohio* (SAIC 2011a).

BTEX = Benzene, toluene, ethylbenzene, and total xylenes.
BUSTR = Bureau of Underground Storage Tank Regulations.
DRO = Diesel range organic.
ft = Feet,
GRO = Gasoline range organic.
HRR = Historical Records Review.
J = Estimated.
Max = Maximum.
MTBE = Methyl tertiary-butyl ether.
ND = Not-detected.
NFA = No further action.
No. = Number.
PAH = Polycyclic aromatic hydrocarbon.
RVAAP = Ravenna Army Ammunition Plant.
TPH = Total petroleum hydrocarbon.
UST = Underground storage tank.

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