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1.0 INTRODUCTION

This report documents the results of Buildings F-15/F-16 (AOC-46) sampling effort which was completed during the activities conducted to characterize the 14 Ravenna Army Ammunition Plant (RVAAP) Areas of Concern (AOCs). This document summarizes the results of the field activities that were conducted from October 2004 to February 2005.

1.1 PURPOSE AND SCOPE

Characterization activities were conducted at Buildings F-15/F-16 to collect sufficient data for all applicable media to allow efficient planning and execution of future environmental actions.

The characterization effort for Buildings F-15/F-16 was undertaken to accomplish the following:

- Collect characterization data using multi-increment (MI) sampling to provide data for future risk assessments that may be conducted;
- Develop and/or update the Conceptual Site Model to identify the key elements that should be considered in future actions;
- Assess AOC-specific physical characteristics;
- Assess potential sources of contamination;
- Allow initial assessment of the nature and lateral extent of soil, sediment, and surface water and contamination (the depth of contamination was not evaluated for this characterization effort); and
- Conduct a preliminary human health and ecological screening.

The investigation approach to this AOC involved a combination of field and laboratory activities to characterize the site. Field investigation techniques included surface soil (0-1 ft) samples, (multi-increment (MI) and discrete), MI sediment samples, and a sample location survey. The rationale for the AOC-specific sampling plan was biased based on historical information including past usage, past investigations, ecological settings, climatic conditions, and geological and hydrologic characteristics. The field program was conducted in general accordance with the revised (USACE, 2001a) and the Final Sampling and Analysis Plan Addendum FSAP for the characterization of 14 RVAAP AOCs (MKM, 2004).

1.2 BACKGROUND INFORMATION

This section briefly describes Buildings F-15 and F-16, and previous studies and assessments performed.

1.2.1 Site Description and History

Buildings F-15/F-16 are located west of Block D and east of Slagle Road. The buildings are each approximately 60 ft by 120 ft and were used during World War II, the Korean War, and the Vietnam War to test miscellaneous explosives and propellants. Number of tests conducted, quantities of materials tested and exact dates of testing are unknown. Currently the buildings are abandoned. The roof of

Building F-15 has partially collapsed. Figure 1-2, Volume I shows the location of Buildings F-15/F-16 within the RVAAP facility.

1.2.2 Previous Investigation

The following evaluation and assessment have been conducted at Buildings F-15/F-16:

1.2.2.1 Installation Assessment of Ravenna Army Ammunition Plant (USATHAMA 1978.

This assessment identified the following conditions at RVAAP:

- Areas of RVAAP, including the productions areas (i.e. LL-5, LL-7, LL-8, LL-10 and LL-12), burning grounds, test areas and demolition areas were identified as sites contaminated with explosive waste which included: TNT, Composition B, lead azide, lead styphnate and black powder.
- Surface waters exiting the installation were not required to be monitored for nitrobodies and heavy metals.
- Analysis of the well water indicated potable quality.
- UXO items were identified in the demolition area.
- No environmental stress was identified at RVAAP.
- The chemical agent mustard may be buried within the old demolition grounds.
- The Ramsdell Quarry site landfill was identified as having a potential leaching problem.
- Trace quantities of 2,4,6-TNT were identified in the wells, indicating that some leaching had occurred.

1.2.2.2 Relative Risk Site Evaluation for Newly Added Sites at the Ravenna Army Ammunition Plant (USACHPPM 1998)

Buildings F-15/F-16 were scored with a moderate (3.61) contaminate hazard factor (CHF) for sediment/human endpoint (medium) with a potential migration pathway factor and receptor pathway factor. The AOC was scored with a moderate (7.42) CHF for sediment/ecological endpoint (high) with a potential migration pathway factor and an identified receptor pathway factor. The receptor pathway factor is sediment running off of the AOC and entering into Sand Creek, which is a known habitat for State Endangered Species. The AOC was also scored with a moderate (17.1) CHF for surface soil with a potential migration pathway factor and receptor pathway factor. The final Relative Risk Site Evaluation (RRSE) score for the AOC was “High.”

1.2.3 Regulatory Authorities

Volume I, Section 1.2.3 identifies the regulatory authorities which oversee remedial activities for these AOCs.

1.2.4 Regulatory Status of Buildings F-15/F-16

Volume I, Section 1.2.4 identifies the regulatory status for these AOCs.

2.0 ENVIRONMENTAL SETTING AT BUILDINGS F-15/F-16

This section describes the physical characteristics of Buildings F-15/F-16 that are factors in interpreting the potential contaminant transport pathways, receptor populations, and exposure scenarios with respect to the evaluation of human health and ecological risks. The area immediately surrounding Buildings F-15/F-16 is lightly forested except for the clearing that defines the AOC operations area. An unnamed stream flows on the southern perimeter of the AOC. This stream flows to Sand Creek. This AOC is approximately 1200 feet west of D Block Storage Area. The AOC surface water flows to the south/southwest. Slagle Road is located approximately 200 feet to the west. Paris Windham Road is located approximately 3500 feet south of the AOC.

2.1 SURFACE FEATURES

The topography at Building F-15 ranges from 1120 to 1130 ft amsl and gently slopes from the southeast to the northwest. The topography of Building F-16 ranges from 1115 to 1125 ft amsl and slopes from the northwest to the southeast towards Sand Creek (USGS Topographic Map, Windham Quadrangle, 1994).

2.2 METEOROLOGY AND CLIMATE

Meteorology and climate are addressed in Section 2.2 of Volume I.

2.3 SURFACE WATER HYDROLOGY

Surface water drainage generally follows the topography in the vicinities of the two buildings. Surface drainage in the vicinity of Building F-15 flows from the southeast to the northwest and surface drainage in the vicinity of Building F-16 flows from the northwest to the southeast. Intermittent surface water flows in several drainage ditches located on site. These ditches are fed by surface runoff from precipitation events. The ditches tend to hold water for extended periods of time due to the low permeability of soils. Several drainage ditches run north and south between the two building sites, along the road to the west of the buildings, and along the railroad tracks to the east of the buildings.

2.4 GEOLOGY

No subsurface investigation was performed in the areas of Buildings F-15 and F-16, so no AOC-specific information about glacial deposits or bedrock was obtained. Volume I, Section 2.4 contains information about RVAAP geology.

2.5 SOIL

Three soil types are found at this AOC: the Mahoning Silt Loam (0 to 2 percent and 2 to 6 percent slopes), and the Trumbull silt loam (0 to 2 percent slopes). The Mahoning Silt Loam (0 to 2 percent) covers the majority of the area near Building F-15 although the Trumbull Silt Loam is found along the

eastern boundary. The Mahoning Silt Loam (2 to 6 percent) covers the majority of the area near Building F-16 although the Trumbull Silt Loam is found along Sand Creek.

The Mahoning series consists of deep, somewhat poorly drained, nearly level to gently sloping soils that formed in silty clay loam or clay loam glacial till. Mahoning Silt Loam (0 to 2 percent) is a nearly level soil in upland areas between drainage ways. Runoff is slow to ponded. Mahoning Silt Loam (2 to 6 percent) is gently sloped land with medium to rapid runoff and erosion is a hazard. Seasonal wetness and slow permeability characterize both of these soil types.

The Trumbull Series consists of deep, poorly drained, nearly level soils. These soils formed in silty clay loam, clay loam, or silty clay glacial till. Permeability is very slow in the subsoil and underlying glacial till. Runoff is slow and ponding is common after heavy rains. Trumbull soils are slow to dry in spring. Trumbull silt loam (0-2 percent slopes) is a nearly level soil mainly along small drainageways or in small depressions adjacent to the better drained Mahoning and Remsen soils. Seasonal wetness and very slow permeability are the major limitations.

2.6 HYDROGEOLOGY

Information about RVAAP hydrogeology is presented in Volume I, Section 2.6. That information applies to Buildings F-15/F-16 also.

2.7 DEMOGRAPHY AND LAND USE

Demographics and land use are discussed in Volume 1, Section 2.7.

2.8 ECOLOGY

Ecological information is provided in Volume I, Section 2.8.

3.0 CHARACTERIZATION ACTIVITIES BUILDINGS F-15/F-16

This section describes the field and analytical methods used during the characterization activities conducted at Buildings F-15/F-16. The field and analytical programs were conducted in accordance with the RVAAP Facility Wide Sampling and Analysis Plan (FWSAP) (USACE, 2001) and the RVAAP 14 AOC FWSAP Addendum (MKM, 2004). Characterization objectives, rationale for sampling locations and sampling methods are briefly discussed in this section.

3.1 FIELD ACTIVITIES

Field activities conducted from October 2004 thru February 2005 included:

- Collecting MI surface soil (0-1 ft) samples (10-28-04 – 11-03-04);
- Collecting MI sediment samples from drainage pathways (11-03-04);
- Collecting surface water samples from drainage pathways (11-03-04);
- Collecting geotechnical samples from the borings (11-03-04); and
- Conducting a sample location survey (12-13-04 – 01-07-05).

Sampling points for the characterization of this AOC were located to assess the impact that Buildings F-15/F-16 operations may have had on soil, sediment and surface water. The following sections describe the rationales, for and methods, of sample collection that were employed during the investigation. Information from previous assessments and evaluations, plus institutional knowledge about the process operations, were used to determine the sampling locations, type of media collected, analyses run and numbers of samples collected. Table F15/F16-1 summarizes the type and number of samples collected and the analyses that were conducted. A photolog of the investigation activities is provided in Appendix C. Figure F15/F16-1 shows the sampling locations for all media collected at this AOC.

3.1.1 MI Surface Soil (0-1 ft) Sampling

MI surface soil (0-1 ft) samples were collected at this AOC to:

- Assess the potential impact of Buildings F-15/F-16 testing operations on the soils within the AOC;
- Identify the potential contribution of contaminants from Buildings F-15/F-16 testing operations to dry drainage pathways; and
- Determine the nature of contamination.

Areas adjacent to Buildings F-15/F-16, the railway adjacent to Buildings F-15/F-16 and dry drainage ditches within the AOC were demarcated into 18 MI sampling grids. One MI surface soil (0-1 ft) sample was collected from each grid. Multi-increment samples were collected as described in Volume I, Section 3.1.10.1. Three split samples were collected and submitted for analysis by an independent, USACE-approved laboratory.

Analysis for Buildings F-15/F-16 MI surface soil (0-1 ft) sampling included the following parameters: Target Analyte List (TAL) Metals, Explosives, Volatile Organic Compounds (VOCs), Semi-Volatile Organic Compounds (SVOLs), propellants, pesticides and polychlorinated biphenyls (PCBs).

VOC samples were collected as discrete samples to fulfill the 10 percent quality assurance requirement and the FWSAP approved VOC collection methods. Section 3.1.10.3 of Volume I describes the procedure used to collect discrete surface soil (0-1 ft) samples. Discrete VOC samples were not subjected to MI sample drying or processing. Field sampling forms documenting the surface soil (0-1 ft) sampling activities are presented in Appendix E.

3.1.2 MI Sediment Sampling

Two MI sediment samples were collected at this AOC to:

- Evaluate whether sediments are being impacted by surface water runoff at Buildings F-15/F-16;
- Evaluate the migration pathway for contaminants that may have been suspended in surface water runoff; and
- Evaluate whether contaminants may have migrated beyond the AOC boundaries.

Two locations were selected to evaluate whether the drainage system at Buildings F-15/F-16 carried contaminants beyond the site boundary. The MI sediment samples were co-located with the associated surface water samples. The sediment sample at sampling location F16sd-001m was collected using a push, and the sediment sample at sampling location F16sd-002M was collected using a long handled scoop or telescopic pole with Teflon swivel cup. Both MI sediment sampling grids were sampled as specified in the procedures described in Section 3.1.10.4 of Volume I. One split sample was collected and submitted for analysis to an independent, USACE-approved laboratory. Samples were prepared, packaged and shipped in accordance with Section 6.0 of the RVAAP 14 AOC FWSAP Addendum. Analysis for Buildings F-15/F-16 MI sediment sampling include the following parameters: TAL Metals, Explosives, total organic carbon and grain size. Field sampling forms are presented in Appendix Q.

3.1.3 Surface Water Sampling

Two surface water samples were collected at this AOC to:

- Evaluate whether surface water is being impacted by runoff from Buildings F-15/F-16; and
- Identify the migration pathways for contaminated runoff from Buildings F-15/F-16.

One surface water sample was collected from an unnamed creek, a tributary of Sand Creek which is located east of Building F-16. A second surface water sample was collected from a small ponded area south of Building F-16. Water quality measurements (pH, conductivity, dissolved oxygen content, and temperature) were recorded just prior to sample collection. Surface water samples were collected using the direct fill method, as referenced in Volume I, section 3.1.10.9. One split sample was collected and submitted for analysis to an independent, USACE-approved laboratory. Analysis for Buildings F-15/F-16

surface water included the following parameters: TAL Metals, Explosives, VOCs, SVOCs, propellants, pesticides and PCBs. Field sampling forms for surface water sampling are presented in Appendix O.

3.1.4 Sampling Location Survey

The sampling location survey at Buildings F-15/F-16 was conducted per the specifications in Section 3.1.11, Volume I of this characterization report. The sampling location survey data can be found in Appendix S.

3.2 DEVIATIONS FROM THE WORK PLAN

Every effort was made to complete the field activities as outlined in the FWSAP and the approved RVAAP 14 AOC FWSAP Addendum. However, in some instances, circumstances or field conditions necessitated a modification. Modifications to the FWSAP during the Buildings F-15/F-16 AOC characterization are noted below.

- Ballast covered two sampling locations (F15ss-007M-SO and F16ss-006M-SO). At those two locations, the ballast was removed to allow access to the sampling locations.
- Although an equipment blank sample (F15ss-004M-EB) was collected for a Building F15 surface soil sample, it was cancelled because of different sampling equipment.
- Sample F15ss-002M-DUP and F15ss-002M-SO split were not collected, even though they are entered on the sample report form.

Although modifications to the FWSAP were identified, the objectives of the Buildings F-15/F-16 AOC characterization were achieved.

4.0 NATURE OF CONTAMINATION AT BUILDINGS F-15/F-16

This section summarizes the surface soil (0-1 ft), sediment, and surface water analytical results obtained from the environmental sampling conducted at Buildings F-15/F-16. The results are organized by media: surface soil (0-1 ft), surface water, and sediment. The number of samples collected and the number of analytical results that exceeded either the RVAAP background criteria or Region 9 residential Preliminary Remediation Goals are listed in each subsection. The evaluation completed in this section is a preliminary comparison and is not intended to be used for making risk management decisions. The risk screening, presented later in this report, discusses and evaluates the contaminants detected during this AOC characterization. The following sections summarize the initial screening of the analytical data for samples collected during the AOC characterization.

4.1 MI SURFACE SOIL (0-1 FT)

Nineteen MI surface soil (0-1 ft) samples (18 regular samples and one QC sample) were collected from various locations during the characterization activities conducted at Buildings F-15/F-16. Additionally, two discrete surface soil (0-1 ft) samples were collected for VOC analysis. All positive detections were compared to RVAAP background and Region 9 residential PRG values, as previously discussed.

Surface soil (0-1 ft) results that equaled or exceeded detection limits are presented in Table F15/F16-2. All surface soil (0-1 ft) analytical results are presented in Table F15/F16-5. Locations where surface soil (0-1 ft) analytes were detected at concentrations greater than background and Region 9 residential PRGs are shown in Figures F15/F16-2 and F15/F16-3. Laboratory analytical reports are provided in Appendix F.

The surface soil (0-1 ft) analytical results that exceeded RVAAP background or Region 9 residential PRGs are summarized as follows:

- **Aluminum** exceeded the Region 9 residential PRG in 18 samples with a **maximum concentration of 16000 mg/kg.**
- **Arsenic** exceeded the Region 9 residential PRG in 16 samples, and exceeded background and the Region 9 residential PRG in three samples with a **maximum concentration of 20 mg/kg.**
- **Barium** exceeded background in eight samples with a **maximum concentration of 200 mg/kg.**
- **Beryllium** exceeded background in nine samples with a **maximum concentration of 2.9 mg/kg.**
- **Cadmium** exceeded background in five samples with a **maximum concentration of 2.5 mg/kg.**
- **Calcium** exceeded background in three samples with a **maximum concentration of 29000 mg/kg.**
- **Chromium** exceeded background in 17 samples, and exceeded background and the Region 9 residential PRG in two samples with a **maximum concentration of 55 mg/kg.**
- **Cobalt** exceeded background in nine samples with a **maximum concentration of 12 mg/kg.**
- **Copper** exceeded background in 17 samples with a **maximum concentration of 200 mg/kg.**
- **Iron** exceeded the Region 9 residential PRG in six samples, and exceeded background and the Region 9 residential PRG in 13 samples with a **maximum concentration of 28000 mg/kg.**

- **Lead** exceeded background in eight samples with a **maximum concentration of 120 mg/kg.**
- **Magnesium** exceeded background in 12 samples with a **maximum concentration of 6600 mg/kg.**
- **Manganese** the Region 9 residential PRG in 19 samples with a **maximum concentration of 1200 mg/kg.**
- **Nickel** exceeded background in 13 samples with a **maximum concentration of 28 mg/kg.**
- **Potassium** exceeded background in 18 samples with a **maximum concentration of 2100 mg/kg.**
- Selenium exceeded background in one sample with a maximum concentration of 1.7 mg/kg.
- **Sodium** exceeded background in 19 samples with a **maximum concentration of 710 mg/kg.**
- **Vanadium** exceeded the Region 9 residential PRG in 19 samples with a **maximum concentration of 29 mg/kg.**
- **Zinc** exceeded background in 14 samples with a **maximum concentration of 130 mg/kg.**
- **Antimony** exceeded background in one sample with a **maximum concentration of 1.0 mg/kg.**
- **Thallium** exceeded background in four samples, and exceeded background and the Region 9 residential PRG in one sample with a **maximum concentration of 0.59 mg/kg.**
- **2-Methylnaphthalene** exceeded the laboratory detection limit in two samples with a **maximum concentration of 1.0 mg/kg.**
- **Benzo(a)pyrene** exceeded the Region 9 residential PRG in one sample with a **maximum concentration of 0.11 mg/kg.**
- **Benzo(g,h,i)perylene** exceeded the laboratory detection limit in two samples with a **maximum concentration of 0.095 mg/kg.**
- **Phenanthrene** exceeded the laboratory detection limit in two samples with a **maximum concentration of 0.52 mg/kg.**
- **Nitrocellulose** exceeded the laboratory detection limit in two samples with a **maximum concentration of 2.1 mg/kg.**
- **Explosives, VOCs, pesticides** and **PCBs** were below Region 9 residential PRGs and/or laboratory detection limits.

4.2 SEDIMENTS

Three MI sediment samples (two regular samples and one QC sample) were collected during the AOC characterization at Buildings F-15/F-16. Results from the sediment samples were compared to facility-wide background concentrations for sediments and/or Region 9 residential PRGs for soil.

Sediment results at or above detection limits are presented in Table F-15/F-16-3. All sediment analytical results are presented in Table F-15/F-16-6. Sample locations where sediment analytes were detected at or above RVAAP background levels and Region 9 residential PRGs are shown in Figure F15/F16-4. Laboratory analytical reports are provided in Appendix R.

The sediment results that exceeded RVAAP background or Region 9 residential PRGs are summarized as follows:

- **Aluminum** exceeded the Region 9 residential PRG in three samples with a **maximum concentration of 13000 mg/kg.**
- **Arsenic** exceeded the Region 9 residential PRG in three samples with a **maximum concentration of 12 mg/kg.**
- **Beryllium** exceeded background in three samples with a **maximum concentration of 0.91 mg/kg.**
- **Cadmium** exceeded background in two samples with a **maximum concentration of 0.24 mg/kg.**
- **Calcium** exceeded background in one sample with a **maximum concentration of 1700 mg/kg.**
- **Chromium** exceeded background in one sample with a **maximum concentration of 20 mg/kg.**
- **Cobalt** exceeded background in one sample with a **maximum concentration of 11 mg/kg.**
- **Iron** exceeded the Region 9 residential PRG in three samples with a **maximum concentration of 25000 mg/kg.**
- **Lead** exceeded background in two samples with a **maximum concentration of 29 mg/kg.**
- **Magnesium** exceeded background in one sample with a **maximum concentration of 4700 mg/kg.**
- **Manganese** the Region 9 residential PRG in three samples with a **maximum concentration of 460 mg/kg.**
- **Nickel** exceeded background in three samples with a **maximum concentration of 25 mg/kg.**
- **Potassium** exceeded background in one sample with a **maximum concentration of 2000 mg/kg.**
- **Sodium** exceeded background in three samples with a **maximum concentration of 420 mg/kg.**
- **Vanadium** exceeded the Region 9 residential PRG in three samples with a **maximum concentration of 23 mg/kg.**
- **Explosives, propellants, SVOCs, VOCs, pesticides** and **PCBs** were below Region 9 residential PRGs and/or laboratory detection limits.

4.3 SURFACE WATER

Three surface water samples (two regular samples and one QC samples) were collected during the AOC characterization at Buildings F-15/F-16. Analytical results from analyses were compared to RVAAP surface water background concentrations and/or USEPA Region 9 tap water PRGs.

Concentrations of contaminants in surface water that were detected at or above quantitation limits are presented in Table F-15/F-16-4. All surface water analytical results are presented in Table F-15/F-16-7. Sample locations where surface water analytes were detected at or above RVAAP background levels and Range 9 tap water PRGs are shown on Figure F15/F16-4. Laboratory analytical reports are provided in Appendix P.

The surface water analytical results that exceeded RVAAP background or Region 9 tap water PRGs are summarized as follows:

- **Calcium** exceeded background in one sample with a **maximum concentration of 97000 µg/L**.
- **Chromium** exceeded background in one sample with a **maximum concentration of 1.6 µg/L.**
- **Cobalt** exceeded background in one sample with a **maximum concentration of 2.0 µg/L.**
- **Iron** exceeded background in one sample with a **maximum concentration of 3600 µg/L.**

- **Magnesium** exceeded background in one sample with a **maximum concentration of 13000 µg/L**.
- **Manganese** exceeded background and the Region 9 tap water PRG in one sample with a **maximum concentration of 4600 µg/L.**
- **Nickel** exceeded background in one sample with a **maximum concentration of 1.9 µg/L.**
- **Potassium** exceeded background in one sample with a **maximum concentration of 7100 µg/L.**
- **Arsenic** exceeded the Region 9 tap water PRG in one sample with a **maximum concentration of 6.8 µg/L.**
- **Lead** exceeded background in one sample with a **maximum concentration of 1.5 µg/L.**
- **4-Amino-2,6-Dinitrotoluene** exceeded the laboratory detection limit in one sample with a **maximum concentration of 0.53 µg/L.**
- **SVOCs, VOCs, pesticides, PCBs and propellants** were less than Region 9 tap water PRGs and/or laboratory detection limits.

5.0 HUMAN HEALTH AND ECOLOGICAL RISK SCREENING FOR BUILDINGS F-15/F-16

This section details both the human health and ecological risk screening performed at Buildings F-15 and F-16.

5.1 HUMAN HEALTH RISK SCREENING

Volume 1, Section 5.1 explains how the Buildings F-15/F-16 data were screened to determine human health contaminants of potential concern (COPCs). Total chromium analytical results were conservatively screened against 1/10th of the PRG value; therefore, a screening value of 21 mg/kg was used rather than 210 mg/kg.

5.1.1 Surface Soil (0-1 ft)

Table F15/F16-8 presents the human health screening data for surface soil (0-1 ft) at Buildings F-15/F-16. A total of 43 constituents were detected including metals and semivolatile organic compounds (SVOCs).

- Nineteen constituents had detections greater than RVAAP background concentrations: arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, nickel, potassium, selenium, sodium, zinc, antimony, mercury, and thallium.
- Eight constituents had detections above the adjusted Region 9 residential PRGs: aluminum, arsenic, chromium, iron, manganese, vanadium, thallium, and benzo(a)pyrene.
- Four constituents also had detected concentrations above both RVAAP background and the residential PRG: arsenic, chromium, iron, and thallium.
- Five constituents have no established RVAAP background value or Region 9 residential PRG: acenaphthylene, 2-methylnaphthalene, benzo(g,h,i)perylene, phenanthrene, and nitrocellulose.

Based on these results, nine constituents were identified as chemicals of potential concern (COPC) in surface soil (0-1 ft) at Buildings F-15/F-16: arsenic, chromium, iron, thallium, 2-methylnaphthalene, benzo(a)pyrene, benzo(g,h,i)perylene, phenanthrene, and nitrocellulose. Of these COPC, acenaphthylene, 2-methylnaphthalene, benzo(g,h,i)perylene, phenanthrene, and nitrocellulose were identified due to the lack of screening criteria.

5.1.2 Sediment

Table F-15/F-16-9 presents the human health screening data for sediment at Buildings F-15/F-16. Nineteen constituents were detected in sediment.

- Ten constituents had detected concentrations greater than RVAAP background values: beryllium, cadmium, calcium, chromium, cobalt, lead, magnesium, nickel, potassium, and sodium.
- Five constituents had detections above the adjusted Region 9 residential PRGs: aluminum, arsenic, iron, manganese, and vanadium.

- No constituents also had detected concentrations greater than both RVAAP background and Region 9 residential PRGs.

Based on these comparisons, no constituents were identified as COPC for sediment.

5.1.3 Surface Water

Table F-15/F-16-10 presents the human health screening data for surface water at Buildings F-15/F-16. A total of 21 constituents were detected.

- Ten constituents had detections greater than RVAAP background values: calcium, chromium, cobalt, copper, iron, magnesium, manganese, potassium, nickel, arsenic, and lead.
- Two constituents, manganese and arsenic, had detections above the Region 9 tap water PRGs.
- Manganese and arsenic were detected above the RVAAP background concentrations and Region 9 tap water PRGs.
- One constituent had no established background value or Region 9 tap water PRG: 4-amino-2,6-dinitrotoluene.

Based on these comparisons, three constituents were identified as COPCs in surface water: arsenic, manganese, and 4-amino-2,6-dinitrotoluene. Of these COPC, 4-amino-2,6-dinitrotoluene was identified due to the lack of screening criteria.

5.2 ECOLOGICAL RISK SCREENING

See Volume I, Section 5.2 for an explanation of the procedures used to conduct this ecological risk screen.

5.2.1 Surface Soil (0-1 ft)

Table F-15/F-16-11 presents the ecological screening data for surface soil (0-1ft) at Buildings F-15/F-16. A total of 42 constituents were detected.

- Nineteen constituents had detections greater than RVAAP background concentrations: arsenic, barium, beryllium, cadmium, calcium, chromium, cobaly, copper, iron, lead, magnesium, nickel, potassium, selenium, sodium, zinc, antimony, mercury, and thallium.
- Fourteen constituents had detections above ecological screening values: aluminum, arsenic, chromium, copper, iron, lead, manganese, selenium, vanadium, zinc, mercury, 4,4-DDT, Aroclor 1260, and naphthalene.
- Four constituents (carbazole, dibenzofuran, nitrocellulose, and nitroglycerin) have no screening values. Magnesium also exceeds the RVAAP background concentration.

Based on these comparisons, 15 constituents were identified as chemicals of potential ecological concern (COPECs) in surface soil (0-1ft) at Buildings F-15/F-16: arsenic, chromium, copper, iron, lead, magnesium, selenium, zinc, mercury, 4,4-DDT, aroclor 1260, carbazole, dibenzofuran, naphthalene,

nitrocellulose, and nitroglycerin. Of these COPECs, carbazole, dibenzofuran, nitrocellulose, and nitroglycerin were identified due to the lack of screening criteria.

5.2.2 Sediment

Table F-15/F-16-12 presents the ecological screening data for sediment at Buildings F-15/F-16. Nineteen constituents were detected in sediment.

- Ten constituents had detected concentrations greater than RVAAP background values: beryllium, cadmium, calcium, chromium, cobalt, lead, magnesium, nickel, potassium, and sodium.
- Only one constituent, beryllium, exceeded the Sediment Reference Value (SRV).
- Only arsenic and nickel had detections above ecological screening values.
- Six constituents (aluminum, barium, beryllium, iron, manganese, and vanadium) have no screening values.

Based on these comparisons, only beryllium was identified as a COPEC due to the lack of screening criteria.

5.2.3 Surface Water

Table F-15/F-16-13 presents the ecological screening data for surface water at Buildings F-15/F-16.

- Twenty-one constituents were detected in surface water samples.
- Ten constituents had detections greater than RVAAP background values: calcium, chromium, cobalt, iron, magnesium, manganese, nickel, potassium, arsenic, and lead.
- None of the constituents were detected above ecological screening values.
- Four constituents (aluminum, iron, manganese, and acetone) have no screening values.

Based on these comparisons, three constituents were identified as COPECs: iron, manganese and acetone. All of these were identified as a COPECs in surface water at Buildings F-15/F-16 due to the lack of screening criteria.

6.0 SUMMARY AND CONCLUSION FOR THE CHARACTERIZATION OF BUILDINGS F-15/F-16

This section briefly summarizes the existing conditions that were found during the characterization at Buildings F-15 and F-16, and the risk screening tasks that were completed.

6.1 NATURE OF CONTAMINATION

The nature and extent of contamination was examined in three media: soil, sediment and surface water. Only one organic constituent was detected above screening criteria in the samples collected from the various media. The remaining detections were inorganic constituents.

- Twenty-two metals and one SVOC (benzo(a)pyrene) were detected in surface soil (0-1 ft) above RVAAP background and/or Region 9 residential PRG screening values.
- Fifteen metals were detected above RVAAP background and/or Region 9 residential PRG screening values in sediment.
- Ten metals were detected above RVAAP background and/or Region 9 residential PRG screening values in surface water.

6.2 HUMAN HEALTH RISK SCREENING

An Human Health Risk Screening (HHRS) was conducted to compare the concentrations detected in Buildings F-15/F-16 samples to RVAAP-specific background values and U.S. EPA Region 9 PRGs. This preliminary screening was conducted to identify potential COPCs. The following table identifies the COPCs by media:

Table F-15/F-16 -15

Chemical of Potential Concern – All Media

Soils	Sediment	Surface Water	Groundwater
Arsenic Chromium Iron Thallium 2-Methylnapthalene Benzo(a)pyrene Benzo(g,h,i)perylene Phenanthrene Nitrocellulose	No COPCs detected	Manganese Arsenic 4-Amino-2,6-dinitrotoluene	Groundwater not sampled

6.3 ECOLOGICAL RISK SCREENING

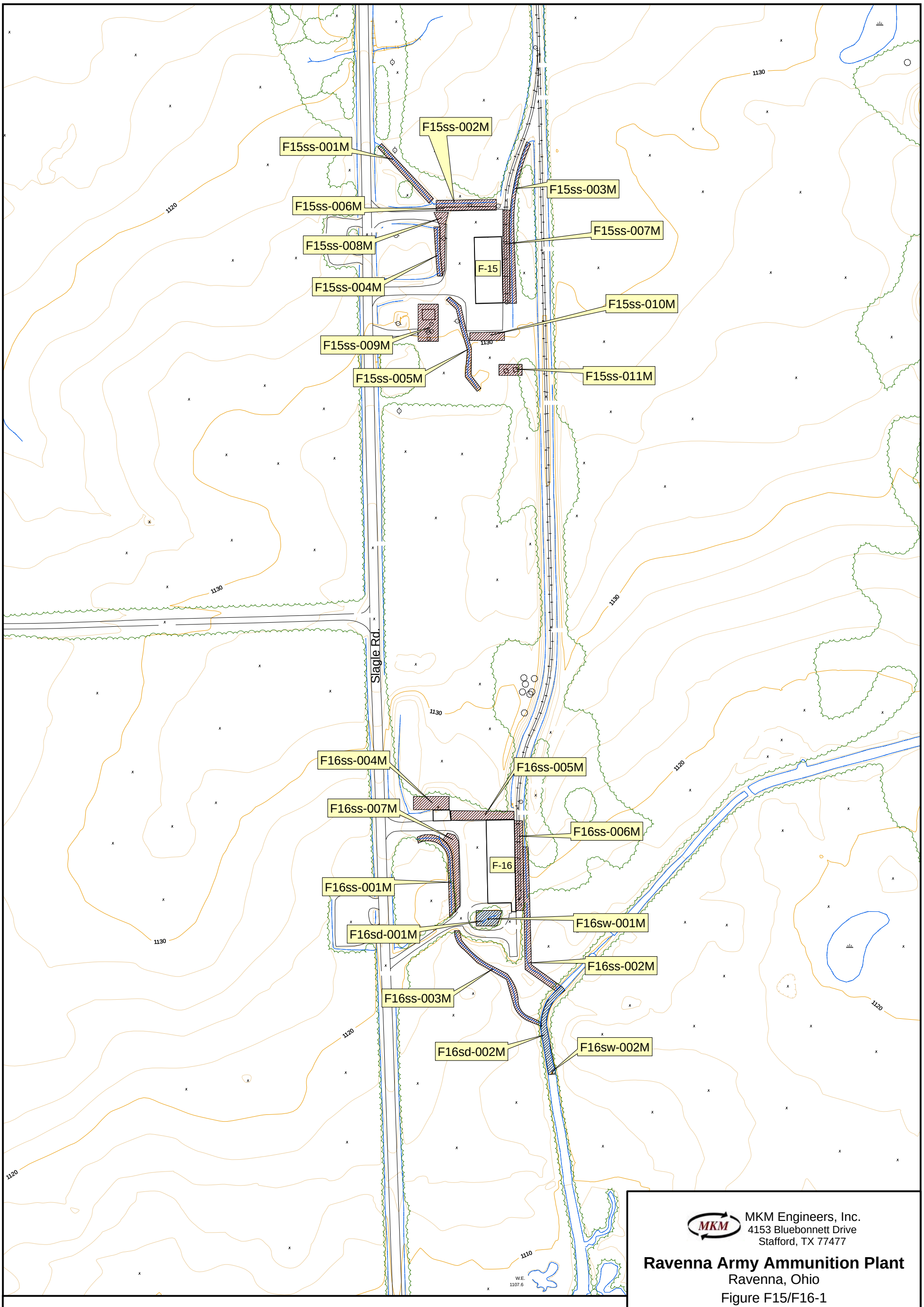
An ecological risk screening was performed to compare contaminant concentrations detected in Buildings F-15/F-16 to RVAAP-specific background values and ecological screening values. The ecological risk screening was conducted as outlined in Volume 1, Section 5.2. The ecological risk screening identified COPECs for Building F-15/F-16. The following table summarizes those COPECs by media:

Table F-15/F-16 -16
Chemical of Potential Ecological Concern – All Media

Soils	Sediment	Surface Water	Groundwater
Arsenic	Beryllium	Iron	Groundwater not
Copper		Manganese	evaluated for ERS
Chromium		Acetone	
Iron			
Lead			
Selenium			
Zinc			
Mercury			
4,4-DDT			
Aroclor 1260			
Carbazole			
Dibenzofuran			
Naphthalene			
Nitrocellulose			
Nitroglycerin			

6.4 CONCLUSION

Based on the COPCs presented in Section 6.2 and the COPECs presented in Section 6.3, a full risk evaluation should be considered in the overall risk management decisions that are made for the Buildings F-15/F-16.



Legend

- Vegetation
- Streams / Ditches
- Road
- Steam Line Post
- 10 ft Contour Lines
- 2 ft Contour Lines
- Building
- Surface Soil (0-1 ft) Multi-increment Sample Location
- Sediment Multi- increment Sample Location
- Previous Railways
- Surface Water Sampling Locations

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Ravenna Army Ammunition Plant

Ravenna, Ohio

Figure F15/F16-1

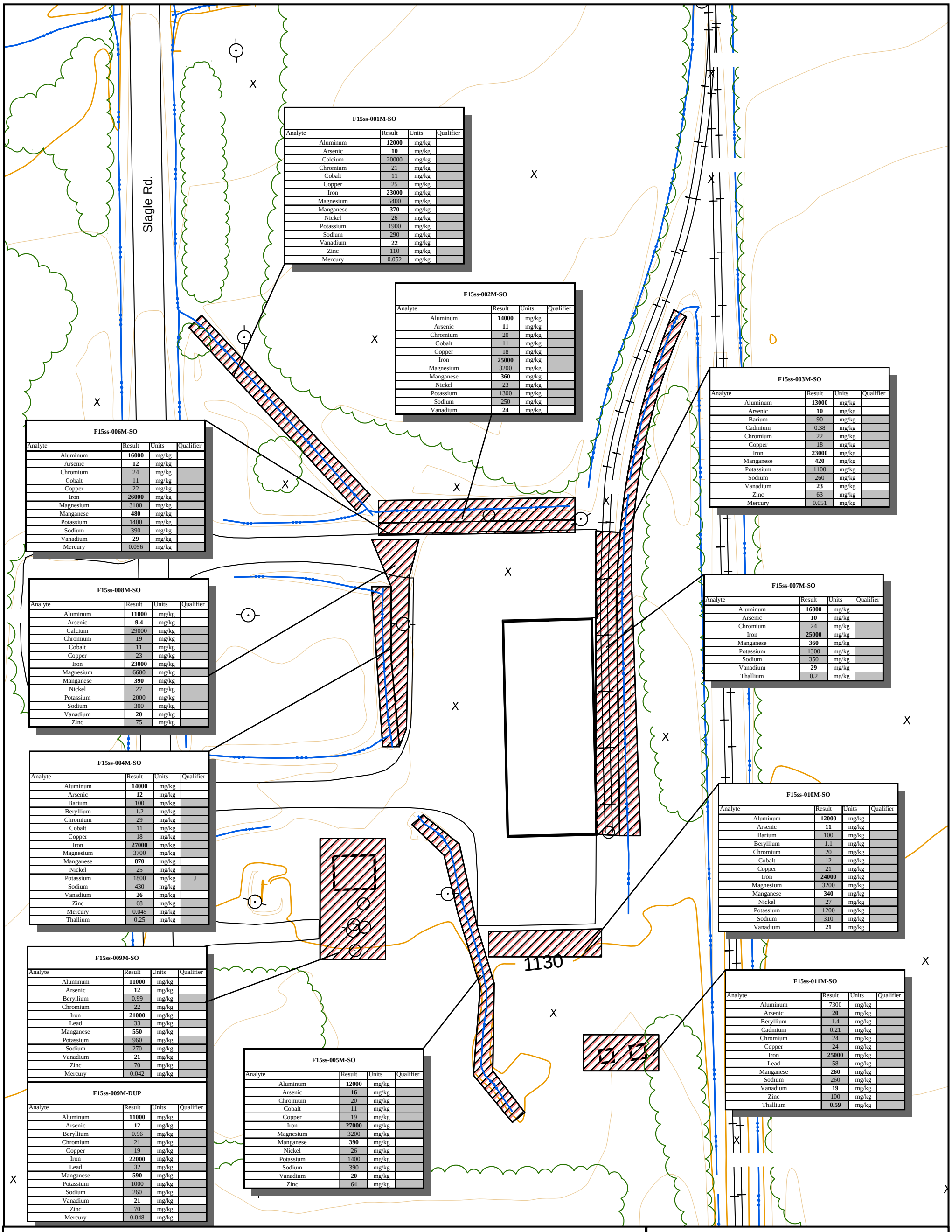
Building F-15

Sampling Locations

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	SAB	15 July 06	04-02-0030

0 40 80 160 240 320 Feet

N W E S



F15ss-001M-SO

Analyte	Result	Units	Qualifier
Aluminum	**12000**	mg/kg	
Arsenic	**10**	mg/kg	
Calcium	20000	mg/kg	
Chromium	21	mg/kg	
Cobalt	11	mg/kg	
Copper	25	mg/kg	
Iron	**23000**	mg/kg	
Magnesium	5400	mg/kg	
Manganese	**370**	mg/kg	
Nickel	26	mg/kg	
Potassium	1900	mg/kg	
Sodium	290	mg/kg	
Vanadium	**22**	mg/kg	
Zinc	110	mg/kg	
Mercury	0.052	mg/kg	

F15ss-002M-SO

Analyte	Result	Units	Qualifier
Aluminum	**14000**	mg/kg	
Arsenic	**11**	mg/kg	
Chromium	20	mg/kg	
Cobalt	11	mg/kg	
Copper	18	mg/kg	
Iron	**25000**	mg/kg	
Magnesium	3200	mg/kg	
Manganese	**360**	mg/kg	
Nickel	23	mg/kg	
Potassium	1300	mg/kg	
Sodium	250	mg/kg	
Vanadium	**24**	mg/kg	

F15ss-003M-SO

Analyte	Result	Units	Qualifier
Aluminum	**13000**	mg/kg	
Arsenic	**10**	mg/kg	
Barium	90	mg/kg	
Cadmium	0.38	mg/kg	
Chromium	22	mg/kg	
Copper	18	mg/kg	
Iron	**23000**	mg/kg	
Manganese	**420**	mg/kg	
Potassium	1100	mg/kg	
Sodium	260	mg/kg	
Vanadium	**23**	mg/kg	
Zinc	63	mg/kg	
Mercury	0.051	mg/kg	

F15ss-006M-SO

Analyte	Result	Units	Qualifier
Aluminum	**16000**	mg/kg	
Arsenic	**12**	mg/kg	
Chromium	24	mg/kg	
Cobalt	11	mg/kg	
Copper	22	mg/kg	
Iron	**26000**	mg/kg	
Magnesium	3100	mg/kg	
Manganese	**480**	mg/kg	
Potassium	1400	mg/kg	
Sodium	390	mg/kg	
Vanadium	**29**	mg/kg	
Mercury	0.056	mg/kg	

F15ss-007M-SO

Analyte	Result	Units	Qualifier
Aluminum	**16000**	mg/kg	
Arsenic	**10**	mg/kg	
Chromium	24	mg/kg	
Iron	**25000**	mg/kg	
Manganese	**360**	mg/kg	
Potassium	1300	mg/kg	
Sodium	350	mg/kg	
Vanadium	**29**	mg/kg	
Thallium	0.2	mg/kg	

F15ss-008M-SO

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**9.4**	mg/kg	
Calcium	29000	mg/kg	
Chromium	19	mg/kg	
Cobalt	11	mg/kg	
Copper	23	mg/kg	
Iron	**23000**	mg/kg	
Magnesium	6600	mg/kg	
Manganese	**390**	mg/kg	
Nickel	27	mg/kg	
Potassium	2000	mg/kg	
Sodium	300	mg/kg	
Vanadium	**20**	mg/kg	
Zinc	75	mg/kg	

F15ss-004M-SO

Analyte	Result	Units	Qualifier
Aluminum	**14000**	mg/kg	
Arsenic	**12**	mg/kg	
Barium	100	mg/kg	
Beryllium	1.2	mg/kg	
Chromium	29	mg/kg	
Cobalt	11	mg/kg	
Copper	18	mg/kg	
Iron	**27000**	mg/kg	
Magnesium	3700	mg/kg	
Manganese	**870**	mg/kg	
Nickel	25	mg/kg	
Potassium	1800	mg/kg	J
Sodium	430	mg/kg	
Vanadium	**26**	mg/kg	
Zinc	68	mg/kg	
Mercury	0.045	mg/kg	
Thallium	0.25	mg/kg	

F15ss-010M-SO

Analyte	Result	Units	Qualifier
Aluminum	**12000**	mg/kg	
Arsenic	**11**	mg/kg	
Barium	100	mg/kg	
Beryllium	1.1	mg/kg	
Chromium	20	mg/kg	
Cobalt	12	mg/kg	
Copper	21	mg/kg	
Iron	**24000**	mg/kg	
Magnesium	3200	mg/kg	
Manganese	**340**	mg/kg	
Nickel	27	mg/kg	
Potassium	1200	mg/kg	
Sodium	310	mg/kg	
Vanadium	**21**	mg/kg	

F15ss-009M-SO

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**12**	mg/kg	
Beryllium	0.99	mg/kg	
Chromium	22	mg/kg	
Iron	**21000**	mg/kg	
Lead	33	mg/kg	
Manganese	**550**	mg/kg	
Potassium	960	mg/kg	
Sodium	270	mg/kg	
Vanadium	**21**	mg/kg	
Zinc	70	mg/kg	
Mercury	0.042	mg/kg	

F15ss-011M-SO

Analyte	Result	Units	Qualifier
Aluminum	7300	mg/kg	
Arsenic	**20**	mg/kg	
Beryllium	1.4	mg/kg	
Cadmium	0.21	mg/kg	
Chromium	24	mg/kg	
Copper	24	mg/kg	
Iron	**25000**	mg/kg	
Lead	58	mg/kg	
Manganese	**260**	mg/kg	
Sodium	260	mg/kg	
Vanadium	**19**	mg/kg	
Zinc	100	mg/kg	
Thallium	**0.59**	mg/kg	

F15ss-009M-DUP

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**12**	mg/kg	
Beryllium	0.96	mg/kg	
Chromium	21	mg/kg	
Copper	19	mg/kg	
Iron	**22000**	mg/kg	
Lead	32	mg/kg	
Manganese	**590**	mg/kg	
Potassium	1000	mg/kg	
Sodium	260	mg/kg	
Vanadium	**21**	mg/kg	
Zinc	70	mg/kg	
Mercury	0.048	mg/kg	

F15ss-005M-SO

Analyte	Result	Units	Qualifier
Aluminum	**12000**	mg/kg	
Arsenic	**16**	mg/kg	
Chromium	20	mg/kg	
Cobalt	11	mg/kg	
Copper	19	mg/kg	
Iron	**27000**	mg/kg	
Magnesium	3200	mg/kg	
Manganese	**390**	mg/kg	
Nickel	26	mg/kg	
Potassium	1400	mg/kg	
Sodium	390	mg/kg	
Vanadium	**20**	mg/kg	
Zinc	64	mg/kg	

Legend

- Vegetation
- Steam Line Post
- Building
- Previous Railways
- Streams / Ditches
- 10 ft Contour Lines
- Surface Soil (0-1 ft) Multi-increment Sample Location
- Road
- 2 ft Contour Lines
- Sediment Multi- increment Sample Location

Notes:

J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style.
Result < PRG & Background, then the value is presented with a normal style.
Mg / Kg - Milligrams per Kilogram (parts per million - ppm)

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Ravenna Army Ammunition Plant

Ravenna, Ohio

Figure F-15/F-16-2A

Building F-15

Soil Sample Locations

Exceedences-Inorganics

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	SAB	15 July 06	04-02-0030

0 30 60 120 Feet

N W E S

F16ss-001M-SO

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**12**	mg/kg	
Barium	96	mg/kg	
Chromium	27	mg/kg	
Cobalt	11	mg/kg	
Copper	28	mg/kg	
Iron	**24000**	mg/kg	
Lead	34	mg/kg	
Manganese	**340**	mg/kg	
Nickel	27	mg/kg	
Potassium	1300	mg/kg	
Sodium	320	mg/kg	
Vanadium	**21**	mg/kg	
Zinc	110	mg/kg	
Mercury	0.05	mg/kg	

F16ss-004M-SO

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**18**	mg/kg	
Beryllium	0.93	mg/kg	
Chromium	27	mg/kg	
Copper	31	mg/kg	
Iron	**24000**	mg/kg	
Lead	31	mg/kg	
Manganese	**650**	mg/kg	
Nickel	25	mg/kg	
Potassium	1400	mg/kg	
Sodium	330	mg/kg	
Vanadium	**20**	mg/kg	
Zinc	99	mg/kg	

F16ss-005M-SO

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**11**	mg/kg	
Barium	110	mg/kg	
Beryllium	1.5	mg/kg	
Cadmium	0.36	mg/kg	
Chromium	**38**	mg/kg	**J**
Copper	32	mg/kg	
Iron	**22000**	mg/kg	
Lead	60	mg/kg	J
Magnesium	3300	mg/kg	
Manganese	**710**	mg/kg	
Nickel	26	mg/kg	
Potassium	1500	mg/kg	J
Sodium	450	mg/kg	
Vanadium	**19**	mg/kg	

F16ss-006M-SO

Analyte	Result	Units	Qualifier
Aluminum	**16000**	mg/kg	
Arsenic	**12**	mg/kg	
Barium	91	mg/kg	
Beryllium	0.94	mg/kg	
Chromium	24	mg/kg	
Cobalt	12	mg/kg	
Copper	20	mg/kg	
Iron	**26000**	mg/kg	
Magnesium	4600	mg/kg	
Manganese	**420**	mg/kg	
Nickel	28	mg/kg	
Potassium	2100	mg/kg	
Sodium	400	mg/kg	
Vanadium	**26**	mg/kg	
Thallium	0.2	mg/kg	

F16ss-007M-SO

Analyte	Result	Units	Qualifier
Aluminum	**14000**	mg/kg	
Arsenic	**10**	mg/kg	
Barium	200	mg/kg	
Beryllium	2.9	mg/kg	
Cadmium	2.5	mg/kg	
Calcium	25000	mg/kg	
Chromium	**55**	mg/kg	
Copper	40	mg/kg	
Iron	**28000**	mg/kg	
Lead	120	mg/kg	
Magnesium	4000	mg/kg	
Manganese	**1200**	mg/kg	
Nickel	25	mg/kg	
Potassium	1400	mg/kg	
Selenium	1.7	mg/kg	
Sodium	710	mg/kg	
Vanadium	**21**	mg/kg	
Zinc	130	mg/kg	
Antimony	1	mg/kg	

F16ss-002M-SO

Analyte	Result	Units	Qualifier
Aluminum	**14000**	mg/kg	
Arsenic	**11**	mg/kg	
Cadmium	0.25	mg/kg	
Chromium	23	mg/kg	
Copper	200	mg/kg	
Iron	**25000**	mg/kg	
Lead	34	mg/kg	
Magnesium	4100	mg/kg	
Manganese	**400**	mg/kg	
Nickel	25	mg/kg	
Potassium	1900	mg/kg	
Sodium	340	mg/kg	
Vanadium	**24**	mg/kg	
Zinc	100	mg/kg	

F16sd-001M-SD

Analyte	Result	Units	Qualifier
Aluminum	**13000**	mg/kg	
Arsenic	**12**	mg/kg	
Beryllium	0.7	mg/kg	
Chromium	20	mg/kg	
Iron	**25000**	mg/kg	
Lead	29	mg/kg	
Manganese	**410**	mg/kg	
Nickel	20	mg/kg	
Sodium	320	mg/kg	
Vanadium	**22**	mg/kg	

F16sd-001M-DUP

Analyte	Result	Units	Qualifier
Aluminum	**12000**	mg/kg	
Arsenic	**11**	mg/kg	
Beryllium	0.72	mg/kg	
Cadmium	0.18	mg/kg	
Iron	**22000**	mg/kg	
Lead	28	mg/kg	
Manganese	**410**	mg/kg	
Nickel	20	mg/kg	
Sodium	330	mg/kg	
Vanadium	**21**	mg/kg	

F15ss-003M-SO

Analyte	Result	Units	Qualifier
Aluminum	**13000**	mg/kg	
Arsenic	**10**	mg/kg	
Barium	90	mg/kg	
Cadmium	0.38	mg/kg	
Chromium	22	mg/kg	
Copper	18	mg/kg	
Iron	**23000**	mg/kg	
Manganese	**420**	mg/kg	
Potassium	1100	mg/kg	
Sodium	260	mg/kg	
Vanadium	**23**	mg/kg	
Zinc	63	mg/kg	
Mercury	0.051	mg/kg	

F16sd-002M-SD

Analyte	Result	Units	Qualifier
Aluminum	**13000**	mg/kg	
Arsenic	**8**	mg/kg	
Beryllium	0.91	mg/kg	
Cadmium	0.24	mg/kg	
Calcium	17000	mg/kg	
Cobalt	11	mg/kg	
Iron	**24000**	mg/kg	
Magnesium	4700	mg/kg	
Manganese	**460**	mg/kg	
Nickel	25	mg/kg	
Potassium	2000	mg/kg	
Sodium	420	mg/kg	
Vanadium	**23**	mg/kg	

1120

Slagle Rd.

Legend

- Vegetation
- Streams / Ditches
- Road
- Steam Line Post
- 10 ft Contour Lines
- 2 ft Contour Lines
- Building
- Surface Soil (0-1 ft) Multi-increment Sample Location
- Sediment Multi-increment Sample Location
- Fence

Notes:

J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style.
Result < PRG & Background, then the value is presented with a normal style.
Mg / Kg - Milligrams per Kilogram (parts per million - ppm)

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Stafford, TX 77477

Ravenna Army Ammunition Plant

Ravenna, Ohio

Figure F-15/F-16-2B

Building F-16

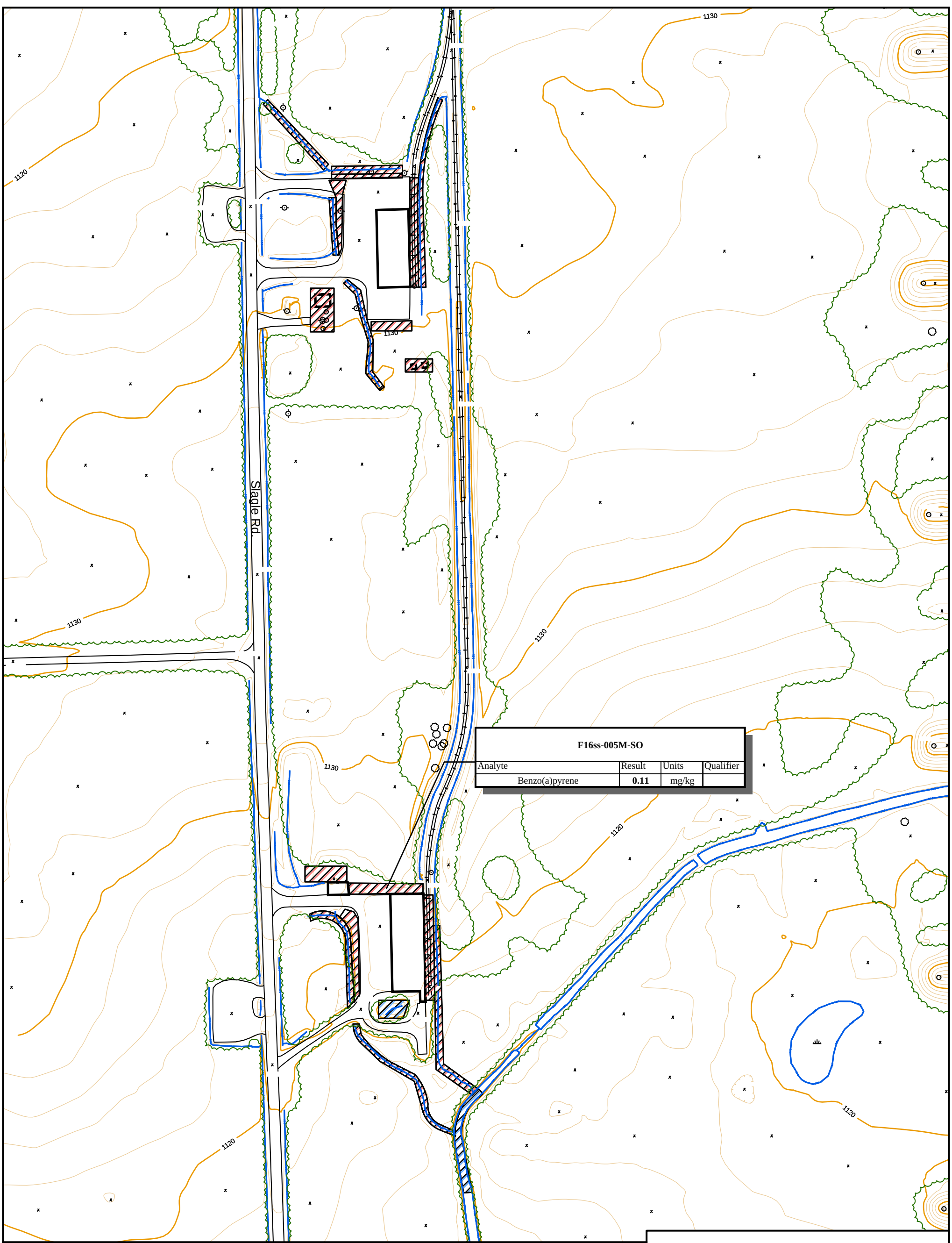
Soil Sample Locations

Exceedences-Inorganics

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	SAB	15 July 06	04-02-0030

0 30 60 120 Feet

N W E S



Legend

- Vegetation
- Streams / Ditches
- Piping
- Road
- 10 ft Contour Lines
- 2 ft Contour Lines
- Building
- Surface Soil (0-1 ft) Multi-increment Sample Location
- Sediment Multi-increment Sample Location
- Railways
- Steam Line Post

Notes:

If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style.
Result < PRG & Background, then the value is presented with a normal style.
Mg / Kg - Milligrams per Kilogram (parts per million - ppm)

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Stafford, TX 77477

Ravenna Army Ammunition Plant

Ravenna, Ohio

Figure F-15/F-16-3

Buildings F-15/ F-16

Soil Sample Locations

Exceedences-Organics

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	SAB	15 July 06	04-02-0030

0 75 150 300 Feet

N W E S

Stagle Rd.

1120
1130

F16sw-001-SW

Analyte	Result	Units	Qualifier
Aluminum	300	ug/l	
Barium	39	ug/l	
Calcium	97000	ug/l	
Chromium	1.6	ug/l	
Cobalt	2	ug/l	
Copper	1.6	ug/l	
Iron	3600	ug/l	
Magnesium	13000	ug/l	
Manganese	**4600**	ug/l	
Nickel	1.9	ug/l	
Potassium	7100	ug/l	
Sodium	3100	ug/l	
Arsenic	**6.8**	ug/l	
Lead	1.5	ug/l	

Legend

- Vegetation
- Streams / Ditches
- Road
- 10 ft Contour Lines
- 2 ft Contour Lines
- Surface Water Sampling Locations
- Steam Line Post
- Building

Notes:

If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style.
Result < PRG & Background, then the value is presented with a normal style.
Ug / L - Micrograms per Liter (parts per billion - ppb)

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Stafford, TX 77477

Ravenna Army Ammunition Plant

Ravenna, Ohio

Figure F-15/F-16-4

Buildings F-15/ F-16

Surface Water and Sediment Sample Locations Exceedences

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	SAB	15 July 06	04-02-0030

0 75 150 300 Feet

N W E S

Table F-15/F-16-1
Buildings F-15/F16 Summary of Sampling and Analysis
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

SAMPLE PREFIX		VOC	SVOC	Explosives	Propellants	TAL Metals	Chrome +6	Pesticides	PCB	Cyanides	Nitrate	TOC	Geo-Tech	Grain	FIELD QA/QC SAMPLES				
F15	SAMPLE ID	8260B	8270C	8330	3532/8330	6010/7000	7196A	8081A	8082B	9010A/9012A	EPA 353.2	EPA 415.1	Analysis (Various)	Size ASTM D422	Multi-Incremental QA	Duplicate Sample	Equipment Blank	Trip Blank	MS/MSD	USACE Split
MULTI-INCREMENTAL SOILS																				
Surface Soils	SS-001M			1		1														
	SS-002M			1		1														
	SS-003M			1		1										NT				1
	SS-004M			1		1														
	SS-005M			1		1											*taken, but canx*		1	
	SS-006M	1	1	1	1	1		1	1											
Dry-Ditch Soils	SS-007M			1		1														
	SS-008M			1		1														
	SS-009M			1		1														
	SS-010M			1		1										1				1
	SS-011M			1		1														
		1	1	11	1	11	0	1	1	0	0	0	0	0	0	1	0	0	1	0

SAMPLE PREFIX		VOC	SVOC	Explosives	Propellants	TAL Metals	Chrome +6	Pesticides	PCB	Cyanides	Nitrate	TOC	Geo-Tech	Grain	FIELD QA/QC SAMPLES				
F16	SAMPLE ID	8260B	8270C	8330	3532/8330	6010/7000	7196A	8081A	8082B	9010A/9012A	EPA 353.2	EPA 415.1	Analysis (Various)	Size ASTM D422	Multi-Incremental QA	Duplicate Sample	Equipment Blank	Trip Blank	MS/MSD	USACE Split
MULTI-INCREMENTAL SOILS																				
Surface Soils	SS-001M			1		1														
	SS-002M			1		1														
	SS-003M			1		1														
	SS-004M			1		1														
Dry-Ditch Soils	SS-005M	1	1	1	1	1		1	1											
	SS-006M			1		1														
	SS-007M			1		1										NT				NT
		1	1	7	1	7	0	1	1	0	0	0	0	0	0	0	0	0	0	0
SURFACE WATER	SW-001	1	1	1	1	1		1	1											
Pond/Wet Ditch/Spring	SW-002	1	1	1	1	1		1	1							1				1
		2	2	2	2	2	0	2	2	0	0	0	0	0	0	1	0	0	0	0
SEDIMENT	SD-001M			1		1						1		1		1				1
Pond/Wet Ditch/Spring	SD-002M			1		1						1		1						
		0	0	2	0	2	0	0	0	0	0	2	0	2	0	1	0	0	0	0

Notes:
Blank cell indicates that either the sample was not analyzed for that compound and/or the sample did not have a QC or Split sample associated with the regular sample.
Grainsize and TOC are taken at "all major drainageway" sediments

Table F-15/F-16-2
Buildings F-15/F-16 Summary of Surface Soil (0-1 ft) Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
						Sample Date:	10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
						Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Surface Soil Background Criteria	Units															
Metals	6010B	Aluminum	7614	nc	17700	mg/kg	**12000**	**14000**	**13000**	**14000**	**12000**		**16000**	**16000**	**11000**	**11000**	**11000**	**12000**	7300	**11000**	**14000**
	6010B	Arsenic	0.39	ca	15.4	mg/kg	**10**	**11**	**10**	**12**	16		**12**	**10**	9.4	**12**	**12**	**11**	**20**	**12**	**11**
	6010B	Barium	538	nc	88.4	mg/kg	85	81	90	100	72		79	76	83	84	86	100	80	96	83
	6010B	Beryllium	15	nc	0.88	mg/kg	0.85	0.86	0.75	1.2	0.81		0.86	0.78	0.83	0.96	0.99	1.1	1.4	0.86	0.8
	6010B	Cadmium	3.7	nc	0.00	mg/kg			0.38										0.21		0.25
	6010B	Calcium	--[n]		15800	mg/kg	20000	3300	3200	9200	3000		2800	4200	29000	9800	8600	3000	5200	3700	5300
	6010B	Chromium	30	ca	17.4	mg/kg	21	20	22	29	20		24	24	19	21	22	20	24	27	23
	6010B	Cobalt	30	ca	10.4	mg/kg	11	11	8.9	11	11		11	8.2	11	7.9	7.3	12	5.9	11	10
	6010B	Copper	313	nc	17.7	mg/kg	25	18	18	18	19		22	15	23	19	17	21	24	28	200
	6010B	Iron	2346	nc	23100	mg/kg	**23000**	**25000**	**23000**	**27000**	**27000**		**26000**	**25000**	**23000**	**22000**	**21000**	**24000**	**25000**	**24000**	**25000**
	6010B	Lead	400	pbk	26.1	mg/kg	20	16	24	20	16		22	13	17	32	33	20	58	34	34
	6010B	Magnesium	--[n]		3030	mg/kg	5400	3200	2800	3700	3200		3100	3000	6600	2700	2900	3200	1100	3000	4100
	6010B	Manganese	176	nc	1450	mg/kg	**370**	**360**	**420**	**870**	**390**		**480**	**360**	**390**	**590**	**550**	**340**	**260**	**340**	**400**
	6010B	Nickel	156	nc	21.1	mg/kg	26	23	21	25	26		21	18	27	17	17	27	19	27	25
	6010B	Potassium	--[n]		927	mg/kg	1900	1300	1100	1800 J	1400		1400	1300	2000	1000	960	1200	680	1300	1900
	6010B	Selenium	39	nc	1.4	mg/kg	0.39									0.54	0.5		0.44		
	6010B	Sodium	--[n]		123	mg/kg	290	250	260	430	390		390	350	300	260	270	310	260	320	340
	6010B	Vanadium	7.8	nc	31.1	mg/kg	**22**	**24**	**23**	**26**	**20**		**29**	**29**	**20**	**21**	**21**	**21**	**19**	**21**	**24**
	6010B	Zinc	2346	nc	61.8	mg/kg	110	57	63	68	64		61	49	75	70	70	58	100	110	100
	7041	Antimony	3.1	nc	0.96	mg/kg											0.54				
	7841	Thallium	0.52	nc	0.00	mg/kg				0.25				0.2					**0.59**		
Pesticides	8081A	4,4'-DDE	1.7	ca	--	mg/kg															
	8081A	4,4'-DDT	1.7	ca	--	mg/kg															
PCBs	8082	Aroclor 1260	0.22	ca	--	mg/kg															
SVOCs	8270C	2-Methylnaphthalene	--		--	mg/kg							0.053								
	8270C	Anthracene	2189	nc	--	mg/kg															
	8270C	Benzo(a)anthracene	0.62	ca	--	mg/kg							0.036								
	8270C	Benzo(a)pyrene	0.062	ca	--	mg/kg							0.031 J								
	8270C	Benzo(b)fluoranthene	0.62	ca	--	mg/kg							0.041								
	8270C	Benzo(g,h,i)perylene	--		--	mg/kg							0.023 J								
	8270C	Benzo(k)fluoranthene	6.2	ca	--	mg/kg							0.026 J								
	8270C	Bis(2-ethylhexyl) phthalate	35	ca	--	mg/kg															
	8270C	Carbazole	24	ca	--	mg/kg															
	8270C	Chrysene	62	ca	--	mg/kg							0.051								
	8270C	Dibenzofuran	15	nc	--	mg/kg							0.017 J								
	8270C	Fluoranthene	229	nc	--	mg/kg							0.059								
	8270C	Indeno(1,2,3-cd)pyrene	0.62	ca	--	mg/kg							0.019 J								
	8270C	Naphthalene	5.6	nc	--	mg/kg							0.038								
	8270C	Phenanthrene	--		--	mg/kg							0.05 J								
	8270C	Pyrene	232	nc	--	mg/kg							0.056								

Table F-15/F-16-2
Buildings F-15/F-16 Summary of Surface Soil (0-1 ft) Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
					Sample Date:	10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units															
Propellants	353.2 Modified	Nitrocellulose	--	--	mg/kg							0.93								
	8332	Nitroglycerine	35 ca	--	mg/kg															

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analyte was a non-detect (with a "U" qualifier) or analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style.

Table F-15/F-16-2
Buildings F-15/F-16 Summary of Surface Soil (0-1 ft) Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
						Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
						Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Surface Soil Background Criteria	Units						
Metals	6010B	Aluminum	7614	nc	17700	mg/kg	**12000**	**11000**		**11000**	**16000**	**14000**
	6010B	Arsenic	0.39	ca	15.4	mg/kg	**11**	**18**		**11**	**12**	**10**
	6010B	Barium	538	nc	88.4	mg/kg	89	81		110	91	200
	6010B	Beryllium	15	nc	0.88	mg/kg	0.84	0.93		1.5	0.94	2.9
	6010B	Cadmium	3.7	nc	0.00	mg/kg				0.36		2.5
	6010B	Calcium	--[n]		15800	mg/kg	8900	5700		13000	9200	25000
	6010B	Chromium	30	ca	17.4	mg/kg	24	27		**38 J**	24	**55**
	6010B	Cobalt	30	ca	10.4	mg/kg	9.9	8.9		6.5	12	4.6
	6010B	Copper	313	nc	17.7	mg/kg	20	31		32	20	40
	6010B	Iron	2346	nc	23100	mg/kg	**24000**	**24000**		**22000**	**26000**	**28000**
	6010B	Lead	400	pbk	26.1	mg/kg	23	31		60 J	13	120
	6010B	Magnesium	--[n]		3030	mg/kg	3500	2800		3300	4600	4000
	6010B	Manganese	176	nc	1450	mg/kg	**320**	**650**		**710**	**420**	**1200**
	6010B	Nickel	156	nc	21.1	mg/kg	26	25		26	28	25
	6010B	Potassium	--[n]		927	mg/kg	1700	1400		1500 J	2100	1400
	6010B	Selenium	39	nc	1.4	mg/kg						1.7
	6010B	Sodium	--[n]		123	mg/kg	340	330		450	400	710
	6010B	Vanadium	7.8	nc	31.1	mg/kg	**22**	**20**		**19**	**26**	**21**
	6010B	Zinc	2346	nc	61.8	mg/kg	82	99		81	60	130
	7041	Antimony	3.1	nc	0.96	mg/kg				0.56		1
	7841	Thallium	0.52	nc	0.00	mg/kg				0.33	0.2	
Pesticides	8081A	4,4'-DDE	1.7	ca	--	mg/kg				0.012 J		
	8081A	4,4'-DDT	1.7	ca	--	mg/kg				0.019 J		
PCBs	8082	Aroclor 1260	0.22	ca	--	mg/kg				0.12		
SVOCs	8270C	2-Methylnaphthalene	--		--	mg/kg				1		
	8270C	Anthracene	2189	nc	--	mg/kg				0.053		
	8270C	Benzo(a)anthracene	0.62	ca	--	mg/kg				0.14		
	8270C	Benzo(a)pyrene	0.062	ca	--	mg/kg				**0.11**		
	8270C	Benzo(b)fluoranthene	0.62	ca	--	mg/kg				0.13		
	8270C	Benzo(g,h,i)perylene	--		--	mg/kg				0.095		
	8270C	Benzo(k)fluoranthene	6.2	ca	--	mg/kg				0.1		
	8270C	Bis(2-ethylhexyl) phthalate	35	ca	--	mg/kg				0.13 J		
	8270C	Carbazole	24	ca	--	mg/kg				0.038 J		
	8270C	Chrysene	62	ca	--	mg/kg				0.2		
	8270C	Dibenzofuran	15	nc	--	mg/kg				0.26		
	8270C	Fluoranthene	229	nc	--	mg/kg				0.26		
	8270C	Indeno(1,2,3-cd)pyrene	0.62	ca	--	mg/kg				0.073		
	8270C	Naphthalene	5.6	nc	--	mg/kg				0.73		
	8270C	Phenanthrene	--		--	mg/kg				0.52		
	8270C	Pyrene	232	nc	--	mg/kg				0.3		

Table F-15/F-16-2
Buildings F-15/F-16 Summary of Surface Soil (0-1 ft) Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
					Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units						
Propellants	353.2 Modified	Nitrocellulose	--	--	mg/kg				2.1		
	8332	Nitroglycerine	35 ca	--	mg/kg				0.52		

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analyte was a non-detect (with a "U" qualifier) or analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table F-15/F-16-3
Buildings F-15/F-16 Summary of Sediment Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F16sd-001M-DUP	F16sd-001M-SD	F16sd-002M-SD
						Sample Date:	11/3/2004	11/3/2004	11/3/2004
						Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Sediment Background Criteria	Units			
Metals	6010B	Aluminum	7614	nc	13900	mg/kg	**12000**	**13000**	**13000**
	6010B	Arsenic	0.39	ca	19.5	mg/kg	**11**	**12**	**8**
	6010B	Barium	538	nc	123	mg/kg	65	71	93
	6010B	Beryllium	15	nc	0.38	mg/kg	0.72	0.7	0.91
	6010B	Cadmium	3.7	nc	0.00	mg/kg	0.18		0.24
	6010B	Calcium	--[n]		5510	mg/kg	2700	2300	17000
	6010B	Chromium	30	ca	18.1	mg/kg	17	20	18
	6010B	Cobalt	30	ca	9.1	mg/kg	8.8	8	11
	6010B	Copper	313	nc	27.6	mg/kg	19	19	19
	6010B	Iron	2346	nc	28200	mg/kg	**22000**	**25000**	**24000**
	6010B	Lead	400	pbk	27.4	mg/kg	28	29	17
	6010B	Magnesium	--[n]		2760	mg/kg	2600	2700	4700
	6010B	Manganese	176	nc	1950	mg/kg	**410**	**410**	**460**
	6010B	Nickel	156	nc	17.7	mg/kg	20	20	25
	6010B	Potassium	--[n]		1950	mg/kg	1400	1400	2000
	6010B	Sodium	--[n]		112	mg/kg	330	320	420
	6010B	Vanadium	7.8	nc	26.1	mg/kg	**21**	**22**	**23**
	6010B	Zinc	2346	nc	532	mg/kg	120	87	100
	7471A	Mercury	2.3	nc	0.06	mg/kg	0.033	0.032	0.036

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analyte was a non-detect (with a "U" qualifier) or analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table F-15/F-16-4
Buildings F-15/F-16 Summary of Surface Water Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16sw-001-SW	F16sw-002-DUP	F16sw-002-SW
					Sample Date:	11/3/2004	11/3/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Tap Water)	Surface Water Background Criteria	Units			
Metals	6010B	Aluminum	36499 nc	3370	ug/l	300	520	530
	6010B	Barium	2555 nc	47.5	ug/l	39	24	24
	6010B	Calcium	--[n]	41400	ug/l	97000	31000	31000
	6010B	Chromium	109 nc	0.00	ug/l	1.6		
	6010B	Cobalt	730 nc	0.00	ug/l	2		
	6010B	Copper	1460 nc	7.9	ug/l	1.6		
	6010B	Iron	10950 nc	2560	ug/l	3600	750	750
	6010B	Magnesium	--[n]	10800	ug/l	13000	8000	8000
	6010B	Manganese	876 nc	391	ug/l	**4600**	72	73
	6010B	Nickel	730 nc	0.00	ug/l	1.9		
	6010B	Potassium	--[n]	3170	ug/l	7100	2200	2200
	6010B	Sodium	--[n]	21300	ug/l	3100	3000	2900
	7060A	Arsenic	0.045 ca	3.2	ug/l	6.8		
	7421	Lead	15 mcl	0.00	ug/l	1.5		
VOCs	8260B	Acetone	5475 nc	--	ug/l	16		
SVOCs	8270C	4-Methylphenol	182 nc	--	ug/l	0.65 J		
	8270C	Phenol	10950 nc	--	ug/l	0.62 J		
Explosives	8330	1,3,5-Trinitrobenzene	1095 nc	--	ug/l	0.14 J		
	8330	4-Amino-2,6-Dinitrotoluene	--	--	ug/l	0.53		
	8330	RDX	0.61 ca	--	ug/l	0.14 J		
Propellants	8332	Nitroglycerine	4.8 ca	--	ug/l	2.1		

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analyte was a non-detect (with a "U" qualifier) or analysis was not performed
ug/l - means micrograms per Liter (parts per billion - ppb)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
					Sample Date:		10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
					Sample Depth:		0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Surface Soil Background Criteria	Units															
Metals	6010B	Aluminum	7614	nc	17700	mg/kg	**12000**	**14000**	**13000**	**14000**	**12000**		**16000**	**16000**	**11000**	**11000**	**11000**	**12000**	7300	**11000**	**14000**
	6010B	Arsenic	0.39	ca	15.4	mg/kg	**10**	**11**	**10**	**12**	**16**		**12**	**10**	**9.4**	**12**	**12**	**11**	**20**	**12**	**11**
	6010B	Barium	538	nc	88.4	mg/kg	85	81	90	100	72		79	76	83	84	86	100	80	96	83
	6010B	Beryllium	15	nc	0.88	mg/kg	0.85	0.86	0.75	1.2	0.81		0.86	0.78	0.83	0.96	0.99	1.1	1.4	0.86	0.8
	6010B	Cadmium	3.7	nc	0.00	mg/kg	0.11 U	0.135 U	0.38	0.125 UJ	0.23 U		0.12 U	0.245 U	0.115 U	0.12 U	0.125 U	0.12 U	0.21	0.13 U	0.25
	6010B	Calcium	--[n]		15800	mg/kg	20000	3300	3200	9200	3000		2800	4200	29000	9800	8600	3000	5200	3700	5300
	6010B	Chromium	30	ca	17.4	mg/kg	21	20	22	29	20		24	24	19	21	22	20	24	27	23
	6010B	Cobalt	30	ca	10.4	mg/kg	11	11	8.9	11	11		11	8.2	11	7.9	7.3	12	5.9	11	10
	6010B	Copper	313	nc	17.7	mg/kg	25	18	18	18	19		22	15	23	19	17	21	24	28	200
	6010B	Iron	2346	nc	23100	mg/kg	**23000**	**25000**	**23000**	**27000**	**27000**		**26000**	**25000**	**23000**	**22000**	**21000**	**24000**	**25000**	**24000**	**25000**
	6010B	Lead	400	pbk	26.1	mg/kg	20	16	24	20	16		22	13	17	32	33	20	58	34	34
	6010B	Magnesium	--[n]		3030	mg/kg	5400	3200	2800	3700	3200		3100	3000	6600	2700	2900	3200	1100	3000	4100
	6010B	Manganese	176	nc	1450	mg/kg	**370**	**360**	**420**	**870**	**390**		**480**	**360**	**390**	**590**	**550**	**340**	**260**	**340**	**400**
	6010B	Nickel	156	nc	21.1	mg/kg	26	23	21	25	26		21	18	27	17	17	27	19	27	25
	6010B	Potassium	--[n]		927	mg/kg	1900	1300	1100	1800 J	1400		1400	1300	2000	1000	960	1200	680	1300	1900
	6010B	Selenium	39	nc	1.4	mg/kg	0.39	0.8 U	0.7 U	0.75 U	0.7 U		0.75 U	0.75 U	0.7 U	0.54	0.5	0.75 U	0.44	0.75 U	0.75 U
	6010B	Silver	39	nc	0.00	mg/kg	0.435 U	0.55 U	0.46 U	0.5 U	0.46 U		0.485 U	0.49 U	0.47 U	0.485 U	0.495 U	0.49 U	0.49 U	0.5 U	0.5 U
	6010B	Sodium	--[n]		123	mg/kg	290	250	260	430	390		390	350	300	260	270	310	260	320	340
	6010B	Vanadium	7.8	nc	31.1	mg/kg	**22**	**24**	**23**	**26**	**20**		**29**	**29**	**20**	**21**	**21**	**21**	**19**	**21**	**24**
	6010B	Zinc	2346	nc	61.8	mg/kg	110	57	63	68	64		61	49	75	70	70	58	100	110	100
	7041	Antimony	3.1	nc	0.96	mg/kg	0.65 U	0.75 U	0.7 U	- R	0.65 U		0.75 U	0.7 U	0.7 U	0.65 U	0.54	0.7 U	0.65 U	0.75 U	0.7 U
	7841	Thallium	0.52	nc	0.00	mg/kg	0.275 U	0.33 U	0.305 U	0.25	0.28 U		0.315 U	0.2	0.3 U	0.275 U	0.265 U	0.295 U	**0.59**	0.315 U	0.3 U
Pesticides	8081A	4,4'-DDD	2.4	ca	--	mg/kg							0.00175 U								
	8081A	4,4'-DDE	1.7	ca	--	mg/kg							0.00205 U								
	8081A	4,4'-DDT	1.7	ca	--	mg/kg							0.00175 U								
	8081A	Aldrin	0.029	ca	--	mg/kg							0.00175 U								
	8081A	alpha-BHC	0.09	sat	--	mg/kg							0.00175 U								
	8081A	alpha-Chlordane	1.6	ca	--	mg/kg							0.00175 U								
	8081A	beta-BHC	0.32	ca	--	mg/kg							0.00175 U								
	8081A	delta-BHC	--		--	mg/kg							0.00175 U								
	8081A	Dieldrin	0.030	ca	--	mg/kg							0.00175 U								
	8081A	Endosulfan I	37	nc	--	mg/kg							0.00175 U								
	8081A	Endosulfan II	37	nc	--	mg/kg							0.00175 U								
	8081A	Endosulfan sulfate	37	nc	--	mg/kg							0.00175 U								
	8081A	Endrin	1.8	nc	--	mg/kg							0.00175 U								
	8081A	Endrin aldehyde	--		--	mg/kg							0.00175 U								
	8081A	Endrin ketone	--		--	mg/kg							0.00175 U								
	8081A	gamma-BHC	0.44	ca	--	mg/kg							0.00175 U								
	8081A	gamma-Chlordane	1.6	ca	--	mg/kg							0.00175 U								
	8081A	Heptachlor	0.11	ca	--	mg/kg							0.00175 UJ								
	8081A	Heptachlor epoxide	0.053	ca	--	mg/kg							0.00175 U								
	8081A	Methoxychlor	31	nc	--	mg/kg							0.0085 U								
	8081A	Toxaphene	0.44	ca	--	mg/kg							0.0175 U								

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
					Sample Date:		10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
					Sample Depth:		0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Surface Soil Background Criteria	Units															
PCBs	8082	Aroclor 1016	0.39	nc	--	mg/kg							0.017 U								
	8082	Aroclor 1221	0.22	ca	--	mg/kg							0.017 U								
	8082	Aroclor 1232	0.22	ca	--	mg/kg							0.0085 U								
	8082	Aroclor 1242	0.22	ca	--	mg/kg							0.017 U								
	8082	Aroclor 1248	0.22	ca	--	mg/kg							0.0085 U								
	8082	Aroclor 1254	0.22	ca	--	mg/kg							0.017 U								
	8082	Aroclor 1260	0.22	ca	--	mg/kg							0.017 U								
VOCs	8260B	1,1,1-Trichloroethane	1200	sat	--	mg/kg						0.00315 U									
	8260B	1,1,2,2-Tetrachloroethane	0.41	ca	--	mg/kg						0.00315 U									
	8260B	1,1,2-Trichloroethane	0.73	ca	--	mg/kg						0.00315 U									
	8260B	1,1-Dichloroethane	51	nc	--	mg/kg						0.00315 U									
	8260B	1,1-Dichloroethene	12	nc	--	mg/kg						0.00315 U									
	8260B	1,2-Dibromoethane	0.032	ca	--	mg/kg						0.00315 U									
	8260B	1,2-Dichloroethane	0.28	ca	--	mg/kg						0.00315 U									
	8260B	1,2-Dichloroethene (total)	6.9	nc	--	mg/kg						0.0065 U									
	8260B	1,2-Dichloropropane	0.34	ca	--	mg/kg						0.00315 U									
	8260B	2-Butanone	2231	nc	--	mg/kg						0.0095 U									
	8260B	2-Hexanone	530	nc	--	mg/kg						0.0065 U									
	8260B	4-Methyl-2-pentanone	528	nc	--	mg/kg						0.0065 U									
	8260B	Acetone	1412	nc	--	mg/kg						0.0095 U									
	8260B	Benzene	0.64	ca	--	mg/kg						0.00315 U									
	8260B	Bromochloromethane	--		--	mg/kg						0.00315 U									
	8260B	Bromodichloromethane	0.82	ca	--	mg/kg						0.00315 U									
	8260B	Bromoform	62	ca	--	mg/kg						0.00315 U									
	8260B	Bromomethane	0.39	nc	--	mg/kg						0.00315 U									
	8260B	Carbon disulfide	36	nc	--	mg/kg						0.00315 U									
	8260B	Carbon tetrachloride	0.25	ca	--	mg/kg						0.00315 U									
	8260B	Chlorobenzene	15	nc	--	mg/kg						0.00315 U									
	8260B	Chloroethane	3.0	ca	--	mg/kg						0.00315 U									
	8260B	Chloroform	0.22	ca	--	mg/kg						0.00315 U									
	8260B	Chloromethane	4.7	nc	--	mg/kg						0.00315 U									
	8260B	cis-1,2-Dichloroethene	4.3	nc	--	mg/kg						0.00315 U									
	8260B	cis-1,3-Dichloropropene	0.78	ca	--	mg/kg						0.00315 U									
	8260B	Dibromochloromethane	1.1	ca	--	mg/kg						0.00315 U									
	8260B	Ethylbenzene	395	sat	--	mg/kg						0.00315 U									
	8260B	m&p-Xylenes	27	nc	--	mg/kg						0.0065 U									
	8260B	Methylene chloride	9.1	ca	--	mg/kg						0.0065 U									
	8260B	o-Xylene	27	nc	--	mg/kg						0.00315 U									
	8260B	Styrene	1700	sat	--	mg/kg						0.00315 U									
	8260B	Tetrachloroethene	0.48	ca	--	mg/kg						0.00315 U									
	8260B	Toluene	520	sat	--	mg/kg						0.00315 U									
	8260B	Total Xylenes	27	nc	--	mg/kg						0.0065 U									
	8260B	trans-1,2-Dichloroethene	6.9	nc	--	mg/kg						0.00315 UJ									
	8260B	trans-1,3-Dichloropropene	0.78	ca	--	mg/kg						0.00315 U									

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
					Sample Date:	10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units															
	8260B	Trichloroethene	0.053 ca	--	mg/kg						0.00315 U									
	8260B	Vinyl chloride	0.079 ca	--	mg/kg						0.00315 UJ									
SVOCs	8270C	1,2,4-Trichlorobenzene	6.2 nc	--	mg/kg							0.085 U								
	8270C	1,2-Dichlorobenzene	600 sat	--	mg/kg							0.085 U								
	8270C	1,3-Dichlorobenzene	53 nc	--	mg/kg							0.085 U								
	8270C	1,4-Dichlorobenzene	3.4 ca	--	mg/kg							0.085 U								
	8270C	2,2-oxybis (1-chloropropane)	2.9 ca	--	mg/kg							0.085 U								
	8270C	2,4,5-Trichlorophenol	611 nc	--	mg/kg							0.17 U								
	8270C	2,4,6-Trichlorophenol	0.61 nc	--	mg/kg							0.085 U								
	8270C	2,4-Dichlorophenol	18 nc	--	mg/kg							0.17 U								
	8270C	2,4-Dimethylphenol	122 nc	--	mg/kg							0.17 U								
	8270C	2,4-Dinitrophenol	12 nc	--	mg/kg							0.35 U								
	8270C	2,4-Dinitrotoluene	12 nc	--	mg/kg							0.017 U								
	8270C	2,6-Dinitrotoluene	6.1 nc	--	mg/kg							0.017 U								
	8270C	2-Chloronaphthalene	494 nc	--	mg/kg							0.085 U								
	8270C	2-Chlorophenol	6.3 nc	--	mg/kg							0.085 U								
	8270C	2-Methylnaphthalene	--	--	mg/kg							0.053								
	8270C	2-Methylphenol	306 nc	--	mg/kg							0.035 U								
	8270C	2-Nitroaniline	18.3 nc	--	mg/kg							0.085 U								
	8270C	2-Nitrophenol	--	--	mg/kg							0.17 U								
	8270C	3,3'-Dichlorobenzidine	1.1 ca	--	mg/kg							0.085 U								
	8270C	3-Nitroaniline	1.8 nc	--	mg/kg							0.35 U								
	8270C	4,6-Dinitro-2-methylphenol	0.61 nc	--	mg/kg							0.35 U								
	8270C	4-Bromophenyl phenyl ether	--	--	mg/kg							0.085 U								
	8270C	4-Chloro-3-methylphenol	--	--	mg/kg							0.17 U								
	8270C	4-Chloroaniline	24 nc	--	mg/kg							0.35 U								
	8270C	4-Chlorophenyl phenyl ether	--	--	mg/kg							0.085 U								
	8270C	4-Methylphenol	31 nc	--	mg/kg							0.035 U								
	8270C	4-Nitroaniline	23 ca	--	mg/kg							0.35 U								
	8270C	4-Nitrophenol	--	--	mg/kg							0.35 U								
	8270C	Acenaphthene	368 nc	--	mg/kg							0.017 U								
	8270C	Acenaphthylene	--	--	mg/kg							0.017 U								
	8270C	Anthracene	2189 nc	--	mg/kg							0.017 U								
	8270C	Benzo(a)anthracene	0.62 ca	--	mg/kg							0.036								
	8270C	Benzo(a)pyrene	0.062 ca	--	mg/kg							0.031 J								
	8270C	Benzo(b)fluoranthene	0.62 ca	--	mg/kg							0.041								
	8270C	Benzo(g,h,i)perylene	--	--	mg/kg							0.023 J								
	8270C	Benzo(k)fluoranthene	6.2 ca	--	mg/kg							0.026 J								
	8270C	Benzoic acid	100000 max	--	mg/kg							- R								
	8270C	Benzyl alcohol	1833 nc	--	mg/kg							0.35 U								
	8270C	Bis(2-chloroethoxy)methane	--	--	mg/kg							0.035 U								
	8270C	Bis(2-chloroethyl) ether	0.22 ca	--	mg/kg							0.035 U								
	8270C	Bis(2-ethylhexyl) phthalate	35 ca	--	mg/kg							0.085 U								
	8270C	Butylbenzyl phthalate	1222 nc	--	mg/kg							0.035 U								

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
					Sample Date:		10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
					Sample Depth:		0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Surface Soil Background Criteria	Units															
	8270C	Carbazole	24	ca	--	mg/kg							0.085 U								
	8270C	Chrysene	62	ca	--	mg/kg							0.051								
	8270C	Dibenzo(a,h)anthracene	0.062	ca	--	mg/kg							0.017 U								
	8270C	Dibenzofuran	15	nc	--	mg/kg							0.017 J								
	8270C	Diethyl phthalate	4888	nc	--	mg/kg							0.035 U								
	8270C	Dimethyl phthalate	100000	max	--	mg/kg							0.035 U								
	8270C	Di-n-butyl phthalate	611	nc	--	mg/kg							0.085 U								
	8270C	Di-n-octyl phthalate	244	nc	--	mg/kg							0.17 U								
	8270C	Fluoranthene	229	nc	--	mg/kg							0.059								
	8270C	Fluorene	275	nc	--	mg/kg							0.017 U								
	8270C	Hexachlorobenzene	0.30	ca	--	mg/kg							0.017 U								
	8270C	Hexachlorobutadiene	6.2	ca	--	mg/kg							0.085 U								
	8270C	Hexachlorocyclopentadiene	37	nc	--	mg/kg							0.5 U								
	8270C	Hexachloroethane	35	ca	--	mg/kg							0.085 U								
	8270C	Indeno(1,2,3-cd)pyrene	0.62	ca	--	mg/kg							0.019 J								
	8270C	Isophorone	512	ca	--	mg/kg							0.085 U								
	8270C	Naphthalene	5.6	nc	--	mg/kg							0.038								
	8270C	Nitrobenzene	2	nc	--	mg/kg							0.017 U								
	8270C	n-Nitroso-di-n-propylamine	0.069	ca	--	mg/kg							0.035 U								
	8270C	n-Nitrosodiphenylamine	99	ca	--	mg/kg							0.017 U								
	8270C	Pentachlorophenol	3.0	ca	--	mg/kg							0.17 U								
	8270C	Phenanthrene	--		--	mg/kg							0.05 J								
	8270C	Phenol	1833	nc	--	mg/kg							0.085 U								
	8270C	Pyrene	232	nc	--	mg/kg							0.056								
Explosives	8330	1,3,5-Trinitrobenzene	183	nc	--	mg/kg	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U		0.05 U	0.049 U	0.05 U	0.0495 U	0.05 U	0.05 U	0.0495 U	0.0495 U	0.05 U
	8330	1,3-Dinitrobenzene	0.61	nc	--	mg/kg	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U		0.05 U	0.049 U	0.05 U	0.0495 U	0.05 U	0.05 U	0.0495 U	0.0495 U	0.05 U
	8330	2,4,6-TNT	16	ca	--	mg/kg	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U		0.05 U	0.049 U	0.05 U	0.0495 U	0.05 U	0.05 U	0.0495 U	0.0495 U	0.05 U
	8330	2,4-Dinitrotoluene	12	nc	--	mg/kg	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U		0.05 U	0.049 U	0.05 U	0.0495 U	0.05 U	0.05 U	0.0495 U	0.0495 U	0.05 U
	8330	2,6-Dinitrotoluene	6.1	nc	--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	2-Amino-4,6-Dinitrotoluene	--		--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	2-Nitrotoluene	0.88	ca	--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	3-Nitrotoluene	73	nc	--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	4-Amino-2,6-Dinitrotoluene	--		--	mg/kg	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U		0.15 U	0.145 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
	8330	4-Nitrotoluene	12	ca	--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	HMX	306	nc	--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	Nitrobenzene	2	nc	--	mg/kg	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U		0.05 U	0.049 U	0.05 U	0.0495 U	0.05 U	0.05 U	0.0495 U	0.0495 U	0.05 U
	8330	RDX	4.4	ca	--	mg/kg	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
	8330	Tetryl	61	nc	--	mg/kg	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U		0.2 U	0.195 U	0.2 U	0.2 U	0.2 U	0.2 U	0.195 U	0.195 U	0.2 U

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F15ss-001M-SO	F15ss-002M-SO	F15ss-003M-SO	F15ss-004M-SO	F15ss-005M-SO	F15ss-006D-SO	F15ss-006M-SO	F15ss-007M-SO	F15ss-008M-SO	F15ss-009M-DUP	F15ss-009M-SO	F15ss-010M-SO	F15ss-011M-SO	F16ss-001M-SO	F16ss-002M-SO
					Sample Date:	10/28/2004	10/28/2004	10/28/2004	10/27/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	10/28/2004	11/3/2004	11/3/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-1 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units															
Propellants	353.2 Modified	Nitrocellulose	--	--	mg/kg							0.93								
	8332	Nitroglycerine	35 ca	--	mg/kg							0.25 U								
	SW8330 Modified	Nitroguanidine	611 nc	--	mg/kg							0.125 U								

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
R - result rejected during ADR validation
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
						Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
						Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Surface Soil Background Criteria	Units						
Metals	6010B	Aluminum	7614	nc	17700	mg/kg	**12000**	**11000**		**11000**	**16000**	**14000**
	6010B	Arsenic	0.39	ca	15.4	mg/kg	**11**	**18**		**11**	**12**	**10**
	6010B	Barium	538	nc	88.4	mg/kg	89	81		110	91	200
	6010B	Beryllium	15	nc	0.88	mg/kg	0.84	0.93		1.5	0.94	2.9
	6010B	Cadmium	3.7	nc	0.00	mg/kg	0.13 U	0.135 U		0.36	0.27 U	2.5
	6010B	Calcium	--[n]		15800	mg/kg	8900	5700		13000	9200	25000
	6010B	Chromium	30	ca	17.4	mg/kg	24	27		**38 J**	24	**55**
	6010B	Cobalt	30	ca	10.4	mg/kg	9.9	8.9		6.5	12	4.6
	6010B	Copper	313	nc	17.7	mg/kg	20	31		32	20	40
	6010B	Iron	2346	nc	23100	mg/kg	**24000**	**24000**		**22000**	**26000**	**28000**
	6010B	Lead	400	pbk	26.1	mg/kg	23	31		60 J	13	120
	6010B	Magnesium	--[n]		3030	mg/kg	3500	2800		3300	4600	4000
	6010B	Manganese	176	nc	1450	mg/kg	**320**	**650**		**710**	**420**	**1200**
	6010B	Nickel	156	nc	21.1	mg/kg	26	25		26	28	25
	6010B	Potassium	--[n]		927	mg/kg	1700	1400		1500 J	2100	1400
	6010B	Selenium	39	nc	1.4	mg/kg	0.8 U	0.8 U		0.85 U	0.8 U	1.7
	6010B	Silver	39	nc	0.00	mg/kg	0.5 U	0.55 U		0.55 U	0.55 U	0.55 U
	6010B	Sodium	--[n]		123	mg/kg	340	330		450	400	710
	6010B	Vanadium	7.8	nc	31.1	mg/kg	**22**	**20**		**19**	**26**	**21**
	6010B	Zinc	2346	nc	61.8	mg/kg	82	99		81	60	130
	7041	Antimony	3.1	nc	0.96	mg/kg	0.7 U	0.75 U		0.56	0.7 U	1
	7841	Thallium	0.52	nc	0.00	mg/kg	0.305 U	0.315 U		0.33	0.2	0.325 U
Pesticides	8081A	4,4'-DDD	2.4	ca	--	mg/kg				0.01 U		
	8081A	4,4'-DDE	1.7	ca	--	mg/kg				0.012 J		
	8081A	4,4'-DDT	1.7	ca	--	mg/kg				0.019 J		
	8081A	Aldrin	0.029	ca	--	mg/kg				0.01 U		
	8081A	alpha-BHC	0.09	sat	--	mg/kg				0.01 U		
	8081A	alpha-Chlordane	1.6	ca	--	mg/kg				0.01 U		
	8081A	beta-BHC	0.32	ca	--	mg/kg				0.01 U		
	8081A	delta-BHC	--		--	mg/kg				0.01 U		
	8081A	Dieldrin	0.030	ca	--	mg/kg				0.01 U		
	8081A	Endosulfan I	37	nc	--	mg/kg				0.01 U		
	8081A	Endosulfan II	37	nc	--	mg/kg				0.01 U		
	8081A	Endosulfan sulfate	37	nc	--	mg/kg				0.01 U		
	8081A	Endrin	1.8	nc	--	mg/kg				0.01 U		
	8081A	Endrin aldehyde	--		--	mg/kg				0.01 U		
	8081A	Endrin ketone	--		--	mg/kg				0.01 U		
	8081A	gamma-BHC	0.44	ca	--	mg/kg				0.01 U		
	8081A	gamma-Chlordane	1.6	ca	--	mg/kg				0.01 U		
	8081A	Heptachlor	0.11	ca	--	mg/kg				0.01 U		
	8081A	Heptachlor epoxide	0.053	ca	--	mg/kg				0.01 U		
	8081A	Methoxychlor	31	nc	--	mg/kg				0.049 U		
	8081A	Toxaphene	0.44	ca	--	mg/kg				0.1 U		

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
					Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units						
PCBs	8082	Aroclor 1016	0.39 nc	--	mg/kg				0.0195 U		
	8082	Aroclor 1221	0.22 ca	--	mg/kg				0.0195 U		
	8082	Aroclor 1232	0.22 ca	--	mg/kg				0.01 U		
	8082	Aroclor 1242	0.22 ca	--	mg/kg				0.0195 U		
	8082	Aroclor 1248	0.22 ca	--	mg/kg				0.01 U		
	8082	Aroclor 1254	0.22 ca	--	mg/kg				0.0195 U		
	8082	Aroclor 1260	0.22 ca	--	mg/kg				0.12		
VOCs	8260B	1,1,1-Trichloroethane	1200 sat	--	mg/kg			0.0033 U			
	8260B	1,1,2,2-Tetrachloroethane	0.41 ca	--	mg/kg			0.0033 U			
	8260B	1,1,2-Trichloroethane	0.73 ca	--	mg/kg			0.0033 U			
	8260B	1,1-Dichloroethane	51 nc	--	mg/kg			0.0033 U			
	8260B	1,1-Dichloroethene	12 nc	--	mg/kg			0.0033 U			
	8260B	1,2-Dibromoethane	0.032 ca	--	mg/kg			0.0033 U			
	8260B	1,2-Dichloroethane	0.28 ca	--	mg/kg			0.0033 U			
	8260B	1,2-Dichloroethene (total)	6.9 nc	--	mg/kg			0.0065 U			
	8260B	1,2-Dichloropropane	0.34 ca	--	mg/kg			0.0033 U			
	8260B	2-Butanone	2231 nc	--	mg/kg			0.01 U			
	8260B	2-Hexanone	530 nc	--	mg/kg			0.0065 U			
	8260B	4-Methyl-2-pentanone	528 nc	--	mg/kg			0.0065 U			
	8260B	Acetone	1412 nc	--	mg/kg			0.01 U			
	8260B	Benzene	0.64 ca	--	mg/kg			0.0033 U			
	8260B	Bromochloromethane	--	--	mg/kg			0.0033 U			
	8260B	Bromodichloromethane	0.82 ca	--	mg/kg			0.0033 U			
	8260B	Bromoform	62 ca	--	mg/kg			0.0033 U			
	8260B	Bromomethane	0.39 nc	--	mg/kg			0.0033 U			
	8260B	Carbon disulfide	36 nc	--	mg/kg			0.0033 U			
	8260B	Carbon tetrachloride	0.25 ca	--	mg/kg			0.0033 U			
	8260B	Chlorobenzene	15 nc	--	mg/kg			0.0033 U			
	8260B	Chloroethane	3.0 ca	--	mg/kg			0.0033 U			
	8260B	Chloroform	0.22 ca	--	mg/kg			0.0033 U			
	8260B	Chloromethane	4.7 nc	--	mg/kg			0.0033 U			
	8260B	cis-1,2-Dichloroethene	4.3 nc	--	mg/kg			0.0033 U			
	8260B	cis-1,3-Dichloropropene	0.78 ca	--	mg/kg			0.0033 U			
	8260B	Dibromochloromethane	1.1 ca	--	mg/kg			0.0033 U			
	8260B	Ethylbenzene	395 sat	--	mg/kg			0.0033 U			
	8260B	m&p-Xylenes	27 nc	--	mg/kg			0.0065 U			
	8260B	Methylene chloride	9.1 ca	--	mg/kg			0.0065 U			
	8260B	o-Xylene	27 nc	--	mg/kg			0.0033 U			
	8260B	Styrene	1700 sat	--	mg/kg			0.0033 U			
	8260B	Tetrachloroethene	0.48 ca	--	mg/kg			0.0033 U			
	8260B	Toluene	520 sat	--	mg/kg			0.0033 U			
	8260B	Total Xylenes	27 nc	--	mg/kg			0.0065 U			
	8260B	trans-1,2-Dichloroethene	6.9 nc	--	mg/kg			0.0033 U			
	8260B	trans-1,3-Dichloropropene	0.78 ca	--	mg/kg			0.0033 U			

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
					Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units						
	8260B	Trichloroethene	0.053 ca	--	mg/kg			0.0033 U			
	8260B	Vinyl chloride	0.079 ca	--	mg/kg			0.0033 U			
SVOCs	8270C	1,2,4-Trichlorobenzene	6.2 nc	--	mg/kg				0.095 U		
	8270C	1,2-Dichlorobenzene	600 sat	--	mg/kg				0.095 U		
	8270C	1,3-Dichlorobenzene	53 nc	--	mg/kg				0.095 U		
	8270C	1,4-Dichlorobenzene	3.4 ca	--	mg/kg				0.095 U		
	8270C	2,2-oxybis (1-chloropropane)	2.9 ca	--	mg/kg				0.095 U		
	8270C	2,4,5-Trichlorophenol	611 nc	--	mg/kg				0.19 U		
	8270C	2,4,6-Trichlorophenol	0.61 nc	--	mg/kg				0.095 U		
	8270C	2,4-Dichlorophenol	18 nc	--	mg/kg				0.19 U		
	8270C	2,4-Dimethylphenol	122 nc	--	mg/kg				0.19 U		
	8270C	2,4-Dinitrophenol	12 nc	--	mg/kg				0.385 U		
	8270C	2,4-Dinitrotoluene	12 nc	--	mg/kg				0.019 U		
	8270C	2,6-Dinitrotoluene	6.1 nc	--	mg/kg				0.019 U		
	8270C	2-Chloronaphthalene	494 nc	--	mg/kg				0.095 U		
	8270C	2-Chlorophenol	6.3 nc	--	mg/kg				0.095 U		
	8270C	2-Methylnaphthalene	--	--	mg/kg				1		
	8270C	2-Methylphenol	306 nc	--	mg/kg				0.0385 U		
	8270C	2-Nitroaniline	18.3 nc	--	mg/kg				0.095 U		
	8270C	2-Nitrophenol	--	--	mg/kg				0.19 U		
	8270C	3,3'-Dichlorobenzidine	1.1 ca	--	mg/kg				0.095 U		
	8270C	3-Nitroaniline	1.8 nc	--	mg/kg				0.385 U		
	8270C	4,6-Dinitro-2-methylphenol	0.61 nc	--	mg/kg				0.385 U		
	8270C	4-Bromophenyl phenyl ether	--	--	mg/kg				0.095 U		
	8270C	4-Chloro-3-methylphenol	--	--	mg/kg				0.19 U		
	8270C	4-Chloroaniline	24 nc	--	mg/kg				0.385 U		
	8270C	4-Chlorophenyl phenyl ether	--	--	mg/kg				0.095 U		
	8270C	4-Methylphenol	31 nc	--	mg/kg				0.0385 U		
	8270C	4-Nitroaniline	23 ca	--	mg/kg				0.385 U		
	8270C	4-Nitrophenol	--	--	mg/kg				0.385 U		
	8270C	Acenaphthene	368 nc	--	mg/kg				0.019 U		
	8270C	Acenaphthylene	--	--	mg/kg				0.019 U		
	8270C	Anthracene	2189 nc	--	mg/kg				0.053		
	8270C	Benzo(a)anthracene	0.62 ca	--	mg/kg				0.14		
	8270C	Benzo(a)pyrene	0.062 ca	--	mg/kg				**0.11**		
	8270C	Benzo(b)fluoranthene	0.62 ca	--	mg/kg				0.13		
	8270C	Benzo(g,h,i)perylene	--	--	mg/kg				0.095		
	8270C	Benzo(k)fluoranthene	6.2 ca	--	mg/kg				0.1		
	8270C	Benzoic acid	100000 max	--	mg/kg				- R		
	8270C	Benzyl alcohol	1833 nc	--	mg/kg				0.385 U		
	8270C	Bis(2-chloroethoxy)methane	--	--	mg/kg				0.0385 U		
	8270C	Bis(2-chloroethyl) ether	0.22 ca	--	mg/kg				0.0385 U		
	8270C	Bis(2-ethylhexyl) phthalate	35 ca	--	mg/kg				0.13 J		
	8270C	Butylbenzyl phthalate	1222 nc	--	mg/kg				0.0385 U		

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
					Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units						
	8270C	Carbazole	24 ca	--	mg/kg				0.038 J		
	8270C	Chrysene	62 ca	--	mg/kg				0.2		
	8270C	Dibenzo(a,h)anthracene	0.062 ca	--	mg/kg				0.019 U		
	8270C	Dibenzofuran	15 nc	--	mg/kg				0.26		
	8270C	Diethyl phthalate	4888 nc	--	mg/kg				0.0385 U		
	8270C	Dimethyl phthalate	100000 max	--	mg/kg				0.0385 U		
	8270C	Di-n-butyl phthalate	611 nc	--	mg/kg				0.095 U		
	8270C	Di-n-octyl phthalate	244 nc	--	mg/kg				0.19 U		
	8270C	Fluoranthene	229 nc	--	mg/kg				0.26		
	8270C	Fluorene	275 nc	--	mg/kg				0.019 U		
	8270C	Hexachlorobenzene	0.30 ca	--	mg/kg				0.019 U		
	8270C	Hexachlorobutadiene	6.2 ca	--	mg/kg				0.095 U		
	8270C	Hexachlorocyclopentadiene	37 nc	--	mg/kg				0.55 U		
	8270C	Hexachloroethane	35 ca	--	mg/kg				0.095 U		
	8270C	Indeno(1,2,3-cd)pyrene	0.62 ca	--	mg/kg				0.073		
	8270C	Isophorone	512 ca	--	mg/kg				0.095 U		
	8270C	Naphthalene	5.6 nc	--	mg/kg				0.73		
	8270C	Nitrobenzene	2 nc	--	mg/kg				0.019 U		
	8270C	n-Nitroso-di-n-propylamine	0.069 ca	--	mg/kg				0.0385 U		
	8270C	n-Nitrosodiphenylamine	99 ca	--	mg/kg				0.019 U		
	8270C	Pentachlorophenol	3.0 ca	--	mg/kg				0.19 U		
	8270C	Phenanthrene	--	--	mg/kg				0.52		
	8270C	Phenol	1833 nc	--	mg/kg				0.095 U		
	8270C	Pyrene	232 nc	--	mg/kg				0.3		
Explosives	8330	1,3,5-Trinitrobenzene	183 nc	--	mg/kg	0.0495 U	0.05 U		0.05 U	0.05 U	0.0495 U
	8330	1,3-Dinitrobenzene	0.61 nc	--	mg/kg	0.0495 U	0.05 U		0.05 U	0.05 U	0.0495 U
	8330	2,4,6-TNT	16 ca	--	mg/kg	0.0495 U	0.05 U		0.05 U	0.05 U	0.0495 U
	8330	2,4-Dinitrotoluene	12 nc	--	mg/kg	0.0495 U	0.05 U		0.05 U	0.05 U	0.0495 U
	8330	2,6-Dinitrotoluene	6.1 nc	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	2-Amino-4,6-Dinitrotoluene	--	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	2-Nitrotoluene	0.88 ca	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	3-Nitrotoluene	73 nc	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	4-Amino-2,6-Dinitrotoluene	--	--	mg/kg	0.15 U	0.15 U		0.15 U	0.15 U	0.15 U
	8330	4-Nitrotoluene	12 ca	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	HMX	306 nc	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	Nitrobenzene	2 nc	--	mg/kg	0.0495 U	0.05 U		0.05 U	0.05 U	0.0495 U
	8330	RDX	4.4 ca	--	mg/kg	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	Tetryl	61 nc	--	mg/kg	0.2 U	0.2 U		0.2 U	0.2 U	0.2 U

Table F-15/F-16-5
Buildings F-15/F-16 Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16ss-003M-SO	F16ss-004M-SO	F16ss-005D-SO	F16ss-005M-SO	F16ss-006M-SO	F16ss-007M-SO
					Sample Date:	11/3/2004	11/3/2004	11/3/2004	11/3/2004	10/28/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-1 ft	0-0.5 ft	0-0.5 ft	0-1 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units						
Propellants	353.2 Modified	Nitrocellulose	--	--	mg/kg				2.1		
	8332	Nitroglycerine	35 ca	--	mg/kg				0.52		
	SW8330 Modified	Nitroguanidine	611 nc	--	mg/kg				0.125 U		

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
R - result rejected during ADR validation
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style.

Table F-15/F-16-6
Buildings F-15/F-16 Summary of All Sediment Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

							F16sd-001M-DUP	F16sd-001M-SD	F16sd-002M-SD
						Sample Date:	11/3/2004	11/3/2004	11/3/2004
						Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)		Sediment Background Criteria	Units			
Metals	6010B	Aluminum	7614	nc	13900	mg/kg	**12000**	**13000**	**13000**
	6010B	Arsenic	0.39	ca	19.5	mg/kg	**11**	**12**	**8**
	6010B	Barium	538	nc	123	mg/kg	65	71	93
	6010B	Beryllium	15	nc	0.38	mg/kg	0.72	0.7	0.91
	6010B	Cadmium	3.7	nc	0.00	mg/kg	0.18	0.16 U	0.24
	6010B	Calcium	--[n]		5510	mg/kg	2700	2300	17000
	6010B	Chromium	30	ca	18.1	mg/kg	17	20	18
	6010B	Cobalt	30	ca	9.1	mg/kg	8.8	8	11
	6010B	Copper	313	nc	27.6	mg/kg	19	19	19
	6010B	Iron	2346	nc	28200	mg/kg	**22000**	**25000**	**24000**
	6010B	Lead	400	pbk	27.4	mg/kg	28	29	17
	6010B	Magnesium	--[n]		2760	mg/kg	2600	2700	4700
	6010B	Manganese	176	nc	1950	mg/kg	**410**	**410**	**460**
	6010B	Nickel	156	nc	17.7	mg/kg	20	20	25
	6010B	Potassium	--[n]		1950	mg/kg	1400	1400	2000
	6010B	Selenium	39	nc	1.7	mg/kg	0.95 U	0.95 U	2.05 U
	6010B	Silver	39	nc	0.00	mg/kg	0.65 U	0.65 U	1.35 U
	6010B	Sodium	--[n]		112	mg/kg	330	320	420
	6010B	Vanadium	7.8	nc	26.1	mg/kg	**21**	**22**	**23**
	6010B	Zinc	2346	nc	532	mg/kg	120	87	100
	7041	Antimony	3.1	nc	0.00	mg/kg	0.95 U	0.8 U	2.05 U
	7471A	Mercury	2.3	nc	0.06	mg/kg	0.033	0.032	0.036
	7841	Thallium	0.52	nc	0.89	mg/kg	0.4 U	0.34 U	0.85 U
Explosives	8330	1,3,5-Trinitrobenzene	183	nc	--	mg/kg	0.049 U	0.0495 U	0.05 U
	8330	1,3-Dinitrobenzene	0.61	nc	--	mg/kg	0.049 U	0.0495 U	0.05 U
	8330	2,4,6-TNT	16	ca	--	mg/kg	0.049 U	0.0495 U	0.05 U
	8330	2,4-Dinitrotoluene	12	nc	--	mg/kg	0.049 U	0.0495 U	0.05 U
	8330	2,6-Dinitrotoluene	6.1	nc	--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	2-Amino-4,6-Dinitrotoluene	--		--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	2-Nitrotoluene	0.88	ca	--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	3-Nitrotoluene	73	nc	--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	4-Amino-2,6-Dinitrotoluene	--		--	mg/kg	0.145 U	0.15 U	0.15 U
	8330	4-Nitrotoluene	12	ca	--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	HMX	306	nc	--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	Nitrobenzene	2	nc	--	mg/kg	0.049 U	0.0495 U	0.05 U
	8330	RDX	4.4	ca	--	mg/kg	0.1 U	0.1 U	0.1 U
	8330	Tetryl	61	nc	--	mg/kg	0.195 U	0.195 U	0.2 U

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
R - result rejected during ADR validation
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style.

Table F-15/F-16-7
Buildings F-15/F-16 Summary of All Surface Water Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16sw-001-SW	F16sw-002-DUP	F16sw-002-SW
					Sample Date:	11/3/2004	11/3/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Tap Water)	Surface Water Background Criteria	Units			
Metals	6010B	Aluminum	36499 nc	3370	ug/l	300	520	530
	6010B	Barium	2555 nc	47.5	ug/l	39	24	24
	6010B	Beryllium	73 nc	0.00	ug/l	1 U	1 U	1 U
	6010B	Cadmium	18 nc	0.00	ug/l	1 U	1 U	1 U
	6010B	Calcium	--[n]	41400	ug/l	97000	31000	31000
	6010B	Chromium	109 nc	0.00	ug/l	1.6	5 U	5 U
	6010B	Cobalt	730 nc	0.00	ug/l	2	2.5 U	2.5 U
	6010B	Copper	1460 nc	7.9	ug/l	1.6	5 U	5 U
	6010B	Iron	10950 nc	2560	ug/l	3600	750	750
	6010B	Magnesium	--[n]	10800	ug/l	13000	8000	8000
	6010B	Manganese	876 nc	391	ug/l	4600	72	73
	6010B	Nickel	730 nc	0.00	ug/l	1.9	5 U	5 U
	6010B	Potassium	--[n]	3170	ug/l	7100	2200	2200
	6010B	Selenium	182 nc	0.00	ug/l	7.5 U	7.5 U	7.5 U
	6010B	Silver	182 nc	0.00	ug/l	5 U	5 U	5 U
	6010B	Sodium	--[n]	21300	ug/l	3100	3000	2900
	6010B	Vanadium	36 nc	0.00	ug/l	5 U	5 U	5 U
	6010B	Zinc	10950 nc	42	ug/l	15 U	15 U	15 U
	7041	Antimony	15 nc	0.00	ug/l	3.75 U	3.75 U	3.75 U
	7060A	Arsenic	0.045 ca	3.2	ug/l	6.8	1 U	1 U
	7421	Lead	15 mcl	0.00	ug/l	1.5	1.5 U	1.5 U
	7470A	Mercury	11 nc	0.00	ug/l	0.1 U	0.1 U	0.1 U
	7841	Thallium	2.4 nc	0.00	ug/l	2 U	2 U	2 U
Pesticides	8081A	4,4'-DDD	0.28 ca	--	ug/l	0.055 U	0.055 U	0.055 U
	8081A	4,4'-DDE	0.20 ca	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	4,4'-DDT	0.20 ca	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	Aldrin	0.0040 ca	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	alpha-BHC	0.011 nc	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	alpha-Chlordane	0.19 ca	--	ug/l	0.0245 U	0.0245 U	0.0245 U
	8081A	beta-BHC	0.037 ca	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	delta-BHC	--	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	Dieldrin	0.0042 ca	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	Endosulfan I	220 nc	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	Endosulfan II	220 nc	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	Endosulfan sulfate	220 nc	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	Endrin	11 nc	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	Endrin aldehyde	--	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	Endrin ketone	--	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	gamma-BHC	0.052 ca	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	gamma-Chlordane	0.19 ca	--	ug/l	0.0485 U	0.049 U	0.049 U
	8081A	Heptachlor	0.015 ca	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	Heptachlor epoxide	0.0074 ca	--	ug/l	0.075 U	0.075 U	0.075 U
	8081A	Methoxychlor	182 nc	--	ug/l	0.29 U	0.295 U	0.295 U
	8081A	Toxaphene	0.061 ca	--	ug/l	0.245 U	0.245 U	0.245 U

Table F-15/F-16-7
Buildings F-15/F-16 Summary of All Surface Water Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16sw-001-SW	F16sw-002-DUP	F16sw-002-SW
					Sample Date:	11/3/2004	11/3/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Tap Water)	Surface Water Background Criteria	Units			
PCBs	8082	Aroclor 1016	0.96 ca	--	ug/l	0.29 U	0.295 U	0.295 U
	8082	Aroclor 1221	0.034 ca	--	ug/l	0.65 U	0.65 U	0.65 U
	8082	Aroclor 1232	0.034 ca	--	ug/l	0.65 U	0.65 U	0.65 U
	8082	Aroclor 1242	0.034 ca	--	ug/l	0.65 U	0.65 U	0.65 U
	8082	Aroclor 1248	0.034 ca	--	ug/l	0.75 U	0.75 U	0.75 U
	8082	Aroclor 1254	0.034 ca	--	ug/l	0.65 U	0.65 U	0.65 U
	8082	Aroclor 1260	0.034 ca	--	ug/l	0.29 U	0.295 U	0.295 U
VOCs	8260B	1,1,1-Trichloroethane	3172 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,1,2,2-Tetrachloroethane	0.055 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,1,2-Trichloroethane	0.20 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,1-Dichloroethane	811 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,1-Dichloroethene	339 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,2-Dibromoethane	0.0056 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,2-Dichloroethane	0.12 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,2-Dichloroethene (total)	120 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	1,2-Dichloropropane	0.16 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	2-Butanone	6968 nc	--	ug/l	5 U	5 U	5 U
	8260B	2-Hexanone	2000 nc	--	ug/l	5 U	5 U	5 U
	8260B	4-Methyl-2-pentanone	1993 nc	--	ug/l	5 U	5 U	5 U
	8260B	Acetone	5475 nc	--	ug/l	16	5 U	5 U
	8260B	Benzene	0.35 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Bromochloromethane	--	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Bromodichloromethane	0.18 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Bromoform	8.5 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Bromomethane	8.7 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Carbon disulfide	1043 nc	--	ug/l	2.5 U	2.5 U	2.5 U
	8260B	Carbon tetrachloride	0.17 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Chlorobenzene	106 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Chloroethane	4.6 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Chloroform	0.17 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Chloromethane	158 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	cis-1,2-Dichloroethene	61 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	cis-1,3-Dichloropropene	0.40 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Dibromochloromethane	0.13 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Ethylbenzene	1340 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	m&p-Xylenes	206 nc	--	ug/l	1 U	1 U	1 U
	8260B	Methylene chloride	4.3 ca	--	ug/l	0.75 U	0.75 U	0.75 U
	8260B	o-Xylene	206 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Styrene	1641 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Tetrachloroethene	0.10 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Toluene	723 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Total Xylenes	206 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	trans-1,2-Dichloroethene	122 nc	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	trans-1,3-Dichloropropene	0.40 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Trichloroethene	0.028 ca	--	ug/l	0.5 U	0.5 U	0.5 U
	8260B	Vinyl chloride	0.020 ca	--	ug/l	0.5 U	0.5 U	0.5 U

Table F-15/F-16-7
Buildings F-15/F-16 Summary of All Surface Water Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16sw-001-SW	F16sw-002-DUP	F16sw-002-SW
					Sample Date:	11/3/2004	11/3/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Tap Water)	Surface Water Background Criteria	Units			
SVOCs	8270C	1,2,4-Trichlorobenzene	7.2 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	1,2-Dichlorobenzene	370 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	1,3-Dichlorobenzene	182 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	1,4-Dichlorobenzene	0.50 ca	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	2,2-oxybis (1-chloropropane)	0.27 ca	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	2,4,5-Trichlorophenol	3650 nc	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	2,4,6-Trichlorophenol	3.6 nc	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	2,4-Dichlorophenol	109 nc	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	2,4-Dimethylphenol	730 nc	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	2,4-Dinitrophenol	73 nc	--	ug/l	9.5 U	9.5 U	9.5 U
	8270C	2,4-Dinitrotoluene	73 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	2,6-Dinitrotoluene	36 nc	--	ug/l	0.24 U	0.24 U	0.24 U
	8270C	2-Chloronaphthalene	487 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	2-Chlorophenol	30 nc	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	2-Methylnaphthalene	--	--	ug/l	0.24 U	0.24 U	0.24 U
	8270C	2-Methylphenol	1825 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	2-Nitroaniline	109 nc	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	2-Nitrophenol	--	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	3,3'-Dichlorobenzidine	0.15 ca	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	3-Nitroaniline	3.2 ca	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	4,6-Dinitro-2-methylphenol	3.6 nc	--	ug/l	9.5 U	9.5 U	9.5 U
	8270C	4-Bromophenyl phenyl ether	--	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	4-Chloro-3-methylphenol	--	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	4-Chloroaniline	146 nc	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	4-Chlorophenyl phenyl ether	--	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	4-Methylphenol	182 nc	--	ug/l	0.65 J	0.95 U	0.95 U
	8270C	4-Nitroaniline	3.2 ca	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	4-Nitrophenol	--	--	ug/l	9.5 U	9.5 U	9.5 U
	8270C	Acenaphthene	365 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Acenaphthylene	--	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Anthracene	1825 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Benzo(a)anthracene	0.092 ca	--	ug/l	0.095 U	0.095 U	0.095 U
	8270C	Benzo(a)pyrene	0.0092 ca	--	ug/l	0.19 U	0.19 U	0.19 U
	8270C	Benzo(b)fluoranthene	0.092 ca	--	ug/l	0.19 U	0.19 U	0.19 U
	8270C	Benzo(g,h,i)perylene	--	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Benzo(k)fluoranthene	0.92 ca	--	ug/l	0.19 U	0.19 U	0.19 U
	8270C	Benzoic acid	145979 nc	--	ug/l	- R	- R	- R
	8270C	Benzyl alcohol	10950 nc	--	ug/l	9.5 U	9.5 U	9.5 U
	8270C	Bis(2-chloroethoxy)methane	--	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	Bis(2-chloroethyl) ether	0.010 ca	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	Bis(2-ethylhexyl) phthalate	4.8 ca	--	ug/l	7 U	7 U	7 U
	8270C	Butylbenzyl phthalate	7300 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	Carbazole	3.4 ca	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	Chrysene	9.2 ca	--	ug/l	0.24 U	0.24 U	0.24 U
	8270C	Dibenzo(a,h)anthracene	0.0092 ca	--	ug/l	0.19 U	0.19 U	0.19 U
	8270C	Dibenzofuran	12 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	Diethyl phthalate	29199 nc	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	Dimethyl phthalate	364867 nc	--	ug/l	0.95 U	0.95 U	0.95 U

Table F-15/F-16-7
Buildings F-15/F-16 Summary of All Surface Water Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16sw-001-SW	F16sw-002-DUP	F16sw-002-SW
					Sample Date:	11/3/2004	11/3/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Tap Water)	Surface Water Background Criteria	Units			
	8270C	Di-n-butyl phthalate	3650 nc	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	Di-n-octyl phthalate	1460 nc	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	Fluoranthene	1460 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Fluorene	243 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Hexachlorobenzene	0.042 ca	--	ug/l	0.24 U	0.24 U	0.24 U
	8270C	Hexachlorobutadiene	0.86 ca	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	Hexachlorocyclopentadiene	219 nc	--	ug/l	9.5 U	9.5 U	9.5 U
	8270C	Hexachloroethane	4.8 ca	--	ug/l	2.4 U	2.4 U	2.4 U
	8270C	Indeno(1,2,3-cd)pyrene	0.092 ca	--	ug/l	0.19 U	0.19 U	0.19 U
	8270C	Isophorone	71 ca	--	ug/l	0.95 U	0.95 U	0.95 U
	8270C	Naphthalene	6.2 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Nitrobenzene	3.4 nc	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	n-Nitroso-di-n-propylamine	0.0096 ca	--	ug/l	0.24 U	0.24 U	0.24 U
	8270C	n-Nitrosodiphenylamine	14 ca	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Pentachlorophenol	0.56 ca	--	ug/l	4.75 U	4.8 U	4.8 U
	8270C	Phenanthrene	--	--	ug/l	0.475 U	0.48 U	0.48 U
	8270C	Phenol	10950 nc	--	ug/l	0.62 J	2.4 U	2.4 U
	8270C	Pyrene	182 nc	--	ug/l	0.475 U	0.48 U	0.48 U
Explosives	8330	1,3,5-Trinitrobenzene	1095 nc	--	ug/l	0.14 J	0.15 U	0.155 U
	8330	1,3-Dinitrobenzene	3.6 nc	--	ug/l	0.11 U	0.15 U	0.155 U
	8330	2,4,6-TNT	2.2 ca	--	ug/l	0.14 U	0.19 U	0.19 U
	8330	2,4-Dinitrotoluene	73 nc	--	ug/l	0.2 U	0.27 U	0.275 U
	8330	2,6-Dinitrotoluene	36 nc	--	ug/l	0.235 U	0.32 U	0.33 U
	8330	2-Amino-4,6-Dinitrotoluene	--	--	ug/l	0.2 U	0.27 U	0.275 U
	8330	2-Nitrotoluene	0.049 ca	--	ug/l	0.17 U	0.23 U	0.24 U
	8330	3-Nitrotoluene	122 nc	--	ug/l	0.17 U	0.23 U	0.24 U
	8330	4-Amino-2,6-Dinitrotoluene	--	--	ug/l	0.53	0.25 U	0.255 U
	8330	4-Nitrotoluene	0.66 ca	--	ug/l	0.17 U	0.23 U	0.24 U
	8330	HMX	1825 nc	--	ug/l	0.17 U	0.23 U	0.24 U
	8330	Nitrobenzene	3.4 nc	--	ug/l	0.09 U	0.12 U	0.125 U
	8330	RDX	0.61 ca	--	ug/l	0.14 J	0.15 U	0.155 U
	8330	Tetryl	365 nc	--	ug/l	0.43 U	0.6 U	0.6 U
Propellants	353.2 Modified	Nitrocellulose	--	--	ug/l	250 U	250 U	250 U
	8332	Nitroglycerine	4.8 ca	--	ug/l	2.1	0.75 U	0.75 U
	SW8330 Modified	Nitroguanidine	3650 nc	--	ug/l	10 U	10 U	10 U

Table F-15/F-16-7
Buildings F-15/F-16 Summary of All Surface Water Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						F16sw-001-SW	F16sw-002-DUP	F16sw-002-SW
					Sample Date:	11/3/2004	11/3/2004	11/3/2004
					Sample Depth:	0-0.5 ft	0-0.5 ft	0-0.5 ft
Group	Method	Parameter	Region 9 PRG (Tap Water)	Surface Water Background Criteria	Units			

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analysis was not performed
ug/l - means micrograms per Liter (parts per billion - ppb)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
R - result rejected during ADR validation
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table F-15/F-16-10
Buildings F-15/F-16 Human Health Risk Screening Tables for Surface Water
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Region 9 PRG (Tap Water)		Surface Water Background	Maximum Detected	Frequency of Detection	COPC
Aluminum	36499	nc	3370	530	3 / 3	No
Barium	2555	nc	47.5	39	3 / 3	No
Calcium	--[n]		41400	97000	3 / 3	No
Chromium	109	nc	0.00	1.6	1 / 3	No
Cobalt	730	nc	0.00	2	1 / 3	No
Copper	1460	nc	7.9	1.6	1 / 3	No
Iron	10950	nc	2560	3600	3 / 3	No
Magnesium	--[n]		10800	13000	3 / 3	No
Manganese	876	nc	391	4600	3 / 3	Yes, > BKG & PRG
Nickel	730	nc	0.00	1.9	1 / 3	No
Potassium	--[n]		3170	7100	3 / 3	No
Sodium	--[n]		21300	3100	3 / 3	No
Arsenic	0.045	ca	3.2	6.8	1 / 3	Yes, > BKG & PRG
Lead	15	mcl	0.00	1.5	1 / 3	No
Acetone	5475	nc	--	16	1 / 3	No
4-Methylphenol	182	nc	--	0.65	1 / 3	No
Phenol	10950	nc	--	0.62	1 / 3	No
1,3,5-Trinitrobenzene	1095	nc	--	0.14	1 / 3	No
4-Amino-2,6-Dinitrotoluene	--		--	0.53	1 / 3	Yes, NTX
RDX	0.61	ca	--	0.14	1 / 3	No
Nitroglycerine	4.8	ca	--	2.1	1 / 3	No

Notes:
-- - no value available
BKG - site specific background
PRG - USEPA Region 9 Preliminary Remediation Goals
NTX - no toxicity screening value available
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
[n] - nutrient
*Concentration Units ug/L

Table F-15/F-16-9
Buildings F-15/F-16 Human Health Risk Screening Tables for Sediment
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Region 9 PRG (Res Soil)		Sediment Background	Maximum Detected	Frequency of Detection	COPC
Aluminum	7614	nc	13900	13000	3 / 3	No
Arsenic	0.39	ca	19.5	12	3 / 3	No
Barium	538	nc	123	93	3 / 3	No
Beryllium	15	nc	0.38	0.91	3 / 3	No
Cadmium	3.7	nc	0.00	0.24	2 / 3	No
Calcium	--[n]		5510	17000	3 / 3	No
Chromium	30	ca	18.1	20	3 / 3	No
Cobalt	30	ca	9.1	11	3 / 3	No
Copper	313	nc	27.6	19	3 / 3	No
Iron	2346	nc	28200	25000	3 / 3	No
Lead	400	pbk	27.4	29	3 / 3	No
Magnesium	--[n]		2760	4700	3 / 3	No
Manganese	176	nc	1950	460	3 / 3	No
Nickel	156	nc	17.7	25	3 / 3	No
Potassium	--[n]		1950	2000	3 / 3	No
Sodium	--[n]		112	420	3 / 3	No
Vanadium	7.8	nc	26.1	23	3 / 3	No
Zinc	2346	nc	532	120	3 / 3	No
Mercury	2.3	nc	0.06	0.036	3 / 3	No

Notes:
-- - no value available
BKG - site specific background
PRG - USEPA Region 9 Preliminary Remediation Goals
NTX - no toxicity screening value available
nc - non-cancer basis, value is 1/10 the published PRG
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
*Concentration Units mg/kg

Table F-15/F-16-8
Buildings F-15/F-16 Human Health Risk Screening Tables for Surface Soil (0-1 ft)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Region 9 PRG (Res Soil)		Surface Soil Background	Maximum Detected	Frequency of Detection	COPC
Aluminum	7614	nc	17700	16000	19 / 19	No
Arsenic	0.39	ca	15.4	20	19 / 19	Yes, > BKG & PRG
Barium	538	nc	88.4	200	19 / 19	No
Beryllium	15	nc	0.88	2.9	19 / 19	No
Cadmium	3.7	nc	0.00	2.5	5 / 19	No
Calcium	--[n]		15800	29000	19 / 19	No
Chromium	30	ca	17.4	55	19 / 19	Yes, > BKG & PRG
Cobalt	30	ca	10.4	12	19 / 19	No
Copper	313	nc	17.7	200	19 / 19	No
Iron	2346	nc	23100	28000	19 / 19	Yes, > BKG & PRG
Lead	400	pbk	26.1	120	19 / 19	No
Magnesium	--[n]		3030	6600	19 / 19	No
Manganese	176	nc	1450	1200	19 / 19	No
Nickel	156	nc	21.1	28	19 / 19	No
Potassium	--[n]		927	2100	19 / 19	No
Selenium	39	nc	1.4	1.7	5 / 19	No
Sodium	--[n]		123	710	19 / 19	No
Vanadium	7.8	nc	31.1	29	19 / 19	No
Zinc	2346	nc	61.8	130	19 / 19	No
Antimony	3.1	nc	0.96	1	3 / 18	No
Mercury	2.3	nc	0.04	0.065	18 / 19	No
Thallium	0.52	nc	0.00	0.59	5 / 19	Yes, > BKG & PRG
4,4'-DDE	1.7	ca	--	0.012	1 / 2	No
4,4'-DDT	1.7	ca	--	0.019	1 / 2	No
Aroclor 1260	0.22	ca	--	0.12	1 / 2	No
2-Methylnaphthalene	--		--	1	2 / 2	Yes, NTX
Anthracene	2189	nc	--	0.053	1 / 2	No
Benzo(a)anthracene	0.62	ca	--	0.14	2 / 2	No
Benzo(a)pyrene	0.062	ca	--	0.11	2 / 2	Yes, > PRG
Benzo(b)fluoranthene	0.62	ca	--	0.13	2 / 2	No
Benzo(g,h,i)perylene	--		--	0.095	2 / 2	Yes, NTX
Benzo(k)fluoranthene	6.2	ca	--	0.1	2 / 2	No
Bis(2-ethylhexyl) phthalate	35	ca	--	0.13	1 / 2	No
Carbazole	24	ca	--	0.038	1 / 2	No
Chrysene	62	ca	--	0.2	2 / 2	No
Dibenzofuran	15	nc	--	0.26	2 / 2	No
Fluoranthene	229	nc	--	0.26	2 / 2	No
Indeno(1,2,3-cd)pyrene	0.62	ca	--	0.073	2 / 2	No
Naphthalene	5.6	nc	--	0.73	2 / 2	No
Phenanthrene	--		--	0.52	2 / 2	Yes, NTX
Pyrene	232	nc	--	0.3	2 / 2	No
Nitrocellulose	--		--	2.1	2 / 2	Yes, NTX
Nitroglycerine	35	ca	--	0.52	1 / 2	No

Notes:
-- - no value available
BKG - site specific background
PRG - USEPA Region 9 Preliminary Remediation Goals
NTX - no toxicity screening value available
nc - non-cancer basis, value is 1/10 the published PRG
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
*Concentration Units mg/kg

Table F-15/F-16-11
Building F-15/F-16 Ecological Risk Screening Tables for Surface Soil (0-1 ft)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Group	Parameter	Frequency of Detection	Average Concentration	Maximum Detected Concentration	Units	Surface Soil Background Concentration	Maximum Concentration > Background	Screening Value	Maximum Concentration > Screening value	PBT	COPC	COPC Rationale
Metals	Aluminum	19 / 19	12542	16000	mg/kg	17700	No	600 ss2	Yes	No	No	BLBKG
	Arsenic	19 / 19	12	20	mg/kg	15.4	Yes	9.9 ss1	Yes	No	Yes	ASL
	Barium	19 / 19	93	200	mg/kg	88.4	Yes	283 ss1	No	No	No	BSL
	Beryllium	19 / 19	1.1	2.9	mg/kg	0.88	Yes	10 ss1	No	No	No	BSL
	Cadmium	5 / 19	0.31	2.5	mg/kg	0.00	Yes	4 ss1	No	No	No	BSL
	Calcium	19 / 19	9058	29000	mg/kg	15800	Yes	NUT	No	No	No	BSL
	Chromium	19 / 19	25	55	mg/kg	17.4	Yes	0.4 ss1	Yes	No	Yes	ASL
	Cobalt	19 / 19	9.4	12	mg/kg	10.4	Yes	20 ss1	No	No	No	BSL
	Copper	19 / 19	32	200	mg/kg	17.7	Yes	60 ss1	Yes	No	Yes	ASL
	Iron	19 / 19	24421	28000	mg/kg	23100	Yes	200 ss2	Yes	No	Yes	ASL
	Lead	19 / 19	32	120	mg/kg	26.1	Yes	40.5 ss1	Yes	No	Yes	ASL
	Magnesium	19 / 19	3484	6600	mg/kg	3030	Yes	NUT	No	No	No	BSL
	Manganese	19 / 19	496	1200	mg/kg	1450	No	100 ss2	Yes	No	No	BLBKG
	Nickel	19 / 19	24	28	mg/kg	21.1	Yes	30 ss1	No	No	No	BSL
	Potassium	19 / 19	1439	2100	mg/kg	927	Yes	NUT	No	No	No	BSL
	Selenium	5 / 19	0.75	1.7	mg/kg	1.4	Yes	0.21 ss1	Yes	No	Yes	ASL
	Sodium	19 / 19	350	710	mg/kg	123	Yes	NUT	No	No	No	BSL
	Vanadium	19 / 19	23	29	mg/kg	31.1	No	2 ss1	Yes	No	No	BLBKG
	Zinc	19 / 19	79	130	mg/kg	61.8	Yes	8.5 ss1	Yes	No	Yes	ASL
	Antimony	3 / 18	0.70	1	mg/kg	0.96	Yes	5 ss1	No	No	No	BSL
	Mercury	18 / 19	0.042	0.065	mg/kg	0.04	Yes	0.00051 ss1	Yes	Yes	Yes	ASL
	Thallium	5 / 19	0.30	0.59	mg/kg	0.00	Yes	1 ss1	No	No	No	BSL
Pesticides	4,4'-DDE	1 / 2	0.0070	0.012	mg/kg	--	NA	0.596 ss4	No	No	No	BSL
	4,4'-DDT	1 / 2	0.010	0.019	mg/kg	--	NA	0.0035 ss4	Yes	No	Yes	ASL
PCBs	Aroclor 1260	1 / 2	0.068	0.12	mg/kg	--	NA	0.000332 ss4	Yes	No	Yes	ASL
SVOCs	Anthracene	1 / 2	0.035	0.053	mg/kg	--	NA	148 ss4	No	No	No	BSL
	Benzo(a)anthracene	2 / 2	0.088	0.14	mg/kg	--	NA	5.21 ss4	No	No	No	BSL
	Benzo(a)pyrene	2 / 2	0.070	0.11	mg/kg	--	NA	1.52 ss4	No	No	No	BSL
	Benzo(b)fluoranthene	2 / 2	0.086	0.13	mg/kg	--	NA	59.8 ss4	No	No	No	BSL
	Benzo(g,h,i)perylene	2 / 2	0.059	0.095	mg/kg	--	NA	119 ss4	No	No	No	BSL
	Benzo(k)fluoranthene	2 / 2	0.063	0.1	mg/kg	--	NA	148 ss4	No	No	No	BSL
	Bis(2-ethylhexyl) phthalate	1 / 2	0.11	0.13	mg/kg	--	NA	0.925 ss4	No	No	No	BSL
	Carbazole	1 / 2	0.062	0.038	mg/kg	--	NA	--	NSL	No	Yes	NSL
	Chrysene	2 / 2	0.13	0.2	mg/kg	--	NA	4.73 ss4	No	No	No	BSL
	Dibenzofuran	2 / 2	0.14	0.26	mg/kg	--	NA	--	NSL	No	Yes	NSL
	Fluoranthene	2 / 2	0.16	0.26	mg/kg	--	NA	122 ss4	No	No	No	BSL
	Indeno(1,2,3-cd)pyrene	2 / 2	0.046	0.073	mg/kg	--	NA	109 ss4	No	No	No	BSL
	Naphthalene	2 / 2	0.38	0.73	mg/kg	--	NA	0.0994 ss4	Yes	No	Yes	ASL
	Phenanthrene	2 / 2	0.29	0.52	mg/kg	--	NA	45.7 ss4	No	No	No	BSL
	Pyrene	2 / 2	0.18	0.3	mg/kg	--	NA	78.5 ss4	No	No	No	BSL
Propellants	Nitrocellulose	1 / 1	2.1	2.1	mg/kg	--	NA	--	NSL	No	Yes	NSL
	Nitroglycerine	1 / 2	0.38	0.52	mg/kg	--	NA	--	NSL	No	Yes	NSL

Notes:
-- - no value available
mg/kg - means milligrams per Kilogram (parts per million - ppm)
ss1 - Preliminary Remediation Goals (Efroymson et al , 1997a)
ss2 - Toxiclogolgical Benchmarks for Soil and Litter Invertebrates (Efrymonson et al. 1997b)
ss3 - Toxiclogolgical Benchmarks for Terrestrial Plants (Efrymonson et al. 1997c)
ss4- Ecological Data Quality Level (USEPA Region 5, 1999)
NA - not applicable
NUT - nutrient
BLBKG - below background concentration
PBT- persistent, bioaccumulative and toxic
NSL - no screening level
ASL- above screening level
BSL - below screening level

Table F-15/F-16-12
Building F-15/F-16 Ecological Risk Screening Tables for Sediment
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Group	Parameter	Frequency of Detection	Average Concentration	Maximum Detected Concentration	Units	Sediment Background Concentration	Maximum Concentration > Background	SRV	Maximum Concentration > SRV	Screening Value	Maximum Concentration > Screening value	PBT	COPC	COPC Rationale
Metals	Aluminum	3 / 3	12667	13000	mg/kg	13900	No	29000	No	--	NSL	No	No	BLBKG
	Arsenic	3 / 3	10	12	mg/kg	19.5	No	25	No	9.79 sd1	Yes	No	No	BLBKG
	Barium	3 / 3	76	93	mg/kg	123	No	190	No	--	NSL	No	No	BLBKG
	Beryllium	3 / 3	0.78	0.91	mg/kg	0.38	Yes	0.8	Yes	--	NSL	No	Yes	NSL
	Cadmium	2 / 3	0.19	0.24	mg/kg	0.00	Yes	0.79	No	0.99 sd1	No	No	No	BLSRV
	Calcium	3 / 3	7333	17000	mg/kg	5510	Yes	21000	No	NUT	No	No	No	BLSRV
	Chromium	3 / 3	18	20	mg/kg	18.1	Yes	29	No	43.4 sd1	No	No	No	BLSRV
	Cobalt	3 / 3	9.3	11	mg/kg	9.1	Yes	12	No	50 sd2	No	No	No	BLSRV
	Copper	3 / 3	19	19	mg/kg	27.6	No	32	No	31.6 sd1	No	No	No	BLBKG
	Iron	3 / 3	23667	25000	mg/kg	28200	No	41000	No	--	NSL	No	No	BLBKG
	Lead	3 / 3	25	29	mg/kg	27.4	Yes	47	No	35.8 sd1	No	No	No	BLSRV
	Magnesium	3 / 3	3333	4700	mg/kg	2760	Yes	7100	No	NUT	No	No	No	BLSRV
	Manganese	3 / 3	427	460	mg/kg	1950	No	1500	No	--	NSL	No	No	BLBKG
	Nickel	3 / 3	22	25	mg/kg	17.7	Yes	33	No	22.7 sd1	Yes	No	No	BLSRV
	Potassium	3 / 3	1600	2000	mg/kg	1950	Yes	6800	No	NUT	No	No	No	BLSRV
	Sodium	3 / 3	357	420	mg/kg	112	Yes	--	NA	NUT	No	No	No	BSL
	Vanadium	3 / 3	22	23	mg/kg	26.1	No	40	No	--	NSL	No	No	BLBKG
	Zinc	3 / 3	102	120	mg/kg	532	No	160	No	121 sd1	No	No	No	BLBKG
	Mercury	3 / 3	0.034	0.036	mg/kg	0.06	No	0.12	No	0.18 sd1	No	Yes	No	BLBKG

Notes:
-- - no value available
mg/kg - means milligrams per Kilogram (parts per million - ppm)
sd1 - Threshold Effects Concentration from McDonald et al , (2000)
sd2 - Ecological Data Quality Level (USEPA Region 5, 1999)
NUT - nutrient
NA - not applicable
BLBKG - below background concentration
PBT- persistent, bioaccumulative and toxic
NSL - no screening level
ASL- above screening level
BSL - below screening level
SRV- Sediment Reference Value (OEPA, 2003)
BLSRV-Below Sediment Reference Value

Table F-15/F-16-13
Building F-15/F-16 Ecological Risk Screening Tables for Surface water
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Group	Parameter	Frequency of Detection	Average Concentration	Maximum Detected Concentration	Units	Surface Water Background Concentration	Maximum Concentration > Background	Screening Value	Maximum Concentration > Screening value	PBT	COPC	COPC Rationale
Metals	Aluminum	3 / 3	450	530	ug/l	3370	No	--	NSL	No	No	BLBKG
	Barium	3 / 3	29	39	ug/l	47.5	No	2000 sw1	No	No	No	BLBKG
	Calcium	3 / 3	53000	97000	ug/l	41400	Yes	NUT	No	No	No	BSL
	Chromium	1 / 3	3.9	1.6	ug/l	0.00	Yes	2811 sw1[H]	No	No	No	BSL
	Cobalt	1 / 3	2.3	2	ug/l	0.00	Yes	220 sw1	No	No	No	BSL
	Copper	1 / 3	3.9	1.6	ug/l	7.9	No	23 sw1[H]	No	No	No	BLBKG
	Iron	3 / 3	1700	3600	ug/l	2560	Yes	--	NSL	No	Yes	NSL
	Magnesium	3 / 3	9667	13000	ug/l	10800	Yes	NUT	No	No	No	BSL
	Manganese	3 / 3	1582	4600	ug/l	391	Yes	--	NSL	No	Yes	NSL
	Nickel	1 / 3	4.0	1.9	ug/l	0.00	Yes	743 sw1[H]	No	No	No	BSL
	Potassium	3 / 3	3833	7100	ug/l	3170	Yes	NUT	No	No	No	BSL
	Sodium	3 / 3	3000	3100	ug/l	21300	No	NUT	No	No	No	BLBKG
	Arsenic	1 / 3	2.9	6.8	ug/l	3.2	Yes	340 sw1	No	No	No	BSL
	Lead	1 / 3	1.5	1.5	ug/l	0.00	Yes	244 sw1[H]	No	No	No	BSL
VOCs	Acetone	1 / 3	8.7	16	ug/l	--	NA	--	NSL	No	Yes	NSL
SVOCs	4-Methylphenol	1 / 3	0.85	0.65	ug/l	--	NA	480 sw1	No	No	No	BSL
	Phenol	1 / 3	1.8	0.62	ug/l	--	NA	4700 sw1	No	No	No	BSL
Explosives	1,3,5-Trinitrobenzene	1 / 3	0.15	0.14	ug/l	--	NA	27 sw1	No	No	No	BSL
	4-Amino-2,6-Dinitrotoluene	1 / 3	0.34	0.53	ug/l	--	NA	98 sw1	No	No	No	BSL
	RDX	1 / 3	0.15	0.14	ug/l	--	NA	520 sw1	No	No	No	BSL
Propellants	Nitroglycerine	1 / 3	1.2	2.1	ug/l	--	NA	160 sw1	No	No	No	BSL

Notes:
-- - no value available
ug/l - means micrograms per Liter (parts per billion - ppb)
sw1 - Ohio Water Quality Criteria (Reg 3745-1-07)
sw1[H] - Ohio Water Quality Criteria (Reg 3745-1-07) based on a site specific hardness of 172 (mg/l)
NA - not applicable
ID - insufficient data to calculate screening value
NUT - nutrient
BLBKG - below background concentration
PBT- persistent, bioaccumulative and toxic
NSL - no screening level
ASL- above screening level

Table F-15/F-16-14
Building F-15/F-16 Ecological Risk Summary of Quantitative and Qualitative COPECs for Environmental Media
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Group	Parameter	Shallow Soil	Sediment	Surface Water
	Beryllium			
	Chromium	X		
	Iron	X		Q
	Lead	X		
	Magnesium			
	Nickel		X	
	Selenium	X		
	Zinc	X		
	Lead	X		
	Mercury	X		
Pesticides	4,4'-DDT	X		
PCBs	Aroclor 1260	X		
VOCs	Acetone			Q
SVOCs	Carbazole	Q		
	Dibenzofuran	Q		
	Naphthalene	X		
Propellants	Nitrocellulose	Q		
	Nitroglycerine	Q		

Notes
blank cells indicate that the analyte was not identified as a COPEC for the media
COPEC - chemical of potential ecological concern
X - quantitative COPEC
Q - qualitatative COPEC

Total PAHs are only applicable to sediments For soil and surface water, only the individual PAHs are screened

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1.0 INTRODUCTION

This report documents the results of the sampling completed at the Anchor Test Area (ATA) (AOC-48), one of the 14 RVAAP AOCs. Field activities were conducted from October 2004 to May 2005 to characterize 14 Ravenna Army Ammunition Plant (RVAAP) Areas of Concern (AOCs).

1.1 PURPOSE AND SCOPE

Characterization activities were conducted at ATA to collect sufficient data for all applicable media to allow efficient planning and execution of future environmental actions.

The characterization effort for the ATA was undertaken to accomplish the following:

- Collect characterization data using multi-increment (MI) sampling to provide data for future risk assessments that may be conducted;
- Develop and/or update the Conceptual Site Model to identify the key elements that should be considered in future actions;
- Assess AOC-specific physical characteristics;
- Assess potential sources of contamination;
- Allow initial assessment of the nature and lateral extent of soil (the depth of contamination was not evaluated for this characterization effort); and
- Conduct a preliminary human health and ecological screening.

The investigation approach to the ATA involved a combination of field and laboratory activities to characterize the site. Field investigation techniques included surface soil (0-1 ft) samples (multi-increment [MI] and discrete), soil boring and sampling, and a sample location survey. The rationale for the AOC-specific sampling plan was biased based on historical information including past usage, past investigations, ecological settings, climatic conditions, and geological and hydrologic characteristics. The field program was conducted in general accordance with the revised (USACE, 2001a) and the Final Sampling and Analysis Plan Addendum FSAP for the characterization of 14 RVAAP AOCs (MKM, 2004).

1.2 BACKGROUND INFORMATION

This section briefly describes the ATA AOC and previous investigations conducted at this AOC.

1.2.1 Site Description and History

The ATA is 0.8 ha (2 acre) located on the west side of Wilcox-Wayland Road, south of Newton Falls Road, and north of South Service Road. Currently the ATA is heavily overgrown with trees, shrubs and tall grass. Although little is known about the historical function of this AOC, the ATA may have been used to test explosive-charged anchors. A 1961 drawing shows the proposed site for the ATA; therefore, the AOC was not active until after the early 1960s. A design figure showing the type of anchor that may

have been used at the AOC is the only information found in the RVAAP historical files regarding "anchors" or "anchor testing". Figure 1-2, Volume I shows the location of ATA within the RVAPP facility.

1.2.2 Previous Investigation

Two studies were conducted at ATA:

1.2.2.1 1978 USATHAMA Installation Risk Assessment

This assessment identified the following conditions at RVAAP:

- Areas of RVAAP, including the productions areas (i.e. LL-5, LL-7, LL-8, LL-10 and LL-12), burning grounds, test areas and demolition areas were identified as sites contaminated with explosive waste which included: TNT, Composition B, lead azide, lead styphnate and black powder.
- Surface waters exiting the installation were not required to be monitored for nitrobodies and heavy metals.
- Analysis of the well water indicated potable quality.
- UXO items were identified in the demolition area.
- No environmental stress was identified at RVAAP.
- The chemical agent mustard may be buried within the old demolition grounds.
- The Ramsdell Quarry site landfill was identified as having a potential leaching problem.
- Trace quantities of 2,4,6-TNT were identified in the wells indicating that some leaching had occurred.

1.2.2.2 1998 Relative Risk Site Evaluation conducted by USACHPPM for AOCs identified after the 1996 CHPPM activities.

ATA was scored with a moderate (3.41) contaminate hazard factor (CHF) for groundwater and a potential migration pathway factor and receptor pathway factor. The AOC also was scored with a moderate (14.4) CHF for surface soil with a potential migration pathway factor and receptor pathway factor. The final RRSE score for the AOC was "Medium".

1.2.3 Regulatory Authorities

Volume 1, Section 1.2.3 identifies the regulatory authorities that oversee remedial activities for this AOC.

1.2.4 Regulatory Status of Anchor Test Area

Volume I, Section 1.2.4 identifies the regulatory status for these AOCs.

2.0 ENVIRONMENTAL SETTING AT ANCHOR TEST AREA

This section describes the physical characteristics of ATA that are factors in interpreting the potential contaminant transport pathways, receptor populations and exposure scenarios with respect to the evaluation of human health and ecological risks. The area immediately surrounding ATA is forested except for the clearing approximately 500 feet south that is occupied by a large wet land. This wet land is drained by an unnamed stream south to the West Branch of the Mahoning River. The AOC is located on the south flank of a small topographic high. The surface water flows to the south directly into the wet land. Wilcox-Wayland Road is located approximately 50 to 75 feet to the east. Newton Falls Road is located approximately 2,500 feet to the north.

2.1 SURFACE FEATURES

The topography in the vicinity of the RVAAP that includes the ATA site ranges from approximately 990 to 1000 ft above mean sea level (amsl) with the highest area located on the eastern side of the AOC.

The distinct surface features of the ATA are two large dirt mounds and a nearby sandpit. It is suspected that the anchor tests were performed within the 12 by 36 ft sand pit and the dirt mounds functioned as blast walls. Metal debris is visible in the area. A section of cement culvert can be seen in one of the mounds. It is suspected that the culvert was used to store anchors while tests were being conducted.

2.2 METEOROLOGY AND CLIMATE

Meteorology and climate are addressed in Volume 1, Section 2.2.

2.3 SURFACE WATER HYDROLOGY

Surface water drainage generally follows the topography of the ATA AOC, draining from the high on the eastern side of ATA toward the northwest (Figure ATA-1).

2.4 GEOLOGY

Drilling activities were not conducted at this AOC. The geology of the AOC is similar to that described previously in Volume 1, Section 2.0.

2.4.1 Glacial Deposits

Refer to Volume 1, Section 2.0 for a description of glacial deposits in the vicinity of this AOC.

2.5 SOIL

According to the Soil Survey of Portage County, Ohio (USDASCS, 1978), RVAAP soils are described as being nearly level to gently sloping, and are poor to moderately well drained. One soil type is found at this site — Ellsworth silt loam (2 to 6 percent slopes).

The Ellsworth series consists of deep, moderately well drained, gently sloping to very steep soils that formed in silty clay loam and silty clay glacial till. The Ellsworth silt loam (2 to 6 percent slopes) is a gently sloping soil on knolls or side slopes parallel to drainageways. Runoff is medium, and the hazard of erosion is severe. Seasonal wetness and slow permeability are characteristics of this type of soil.

2.5.1 Bedrock

The bedrock would be similar to those described previously in Volume 1, Section 2.0.

2.6 DEMOGRAPHY AND LAND USE

Demography and land use are discussed in Volume 1, Section 2.7.

2.7 ECOLOGY

Ecological information is addressed in Volume 1, Section 2.8.

3.0 CHARACTERIZATION ACTIVITIES AT ANCHOR TEST AREA

This section describes the field and analytical methods implemented during the RVAAP 14 AOC Characterization at ATA. The field and analytical programs were conducted in accordance with the RVAAP Facility Wide Sampling and Analysis Plan (FWSAP) (USACE, 2001) and the RVAAP 14 AOC FWSAP Addendum (MKM, 2004). Investigation objectives, rationale for sampling locations, sampling methods and sampling locations are briefly discussed in this section.

3.1 FIELD ACTIVITIES

Field activities conducted from August 2004 thru February 2005 included:

- Collecting MI surface soil (0-1 ft) samples (11-08-04);
- Collecting MI subsurface soil samples (11-08-04); and
- Conducting a sample location survey (12-13-04 – 01-07-05).

Sampling was conducted at this AOC to assess the impact that operations may have had on surface soil (0-1 ft) and subsurface soil, and to evaluate where contaminants related to the former testing operations are located. Information from previous studies, plus institutional knowledge of historical operations were used to determine the sampling locations, type of media collected, analyses performed and number of samples required to adequately characterize the ATA. Table ATA-1 summarizes the type and number of samples collected and the analyses conducted. A photo log of investigation activities is provided in Appendix C. Figure ATA-1 shows the sample locations for all media collected at this AOC.

3.1.1 MI Surface Soil Sampling (0-1 ft)

Six MI surface soil (0-1 ft) samples were collected from five grids at this AOC to identify the potential impact of testing operations on the sand pit area and anchor storage area and determine the nature of contaminants found.

The MI grid locations were biased to include areas where testing operations most likely occurred (i.e. within the sandpit and surrounding the buried cement culvert). MI samples were collected in accordance with Section 4.2.1.2 of the RVAAP 14 AOC FWSAP Addendum.

One split sample was collected and submitted for analysis to an independent, USACE-approved laboratory. Field sampling forms documenting the sampling activities are presented in Appendix E. MI surface soil (0-1 ft) analytical results are presented in Appendix F. One discrete VOC sample, as part of the surface soil (0-1 ft) MI sample, was collected to fulfill the 10 per cent full suite requirement. Section 3.1.93, Volume 1 describes the procedure used to collect discrete surface soil (0-1 ft) samples. Analysis of surface soil (0-1 ft) for ATA included the following parameters: TAL Metals and Explosives. Samples were prepared, packaged and shipped in accordance with Section 6.0 of the RVAAP 14 AOC FWSAP Addendum. Discrete VOC samples were not subjected to MI sample drying or processing.

3.1.2 MI Subsurface Soil Sampling

Two MI subsurface soil samples were collected from one grids at this AOC to:

- Identify the potential impact of testing operations on the sand pit area and anchor storage area; and
- Determine the nature of contaminants found.

Two MI subsurface soil samples (1 to 3 ft and 3 to 5 ft) were collected from the center grid within the sandpit area (ATAsb-001 and ATAsb-002). The two MI subsurface soil samples were collected as required by the FWSAP Addendum (MKM, 2004) with the following exception. Five aliquots, rather than 30, were collected from each subsurface interval within the grid. The five aliquots were combined to make one sample.

One split sample was collected and submitted for analysis to an independent, USACE-approved laboratory. Analysis of subsurface soil (>1ft) for ATA included the following parameters: TAL Metals and Explosives. Samples were prepared, packaged and shipped in accordance with Section 6.0 of the RVAAP 14 AOC FWSAP Addendum. Field sampling forms documenting the sampling activities are presented in Appendix E. MI subsurface soil analytical results are presented in Appendix F.

3.1.3 Sampling Location Survey

Corners of multi-increment sampling grids, discrete soil locations and subsurface borings were surveyed using a sub-meter GPS unit (Trimble). Surveying was conducted in accordance with Section 4.3.2.3.12 of the FWSAP. The sampling location survey data can be found in Appendix S.

3.2 DEVIATIONS FROM THE WORK PLAN

Every effort was made to complete the field activities in accordance with the FWSAP and the approved RVAAP 14 AOC FWSAP Addendum. However, in some instances, field conditions necessitated a modification. Modification to the FWSAP during the ATA investigation was necessary because the location of the half-buried concrete pipe was in a slightly different location than indicated on the figure provided in the SOW. Therefore, sample grid ATAss-005 was moved to surround the concrete pipe.

Although modifications were made to the FWSAP, the objectives of the ATA characterization were still achieved.

4.0 NATURE OF CONTAMINATION AT ANCHOR TEST AREA

The following sections summarize the analytical results from surface soil (0-1 ft) and subsurface environmental sampling conducted at the ATA. The number of samples collected and the number of analytical results that exceeded either the RVAAP background criteria or Region 9 residential Preliminary Remediation Goals is listed in each subsection. The evaluation completed in this section is a preliminary comparison and are not intended to be used for making risk management decisions. The risk screening, presented later in this report, further discusses and evaluates the contaminants detected during this AOC characterization. The comparison data, in addition to the risk screening, will form the basis for the future risk assessment.

4.1 MI SURFACE SOIL (0-1 FT)

Six MI surface soil (0-1 ft) samples (five regular and one QC) were collected from five locations during the AOC characterization at ATA. Additionally, one discrete surface soil (0-1 ft) sample was collected for VOC analysis. All positive detections were compared to RVAAP background and residential PRG values as discussed in Volume 1.

Surface soil (0-1 ft) results at or above detection limits are presented in Table ATA-2. All surface soil (0-1 ft) analytical results are presented in Table ATA-4. Locations where surface soil (0-1 ft) analytes were detected at or above background concentrations and/or residential PRGs are shown on figures ATA-2 and ATA-3. Laboratory analytical reports are provided in Appendix F.

The surface soil (0-1 ft) analytical results that exceeded background or residential PRGs are summarized as follows:

- **Aluminum** exceeded the Region 9 residential PRG in five samples with a **maximum concentration of 13000 mg/kg.**
- **Arsenic** exceeded the Region 9 residential PRG in five samples, and exceeded background and the Region 9 residential PRG in one sample with a **maximum concentration of 54 mg/kg.**
- **Barium** exceeded background in two samples with a **maximum concentration of 130 mg/kg.**
- **Beryllium** exceeded background in two samples with a **maximum concentration of 1.2 mg/kg.**
- **Cadmium** exceeded background in three samples with a **maximum concentration of 0.18 mg/kg.**
- **Calcium** exceeded background in four samples with a **maximum concentration of 18000 mg/kg.**
- **Chromium** exceeded background in four samples, and exceeded background and the Region 9 residential PRG in one sample with a **maximum concentration of 36 mg/kg.**
- **Iron** exceeded the Region 9 residential PRG in six samples with a **maximum concentration of 22000 mg/kg.**
- **Magnesium** exceeded background in four samples with a **maximum concentration of 3900 mg/kg.**
- **Manganese** the Region 9 residential PRG in four samples, and exceeded background and the Region 9 residential PRG in two samples with a **maximum concentration of 1500 mg/kg.**
- **Potassium** exceeded background in four samples with a **maximum concentration of 1100 mg/kg.**

- **Sodium** exceeded background in five samples with a **maximum concentration of 310 mg/kg.**
- **Vanadium** exceeded the Region 9 residential PRG in five samples with a **maximum concentration of 24 mg/kg.**
- **Mercury** exceeded background in three samples with a **maximum concentration of 0.06 mg/kg.**
- **Thallium** exceeded background in two samples with a **maximum concentration of 0.22 mg/kg.**
- **Explosives, propellants, SVOCs, VOCs, pesticides** and **PCBs** were below Region 9 residential PRG's and/or laboratory detection limits.

4.2 MI SUBSURFACE SOIL

Two MI subsurface soil samples were collected from the center grid within the sandpit area (Figure ATA-1) during the AOC characterization at ATA. All positive detections were compared to RVAAP background and residential PRG values as discussed in Volume 1.

A summary of subsurface soil results at or above detection limits is presented in Table ATA-3. All subsurface soil analytical results are presented in Table ATA-5. Locations where subsurface soil analytes were detected at or above background levels and/or residential PRGs are illustrated in figure ATA-4. Laboratory analytical reports are provided in Appendix G.

The subsurface soil analytical results that exceeded background or residential PRGs are summarized as follows:

- **Arsenic** exceeded the Region 9 residential PRG in two samples with a **maximum concentration of 7.1 mg/kg.**
- **Chromium** exceeded background in one sample with a **maximum concentration of 28 mg/kg.**
- **Iron** exceeded the Region 9 residential PRG in two samples with a **maximum concentration of 12000 mg/kg.**
- **Manganese** the Region 9 residential PRG in two samples with a **maximum concentration of 240 mg/kg.**
- **Explosives, propellants, SVOCs, VOCs, pesticides** and **PCBs** were below Region 9 residential PRG's and/or laboratory detection limits.

5.0 HUMAN HEALTH AND ECOLOGICAL RISK SCREENING FOR ANCHOR TEST AREA

This section provides details for both the human health and ecological risk screening performed at ATA.

5.1 HUMAN HEALTH RISK SCREENING

Volume 1, Section 5.1 explains how the ATA data were screened to determine human health contaminants of concern (COPCs). Total chromium analytical results were conservatively screened against 1/10th of the PRG value; therefore, a screening value of 21 mg/kg was used rather than 210 mg/kg.

5.1.1 Surface Soil (0-1 ft)

Table ATA-6 presents the human health screening table for surface soil (0-1 ft) in the ATA. A total of 23 constituents were detected including metals and one SVOC (benzo(b)fluoranthene).

- Ten constituents had detections greater than background concentrations: barium, beryllium, cadmium, calcium, chromium, magnesium, potassium, sodium, mercury and thallium.
- Five constituents had detections above the adjusted Region 9 residential PRG's: aluminum, arsenic, iron, manganese and vanadium.
- Concentrations of three constituents, arsenic, chromium and manganese, exceeded both RVAAP-specific background concentrations and the Region 9 residential PRG.

Based on these comparisons, arsenic, chromium and manganese were identified as chemicals of potential concern (COPC) in surface soil (0-1 ft) at the ATA.

5.1.2 Soil Borings

Table ATA-7 presents the human health screening table for subsurface soil in the ATA. A total of 18 metal constituents were detected.

- Chromium exceeded the RVAAP-specific background concentrations in one location.
- Concentrations of three constituents, arsenic, iron and manganese, exceeded the Region 9 residential PRG.
- No constituents had detected concentrations above both background and the residential PRG.

Based on these results, no COPCs were identified in subsurface soil at the ATA.

5.2 ECOLOGICAL RISK SCREENING

See Volume I, Section 5.2 for an explanation of procedures used to conduct this ecological risk screening.

5.2.1 Surface Soil (0-1 ft)

Table ATA-8 presents the ecological screening table for surface soil (0-1ft) at the ATA. A total of 23 constituents were detected.

- Twelve constituents had detections greater than background concentrations: arsenic, barium, beryllium, cadmium, calcium, chromium, magnesium, manganese, potassium, sodium, mercury and thallium.
- Nine constituents had detections above ecological screening values: aluminum, arsenic, chromium, iron, manganese, selenium, vanadium, zinc and mercury.

Based on these comparisons, four constituents were identified as chemicals of potential ecological concern (COPECs) in surface soil (0-1ft) at the ATA: arsenic, chromium, manganese and mercury.

6.0 SUMMARY AND CONCLUSION FOR THE CHARACTERIZATION OF ANCHOR TEST AREA

This section briefly summarizes the existing conditions that were found during the AOC characterization at ATA and the risk screening tasks that were completed.

6.1 NATURE OF CONTAMINATION

The nature of contamination was examined in only one media: soil (surface soil [0-1 ft] and subsurface soil). Various metal constituents were detected above screening criteria in all soil samples. No organic compounds were detected above screening criteria in any of the surface soil (0-1 ft) or subsurface soil samples.

- In surface soil (0-1 ft) and subsurface soils, metals were the only parameter with analytes that were detected above background and/or residential PRG screening values.

6.2 HUMAN HEALTH RISK SCREENING

An Human Health Risk Screening (HHRS) was conducted to compare the concentrations detected in the ATA samples to RVAAP-specific background concentrations and U.S. EPA Region 9 residential PRGs. This preliminary screening was conducted to identify potential COPCs. The following table identifies the COPCs media:

Table ATA-10

Chemical of Potential Concern – All Media

Soils	Sediment	Surface Water	Groundwater
Arsenic Chromium Manganese	No COPCs detected	No COPCs detected	Groundwater not sampled

6.3 ECOLOGICAL RISK SCREENING

An Ecological Risk Screening (ERS) was performed to compare contaminant concentrations detected in ATA to RVAAP-specific background concentrations and ecological screening values. The ERS was conducted as outlined in Volume 1, Section 5.2. The ERS identified COPECs for ATA. The following table summarizes those COPECs by media.

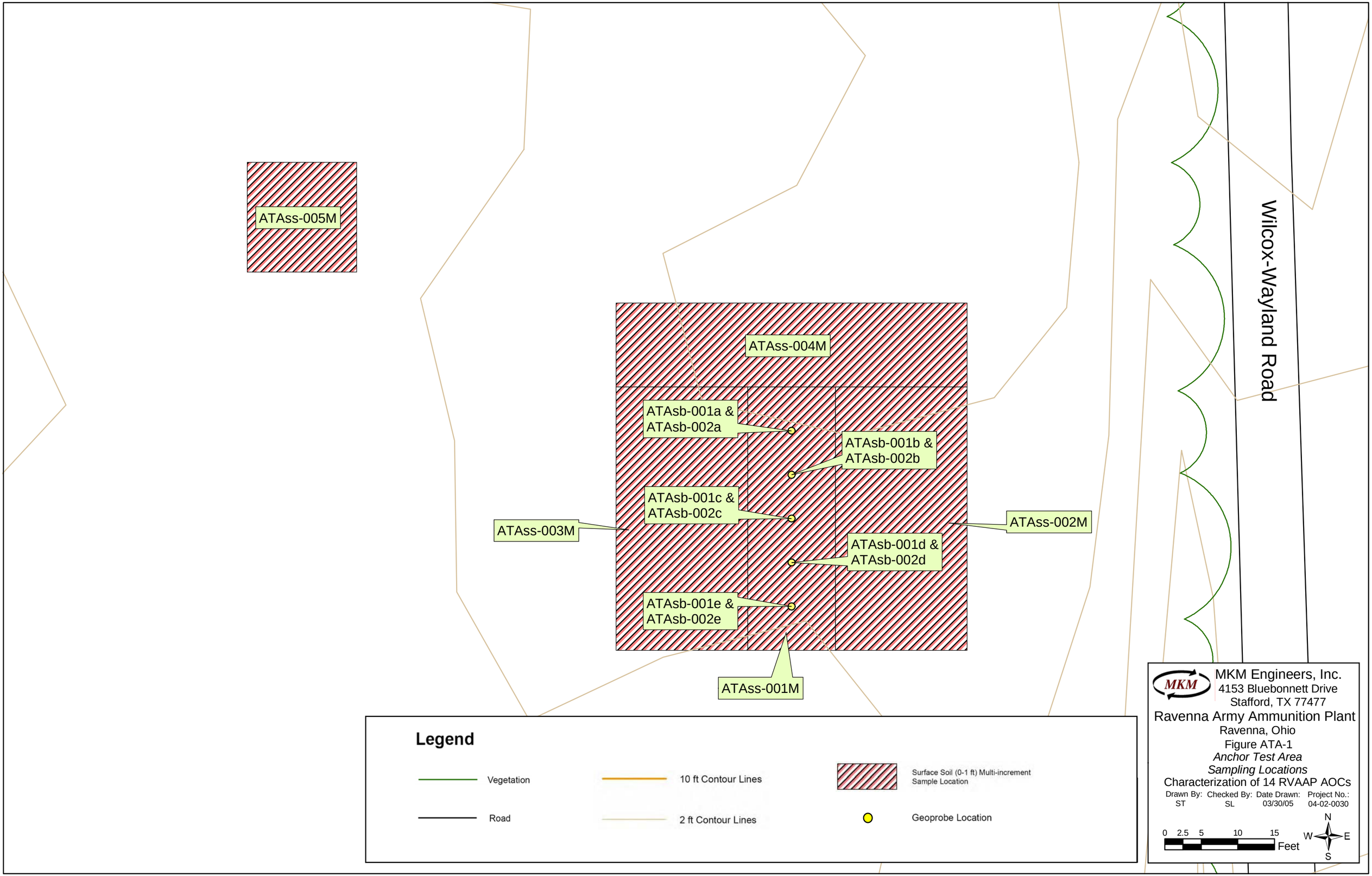
Table ATA-8

Chemical of Potential Ecological Concern – All Media

Soils	Sediment	Surface Water	Groundwater
Arsenic Chromium Manganese Mercury	Not Collected	Not Collected	Groundwater not evaluated for ERS.

6.4 CONCLUSION

Based on the COPCs presented in Section 6.2 and the COPECs presented in Section 6.3, a full risk evaluation should be considered in the overall risk management decisions that are made for ATA.


ATAss-005M
ATAss-004M
ATAsb-001a &
ATAsb-002a
ATAsb-001b &
ATAsb-002b
ATAsb-001c &
ATAsb-002c
ATAss-003M
ATAss-002M
ATAsb-001d &
ATAsb-002d
ATAsb-001e &
ATAsb-002e
ATAss-001M
Wilcox-Wayland Road
Legend
Vegetation
10 ft Contour Lines
Surface Soil (0-1 ft) Multi-increment
Sample Location
Road
2 ft Contour Lines
Geoprobe Location
MKM
MKM Engineers, Inc.
4153 Bluebonnett Drive
Stafford, TX 77477
Ravenna Army Ammunition Plant
Ravenna, Ohio
Figure ATA-1
Anchor Test Area
Sampling Locations
Characterization of 14 RVAAP AOCs
Drawn By: ST
Checked By: SL
Date Drawn: 03/30/05
Project No.: 04-02-0030
0 2.5 5 10 15
Feet
N
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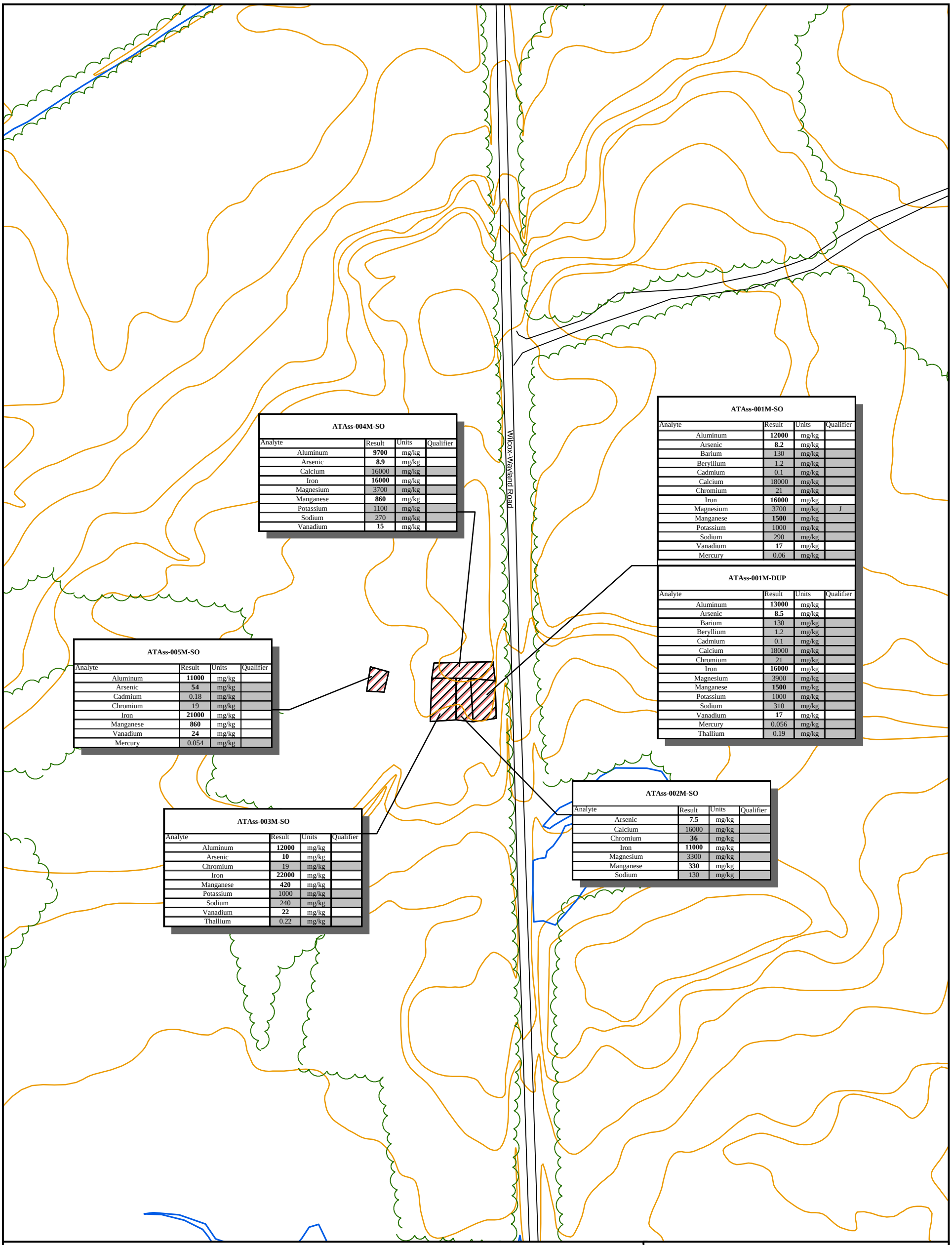


ATAss-004M-SO

Analyte	Result	Units	Qualifier
Aluminum	**9700**	mg/kg	
Arsenic	**8.9**	mg/kg	
Calcium	16000	mg/kg	
Iron	**16000**	mg/kg	
Magnesium	3700	mg/kg	
Manganese	**860**	mg/kg	
Potassium	1100	mg/kg	
Sodium	270	mg/kg	
Vanadium	**15**	mg/kg	

ATAss-001M-SO

Analyte	Result	Units	Qualifier
Aluminum	**12000**	mg/kg	
Arsenic	**8.2**	mg/kg	
Barium	130	mg/kg	
Beryllium	1.2	mg/kg	
Cadmium	0.1	mg/kg	
Calcium	18000	mg/kg	
Chromium	21	mg/kg	
Iron	**16000**	mg/kg	
Magnesium	3700	mg/kg	J
Manganese	**1500**	mg/kg	
Potassium	1000	mg/kg	
Sodium	290	mg/kg	
Vanadium	**17**	mg/kg	
Mercury	0.06	mg/kg	

ATAss-001M-DUP

Analyte	Result	Units	Qualifier
Aluminum	**13000**	mg/kg	
Arsenic	**8.5**	mg/kg	
Barium	130	mg/kg	
Beryllium	1.2	mg/kg	
Cadmium	0.1	mg/kg	
Calcium	18000	mg/kg	
Chromium	21	mg/kg	
Iron	**16000**	mg/kg	
Magnesium	3900	mg/kg	
Manganese	**1500**	mg/kg	
Potassium	1000	mg/kg	
Sodium	310	mg/kg	
Vanadium	**17**	mg/kg	
Mercury	0.056	mg/kg	
Thallium	0.19	mg/kg	

ATAss-005M-SO

Analyte	Result	Units	Qualifier
Aluminum	**11000**	mg/kg	
Arsenic	**54**	mg/kg	
Cadmium	0.18	mg/kg	
Chromium	19	mg/kg	
Iron	**21000**	mg/kg	
Manganese	**860**	mg/kg	
Vanadium	**24**	mg/kg	
Mercury	0.054	mg/kg	

ATAss-002M-SO

Analyte	Result	Units	Qualifier
Arsenic	**7.5**	mg/kg	
Calcium	16000	mg/kg	
Chromium	**36**	mg/kg	
Iron	**11000**	mg/kg	
Magnesium	3300	mg/kg	
Manganese	**330**	mg/kg	
Sodium	130	mg/kg	

ATAss-003M-SO

Analyte	Result	Units	Qualifier
Aluminum	**12000**	mg/kg	
Arsenic	**10**	mg/kg	
Chromium	19	mg/kg	
Iron	**22000**	mg/kg	
Manganese	**420**	mg/kg	
Potassium	1000	mg/kg	
Sodium	240	mg/kg	
Vanadium	**22**	mg/kg	
Thallium	0.22	mg/kg	

Legend

- Vegetation
- 10 ft Contour Lines
- Road
- Streams / Ditches
- 2 ft Contour Lines
- Surface Soil (0-1 ft) Multi-increment Sample Location

Notes:

J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style.
Result < PRG & Background, then the value is presented with a normal style.
mg / kg - Milligrams per Kilogram (parts per million - ppm)

MKM Engineers, Inc.
4153 Bluebonnett Drive
Stafford, TX 77477

Ravenna Army Ammunition Plant

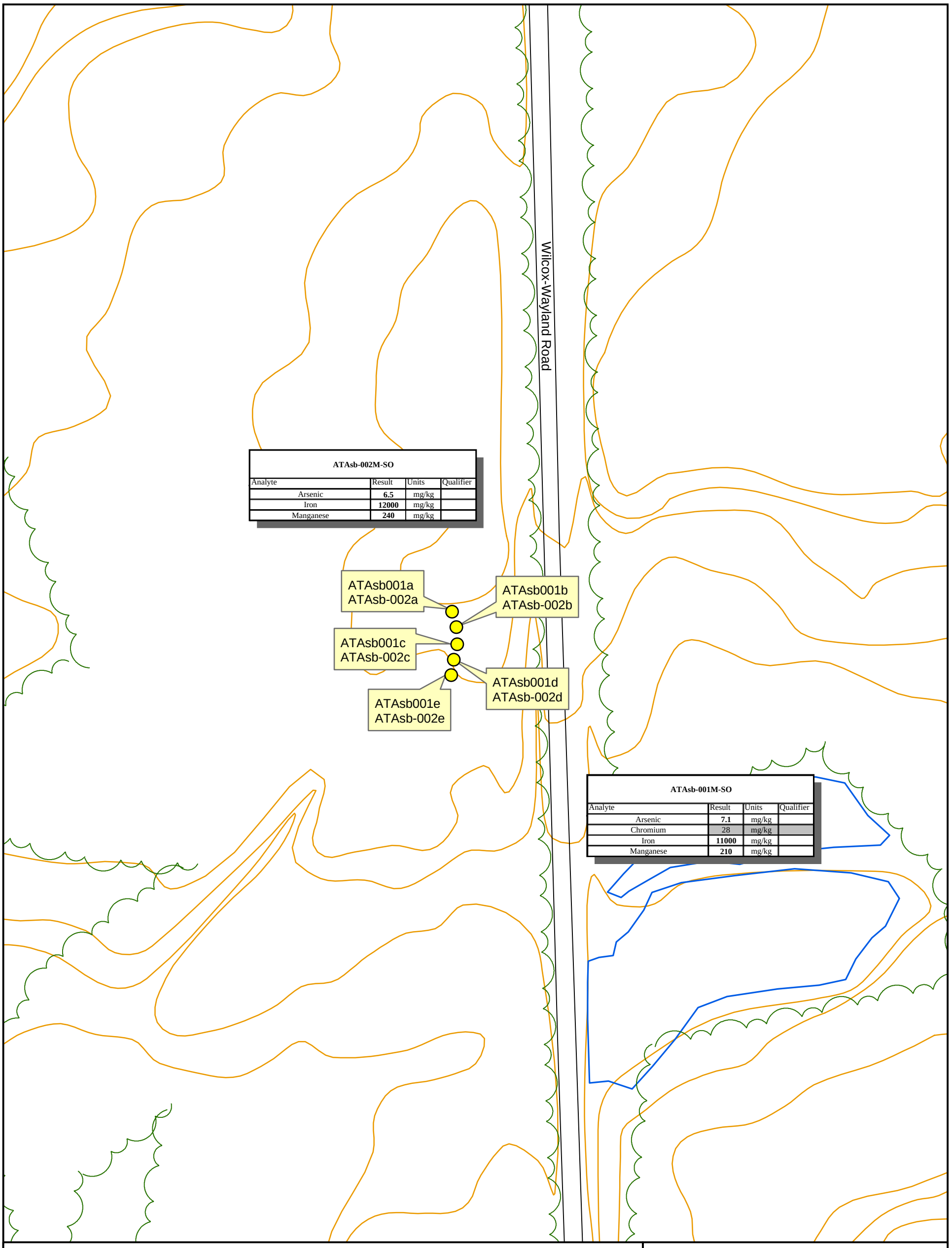
Ravenna, Ohio

Figure ATA-2
Anchor Test Area
Soil Sample Location Exceedences

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	MGS	15 July 06	04-02-0030

0 100 200 400 Feet

N W E S



Legend

Vegetation — 10 ft Contour Lines — Road

Streams / Ditches — 2 ft Contour Lines — Geoprobe Location

Notes:

If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style.
If Result = or > PRG, then the value is presented with a bold style.
Result < PRG & Background, then the value is presented with a normal style.
mg / kg - Milligrams per Kilogram (parts per million - ppm)

*Sample ATAsb-001M-SO is a multi-incremental sample (1 to 3 ft interval) containing aliquots from ATAsb001a,ATAsb001b, ATAsb001c, ATAsb001d and ATAsb001e.
*Sample ATAsb-002M-SO is a multi-incremental sample (3 to 5 ft interval) containing aliquots from ATAsb002a, ATAsb002b, ATAsb002c, ATAsb002d and ATAsb002e.

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Stafford, TX 77477

Ravenna Army Ammunition Plant

Ravenna, Ohio

Figure ATA-3

Anchor Test Area

Subsurface Soil (>1 ft) Sample Location Exceedences

Drawn By:	Checked By:	Date Drawn:	Project No.:
R. Haverkos	MGS	15 July 06	04-02-0030

0 25 50 100 Feet

N W E S

Table ATA-1
Anchor Test Area Summary of Sampling and Analysis
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

SAMPLE PREFIX		VOC	SVOC	Explosives	Propellants	TAL Metals	Chrome +6	Pesticides	PCB	Cyanides	Nitrate	TOC	Geo-Tech	Grain	FIELD QA/QC SAMPLES					
ATA	SAMPLE ID	8260B	8270C	8330	3532/8330	6010/7000	7196A	8081A	8082B	9010A/9012A	EPA 353.2	EPA 415.1	Analysis (Various)	Size ASTM D422	Multi-Incremental QA	Duplicate Sample	Equipment Blank	Trip Blank	MS/MSD	USACE Split
MULTI-INCREMENTAL SOILS																				
Surface Soils	SS-001M			1		1														
	SS-002M			1		1										1			1	1
	SS-003M	1	1	1	1	1		1	1								1			
	SS-004M			1		1														
	SS-005M			1		1														
		1	1	5	1	5	0	1	1	0	0	0	0	0	0	1	1	0	1	1
MI SUB-SURFACE SOILS																				
1-3 ft interval	SB-001			1		1														
3-5 ft interval	SB-002			1		1														
		0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
Blank cell indicates that either the sample was not analyzed for that compound and/or the sample did not have a QC or Split sample associated with the regular sample.
MI Sub-surface samples will be taken in sand pit (5 aliquots will compose each surface and subsurface soil sample)
Grainsize and TOC are taken at "all major drainageway" sediments

Table ATA - 2
Anchor Test Area Summary of Surface Soil (0-1 ft) Detections
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAss-001M-DUP	ATAss-001M-SO	ATAss-002M-SO	ATAss-003D-SO	ATAss-003M-SO	ATAss-004M-SO	ATAss-005M-SO
					Sample Date:	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units							
Metals	6010B	Aluminum	7614	17700	mg/kg	**13000**	**12000**	3300		**12000**	**9700**	**11000**
	6010B	Arsenic	0.39	15.4	mg/kg	**8.5**	**8.2**	**7.5**		**10**	**8.9**	54
	6010B	Barium	538	88.4	mg/kg	130	130	22		67	76	67
	6010B	Beryllium	15	0.88	mg/kg	1.2	1.2	0.24		0.64	0.83	0.63
	6010B	Cadmium	3.7	0.00	mg/kg	0.1	0.1					0.18
	6010B	Calcium	--[n]	15800	mg/kg	18000	18000	16000		3300	16000	1500
	6010B	Chromium	30	17.4	mg/kg	21	21	**36**		19	16	19
	6010B	Cobalt	30	10.4	mg/kg	8.3	8.1	3.6		8	7.4	8.5
	6010B	Copper	313	17.7	mg/kg	10	10	15		14	13	9.3
	6010B	Iron	2346	23100	mg/kg	**16000**	**16000**	**11000**		**22000**	**16000**	**21000**
	6010B	Lead	400	26.1	mg/kg	19	19	8.7		18	15	23
	6010B	Magnesium	--[n]	3030	mg/kg	3900	3700 J	3300		2800	3700	1800
	6010B	Manganese	176	1450	mg/kg	**1500**	**1500**	**330**		**420**	**860**	**860**
	6010B	Nickel	156	21.1	mg/kg	16	16	18		17	16	13
	6010B	Potassium	--[n]	927	mg/kg	1000	1000	490		1000	1100	870
	6010B	Selenium	39	1.4	mg/kg	1.2	1 J	0.49		0.67	0.45	1
	6010B	Silver	39	0.00	mg/kg							
	6010B	Sodium	--[n]	123	mg/kg	310	290	130		240	270	
	6010B	Vanadium	7.8	31.1	mg/kg	**17**	**17**	6.8		**22**	**15**	**24**
	6010B	Zinc	2346	61.8	mg/kg	56	56	49		56	57	56
	7041	Antimony	3.1	0.96	mg/kg							0.59
	7471A	Mercury	2.3	0.04	mg/kg	0.056	0.06			0.036	0.038	0.054
	7841	Thallium	0.52	0.00	mg/kg	0.19				0.22		
SVOCs	8270C	Benzo(b)fluoranthene	0.62	--	mg/kg					0.014 J		

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analyte was a non-detect (with a "U" qualifier) or analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table ATA - 3
Anchor Test Area Summary of Soil Boring Detections (> 1 ft)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAsb-001M-SO	ATAsb-002M-SO
					Sample Date:	11/8/2004	11/8/2004
					Sample Depth:	1-3 ft	3-5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Soil Boring Background Criteria	Units		
Metals	6010B	Aluminum	7614	19500	mg/kg	2400	2900
	6010B	Arsenic	0.39	19.8	mg/kg	**7.1**	**6.5**
	6010B	Barium	538	124	mg/kg	15	17
	6010B	Beryllium	15	0.88	mg/kg	0.18	0.22
	6010B	Calcium	--[n]	35500	mg/kg	17000	19000
	6010B	Chromium	30	27.2	mg/kg	28	26
	6010B	Cobalt	30	23.2	mg/kg	2.9	3.3
	6010B	Copper	313	32.3	mg/kg	14	12
	6010B	Iron	2346	35200	mg/kg	**11000**	**12000**
	6010B	Lead	400	19.1	mg/kg	6.3	6.3
	6010B	Magnesium	--[n]	8790	mg/kg	3500	3300
	6010B	Manganese	176	3030	mg/kg	**210**	**240**
	6010B	Nickel	156	60.7	mg/kg	15	18
	6010B	Potassium	--[n]	3350	mg/kg	430	500
	6010B	Selenium	39	1.5	mg/kg	0.39	0.44
	6010B	Silver	39	0.00	mg/kg		
	6010B	Sodium	--[n]	145	mg/kg	130	130
	6010B	Vanadium	7.8	37.6	mg/kg	5.1	5.9
	6010B	Zinc	2346	93.3	mg/kg	42	39

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analyte was a non-detect (with a "U" qualifier) or analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table ATA - 4
Anchor Test Area Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAss-001M-DUP	ATAss-001M-SO	ATAss-002M-SO	ATAss-003D-SO	ATAss-003M-SO	ATAss-004M-SO	ATAss-005M-SO
					Sample Date:	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units							
Metals	6010B	Aluminum	7614	17700	mg/kg	**13000**	**12000**	3300		**12000**	**9700**	**11000**
	6010B	Arsenic	0.39	15.4	mg/kg	**8.5**	**8.2**	**7.5**		**10**	**8.9**	**54**
	6010B	Barium	538	88.4	mg/kg	130	130	22		67	76	67
	6010B	Beryllium	15	0.88	mg/kg	1.2	1.2	0.24		0.64	0.83	0.63
	6010B	Cadmium	3.7	0.00	mg/kg	0.1	0.1	0.11 U		0.125 U	0.12 U	0.18
	6010B	Calcium	--[n]	15800	mg/kg	18000	18000	16000		3300	16000	1500
	6010B	Chromium	30	17.4	mg/kg	21	21	**36**		19	16	19
	6010B	Cobalt	30	10.4	mg/kg	8.3	8.1	3.6		8	7.4	8.5
	6010B	Copper	313	17.7	mg/kg	10	10	15		14	13	9.3
	6010B	Iron	2346	23100	mg/kg	**16000**	**16000**	**11000**		**22000**	**16000**	**21000**
	6010B	Lead	400	26.1	mg/kg	19	19	8.7		18	15	23
	6010B	Magnesium	--[n]	3030	mg/kg	3900	3700 J	3300		2800	3700	1800
	6010B	Manganese	176	1450	mg/kg	**1500**	**1500**	**330**		**420**	**860**	**860**
	6010B	Nickel	156	21.1	mg/kg	16	16	18		17	16	13
	6010B	Potassium	--[n]	927	mg/kg	1000	1000	490		1000	1100	870
	6010B	Selenium	39	1.4	mg/kg	1.2	1 J	0.49		0.67	0.45	1
	6010B	Silver	39	0.00	mg/kg	0.48 U	0.485 U	0.44 U		0.5 U	0.475 U	0.5 U
	6010B	Sodium	--[n]	123	mg/kg	310	290	130		240	270	150 U
	6010B	Vanadium	7.8	31.1	mg/kg	**17**	**17**	6.8		**22**	**15**	**24**
	6010B	Zinc	2346	61.8	mg/kg	56	56	49		56	57	56
	7041	Antimony	3.1	0.96	mg/kg	0.65 U	0.7 UJ	0.7 U		0.7 U	0.7 U	0.59
	7471A	Mercury	2.3	0.04	mg/kg	0.056	0.06	0.01 U		0.036	0.038	0.054
	7841	Thallium	0.52	0.00	mg/kg	0.19	0.295 U	0.3 U		0.22	0.3 U	0.285 U
Pesticides	8081A	4,4'-DDD	2.4	--	mg/kg					0.0009 U		
	8081A	4,4'-DDE	1.7	--	mg/kg					0.00105 U		
	8081A	4,4'-DDT	1.7	--	mg/kg					0.0009 U		
	8081A	Aldrin	0.029	--	mg/kg					0.0009 U		
	8081A	alpha-BHC	0.09	--	mg/kg					0.0009 U		
	8081A	alpha-Chlordane	1.6	--	mg/kg					0.0009 U		
	8081A	beta-BHC	0.32	--	mg/kg					0.0009 U		
	8081A	delta-BHC	--	--	mg/kg					0.0009 U		
	8081A	Dieldrin	0.030	--	mg/kg					0.0009 U		
	8081A	Endosulfan I	37	--	mg/kg					0.0009 U		
	8081A	Endosulfan II	37	--	mg/kg					0.0009 U		
	8081A	Endosulfan sulfate	37	--	mg/kg					0.0009 U		
	8081A	Endrin	1.8	--	mg/kg					0.0009 U		
	8081A	Endrin aldehyde	--	--	mg/kg					0.0009 U		
	8081A	Endrin ketone	--	--	mg/kg					0.0009 U		
	8081A	gamma-BHC	0.44	--	mg/kg					0.0009 U		
	8081A	gamma-Chlordane	1.6	--	mg/kg					0.0009 U		
	8081A	Heptachlor	0.11	--	mg/kg					0.0009 U		
	8081A	Heptachlor epoxide	0.053	--	mg/kg					0.0009 U		
	8081A	Methoxychlor	31	--	mg/kg					0.0043 U		

Table ATA - 4
Anchor Test Area Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAss-001M-DUP	ATAss-001M-SO	ATAss-002M-SO	ATAss-003D-SO	ATAss-003M-SO	ATAss-004M-SO	ATAss-005M-SO
					Sample Date:	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units							
	8081A	Toxaphene	0.44	--	mg/kg					0.0085 U		
PCBs	8082	Aroclor 1016	0.39	--	mg/kg					0.017 U		
	8082	Aroclor 1221	0.22	--	mg/kg					0.017 U		
	8082	Aroclor 1232	0.22	--	mg/kg					0.0085 U		
	8082	Aroclor 1242	0.22	--	mg/kg					0.017 U		
	8082	Aroclor 1248	0.22	--	mg/kg					0.0085 U		
	8082	Aroclor 1254	0.22	--	mg/kg					0.017 U		
	8082	Aroclor 1260	0.22	--	mg/kg					0.017 U		
VOCs	8260B	1,1,1-Trichloroethane	1200	--	mg/kg				0.00315 U			
	8260B	1,1,2,2-Tetrachloroethane	0.41	--	mg/kg				0.00315 U			
	8260B	1,1,2-Trichloroethane	0.73	--	mg/kg				0.00315 U			
	8260B	1,1-Dichloroethane	51	--	mg/kg				0.00315 U			
	8260B	1,1-Dichloroethene	12	--	mg/kg				0.00315 U			
	8260B	1,2-Dibromoethane	0.032	--	mg/kg				0.00315 U			
	8260B	1,2-Dichloroethane	0.28	--	mg/kg				0.00315 U			
	8260B	1,2-Dichloroethene (total)	6.9	--	mg/kg				0.0065 U			
	8260B	1,2-Dichloropropane	0.34	--	mg/kg				0.00315 U			
	8260B	2-Butanone	2231	--	mg/kg				0.0095 U			
	8260B	2-Hexanone	530	--	mg/kg				0.0065 U			
	8260B	4-Methyl-2-pentanone	528	--	mg/kg				0.0065 U			
	8260B	Acetone	1412	--	mg/kg				0.0095 U			
	8260B	Benzene	0.64	--	mg/kg				0.00315 U			
	8260B	Bromochloromethane	--	--	mg/kg				0.00315 U			
	8260B	Bromodichloromethane	0.82	--	mg/kg				0.00315 U			
	8260B	Bromoform	62	--	mg/kg				0.00315 U			
	8260B	Bromomethane	0.39	--	mg/kg				0.00315 U			
	8260B	Carbon disulfide	36	--	mg/kg				0.00315 U			
	8260B	Carbon tetrachloride	0.25	--	mg/kg				0.00315 U			
	8260B	Chlorobenzene	15	--	mg/kg				0.00315 U			
	8260B	Chloroethane	3.0	--	mg/kg				0.00315 U			
	8260B	Chloroform	0.22	--	mg/kg				0.00315 U			
	8260B	Chloromethane	4.7	--	mg/kg				0.00315 U			
	8260B	cis-1,2-Dichloroethene	4.3	--	mg/kg				0.00315 U			
	8260B	cis-1,3-Dichloropropene	0.78	--	mg/kg				0.00315 U			
	8260B	Dibromochloromethane	1.1	--	mg/kg				0.00315 U			
	8260B	Ethylbenzene	395	--	mg/kg				0.00315 U			
	8260B	m&p-Xylenes	27	--	mg/kg				0.0065 U			
	8260B	Methylene chloride	9.1	--	mg/kg				0.0065 U			
	8260B	o-Xylene	27	--	mg/kg				0.00315 U			
	8260B	Styrene	1700	--	mg/kg				0.00315 U			
	8260B	Tetrachloroethene	0.48	--	mg/kg				0.00315 U			
	8260B	Toluene	520	--	mg/kg				0.00315 U			
	8260B	Total Xylenes	27	--	mg/kg				0.0065 U			

Table ATA - 4
Anchor Test Area Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAss-001M-DUP	ATAss-001M-SO	ATAss-002M-SO	ATAss-003D-SO	ATAss-003M-SO	ATAss-004M-SO	ATAss-005M-SO
					Sample Date:	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units							
	8260B	trans-1,2-Dichloroethene	6.9	--	mg/kg				0.00315 U			
	8260B	trans-1,3-Dichloropropene	0.78	--	mg/kg				0.00315 U			
	8260B	Trichloroethene	0.053	--	mg/kg				0.00315 U			
	8260B	Vinyl chloride	0.079	--	mg/kg				0.00315 U			
SVOCs	8270C	1,2,4-Trichlorobenzene	6.2	--	mg/kg					0.085 U		
	8270C	1,2-Dichlorobenzene	600	--	mg/kg					0.085 U		
	8270C	1,3-Dichlorobenzene	53	--	mg/kg					0.085 U		
	8270C	1,4-Dichlorobenzene	3.4	--	mg/kg					0.085 U		
	8270C	2,2-oxybis (1-chloropropane)	2.9	--	mg/kg					0.085 U		
	8270C	2,4,5-Trichlorophenol	611	--	mg/kg					0.165 U		
	8270C	2,4,6-Trichlorophenol	0.61	--	mg/kg					0.085 U		
	8270C	2,4-Dichlorophenol	18	--	mg/kg					0.165 U		
	8270C	2,4-Dimethylphenol	122	--	mg/kg					0.165 U		
	8270C	2,4-Dinitrophenol	12	--	mg/kg					- R		
	8270C	2,4-Dinitrotoluene	12	--	mg/kg					0.0165 U		
	8270C	2,6-Dinitrotoluene	6.1	--	mg/kg					0.0165 U		
	8270C	2-Chloronaphthalene	494	--	mg/kg					0.085 U		
	8270C	2-Chlorophenol	6.3	--	mg/kg					0.085 U		
	8270C	2-Methylnaphthalene	--	--	mg/kg					0.0165 U		
	8270C	2-Methylphenol	306	--	mg/kg					0.0335 U		
	8270C	2-Nitroaniline	18.3	--	mg/kg					0.085 U		
	8270C	2-Nitrophenol	--	--	mg/kg					0.165 U		
	8270C	3,3'-Dichlorobenzidine	1.1	--	mg/kg					0.085 U		
	8270C	3-Nitroaniline	1.8	--	mg/kg					0.335 U		
	8270C	4,6-Dinitro-2-methylphenol	0.61	--	mg/kg					0.335 U		
	8270C	4-Bromophenyl phenyl ether	--	--	mg/kg					0.085 U		
	8270C	4-Chloro-3-methylphenol	--	--	mg/kg					0.165 U		
	8270C	4-Chloroaniline	24	--	mg/kg					0.335 U		
	8270C	4-Chlorophenyl phenyl ether	--	--	mg/kg					0.085 U		
	8270C	4-Methylphenol	31	--	mg/kg					0.0335 U		
	8270C	4-Nitroaniline	23	--	mg/kg					0.335 U		
	8270C	4-Nitrophenol	--	--	mg/kg					0.335 U		
	8270C	Acenaphthene	368	--	mg/kg					0.0165 U		
	8270C	Acenaphthylene	--	--	mg/kg					0.0165 U		
	8270C	Anthracene	2189	--	mg/kg					0.0165 U		
	8270C	Benzo(a)anthracene	0.62	--	mg/kg					0.0165 U		
	8270C	Benzo(a)pyrene	0.062	--	mg/kg					0.0165 U		
	8270C	Benzo(b)fluoranthene	0.62	--	mg/kg					0.014 J		
	8270C	Benzo(g,h,i)perylene	--	--	mg/kg					0.0165 U		
	8270C	Benzo(k)fluoranthene	6.2	--	mg/kg					0.0165 U		
	8270C	Benzoic acid	100000	--	mg/kg					- R		
	8270C	Benzyl alcohol	1833	--	mg/kg					0.335 U		
	8270C	Bis(2-chloroethoxy)methane	--	--	mg/kg					0.0335 U		
	8270C	Bis(2-chloroethyl) ether	0.22	--	mg/kg					0.0335 U		

Table ATA - 4
Anchor Test Area Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAss-001M-DUP	ATAss-001M-SO	ATAss-002M-SO	ATAss-003D-SO	ATAss-003M-SO	ATAss-004M-SO	ATAss-005M-SO
					Sample Date:	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units							
	8270C	Bis(2-ethylhexyl) phthalate	35	--	mg/kg					0.085 U		
	8270C	Butylbenzyl phthalate	1222	--	mg/kg					0.0335 U		
	8270C	Carbazole	24	--	mg/kg					0.085 U		
	8270C	Chrysene	62	--	mg/kg					0.0165 U		
	8270C	Dibenzo(a,h)anthracene	0.062	--	mg/kg					0.0165 U		
	8270C	Dibenzofuran	15	--	mg/kg					0.0335 U		
	8270C	Diethyl phthalate	4888	--	mg/kg					0.0335 U		
	8270C	Dimethyl phthalate	100000	--	mg/kg					0.0335 U		
	8270C	Di-n-butyl phthalate	611	--	mg/kg					0.085 U		
	8270C	Di-n-octyl phthalate	244	--	mg/kg					0.165 U		
	8270C	Fluoranthene	229	--	mg/kg					0.0165 U		
	8270C	Fluorene	275	--	mg/kg					0.0165 U		
	8270C	Hexachlorobenzene	0.30	--	mg/kg					0.0165 U		
	8270C	Hexachlorobutadiene	6.2	--	mg/kg					0.085 U		
	8270C	Hexachlorocyclopentadiene	37	--	mg/kg					0.5 U		
	8270C	Hexachloroethane	35	--	mg/kg					0.085 U		
	8270C	Indeno(1,2,3-cd)pyrene	0.62	--	mg/kg					0.0165 U		
	8270C	Isophorone	512	--	mg/kg					0.085 U		
	8270C	Naphthalene	5.6	--	mg/kg					0.0165 U		
	8270C	Nitrobenzene	2	--	mg/kg					0.0165 U		
	8270C	n-Nitroso-di-n-propylamine	0.069	--	mg/kg					0.0335 U		
	8270C	n-Nitrosodiphenylamine	99	--	mg/kg					0.0165 U		
	8270C	Pentachlorophenol	3.0	--	mg/kg					0.165 U		
	8270C	Phenanthrene	--	--	mg/kg					0.025 U		
	8270C	Phenol	1833	--	mg/kg					0.085 U		
	8270C	Pyrene	232	--	mg/kg					0.025 U		
Explosives	8330	1,3,5-Trinitrobenzene	183	--	mg/kg	0.05 U	0.0495 U	0.05 U		0.0495 U	0.05 U	0.05 U
	8330	1,3-Dinitrobenzene	0.61	--	mg/kg	0.05 U	0.0495 U	0.05 U		0.0495 U	0.05 U	0.05 U
	8330	2,4,6-TNT	16	--	mg/kg	0.05 U	0.0495 U	0.05 U		0.0495 U	0.05 U	0.05 U
	8330	2,4-Dinitrotoluene	12	--	mg/kg	0.05 U	0.0495 U	0.05 U		0.0495 U	0.05 U	0.05 U
	8330	2,6-Dinitrotoluene	6.1	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	2-Amino-4,6-Dinitrotoluene	--	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	2-Nitrotoluene	0.88	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	3-Nitrotoluene	73	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	4-Amino-2,6-Dinitrotoluene	--	--	mg/kg	0.15 U	0.15 U	0.15 U		0.15 U	0.15 U	0.15 U
	8330	4-Nitrotoluene	12	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	HMX	306	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	Nitrobenzene	2	--	mg/kg	0.05 U	0.0495 U	0.05 U		0.0495 U	0.05 U	0.05 U
	8330	RDX	4.4	--	mg/kg	0.1 U	0.1 U	0.1 U		0.1 U	0.1 U	0.1 U
	8330	Tetryl	61	--	mg/kg	0.2 U	0.2 U	0.2 U		0.2 U	0.2 U	0.2 U
Propellants	353.2 Modified	Nitrocellulose	--	--	mg/kg					0.95 U		
	8332	Nitroglycerine	35	--	mg/kg					0.25 U		
	SW8330 Modified	Nitroguanidine	611	--	mg/kg					0.125 U		

Table ATA - 4
Anchor Test Area Summary of All Surface Soil (0-1 ft) Results
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAss-001M-DUP	ATAss-001M-SO	ATAss-002M-SO	ATAss-003D-SO	ATAss-003M-SO	ATAss-004M-SO	ATAss-005M-SO
					Sample Date:	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004	11/8/2004
					Sample Depth:	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft	0-1 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Surface Soil Background Criteria	Units							

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
R - result rejected during ADR validation
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style.

Table ATA - 5
Anchor Test Area Summary of All Soil Boring Results (> 1 ft)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAsb-001M-SO	ATAsb-002M-SO
					Sample Date:	11/8/2004	11/8/2004
					Sample Depth:	1-3 ft	3-5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Soil Boring Background Criteria	Units		
Metals	6010B	Aluminum	7614	19500	mg/kg	2400	2900
	6010B	Arsenic	0.39	19.8	mg/kg	**7.1**	**6.5**
	6010B	Barium	538	124	mg/kg	15	17
	6010B	Beryllium	15	0.88	mg/kg	0.18	0.22
	6010B	Cadmium	3.7	0.00	mg/kg	0.12 U	0.12 U
	6010B	Calcium	--[n]	35500	mg/kg	17000	19000
	6010B	Chromium	30	27.2	mg/kg	28	26
	6010B	Cobalt	30	23.2	mg/kg	2.9	3.3
	6010B	Copper	313	32.3	mg/kg	14	12
	6010B	Iron	2346	35200	mg/kg	**11000**	**12000**
	6010B	Lead	400	19.1	mg/kg	6.3	6.3
	6010B	Magnesium	--[n]	8790	mg/kg	3500	3300
	6010B	Manganese	176	3030	mg/kg	**210**	**240**
	6010B	Nickel	156	60.7	mg/kg	15	18
	6010B	Potassium	--[n]	3350	mg/kg	430	500
	6010B	Selenium	39	1.5	mg/kg	0.39	0.44
	6010B	Silver	39	0.00	mg/kg	0.48 U	0.485 U
	6010B	Sodium	--[n]	145	mg/kg	130	130
	6010B	Vanadium	7.8	37.6	mg/kg	5.1	5.9
	6010B	Zinc	2346	93.3	mg/kg	42	39
	7041	Antimony	3.1	0.96	mg/kg	0.7 U	0.6 U
	7471A	Mercury	2.3	0.04	mg/kg	0.0055 U	0.0055 U
	7841	Thallium	0.52	0.91	mg/kg	0.29 U	0.26 U
Explosives	8330	1,3,5-Trinitrobenzene	183	--	mg/kg	0.0495 U	0.049 U
	8330	1,3-Dinitrobenzene	0.61	--	mg/kg	0.0495 U	0.049 U
	8330	2,4,6-TNT	16	--	mg/kg	0.0495 U	0.049 U
	8330	2,4-Dinitrotoluene	12	--	mg/kg	0.0495 U	0.049 U
	8330	2,6-Dinitrotoluene	6.1	--	mg/kg	0.1 U	0.1 U
	8330	2-Amino-4,6-Dinitrotoluene	--	--	mg/kg	0.1 U	0.1 U
	8330	2-Nitrotoluene	0.88	--	mg/kg	0.1 U	0.1 U
	8330	3-Nitrotoluene	73	--	mg/kg	0.1 U	0.1 U
	8330	4-Amino-2,6-Dinitrotoluene	--	--	mg/kg	0.15 U	0.145 U
	8330	4-Nitrotoluene	12	--	mg/kg	0.1 U	0.1 U
	8330	HMX	306	--	mg/kg	0.1 U	0.1 U
	8330	Nitrobenzene	2	--	mg/kg	0.0495 U	0.049 U
	8330	RDX	4.4	--	mg/kg	0.1 U	0.1 U
	8330	Tetryl	61	--	mg/kg	0.2 U	0.195 U

Table ATA - 5
Anchor Test Area Summary of All Soil Boring Results (> 1 ft)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

						ATAsb-001M-SO	ATAsb-002M-SO
					Sample Date:	11/8/2004	11/8/2004
					Sample Depth:	1-3 ft	3-5 ft
Group	Method	Parameter	Region 9 PRG (Residential Soil)	Soil Boring Background Criteria	Units		

Notes:
-- - no background/PRG value is available for this analyte
blank cell indicates that the analysis was not performed
mg/kg - means milligrams per Kilogram (parts per million - ppm)
PRG - preliminary remediation goals
nc - non-cancer basis
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
U - analyte not detected
J - estimated value
R - result rejected during ADR validation
If Result = or > Background, then the value is presented with a shaded/highlighted style
If Result = or > Background & PRG, then result is presented with a bold + shaded/highlighted style
If Result = or > PRG, then the value is presented with a bold style
If Result < PRG & Background, then the value is presented with a normal style

Table ATA-6
Anchor Test Area Human Health Screening Tables for Surface Soil (0-1 ft)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Region 9 PRG (Res Soil)		Surface Soil Background	Maximum Detected	Frequency of Detection	COPC
Aluminum	7614	nc	17700	13000	6 / 6	No
Arsenic	0.39	ca	15.4	54	6 / 6	Yes, > BKG & PRG
Barium	538	nc	88.4	130	6 / 6	No
Beryllium	15	nc	0.88	1.2	6 / 6	No
Cadmium	3.7	nc	0.00	0.18	3 / 6	No
Calcium	--[n]		15800	18000	6 / 6	No
Chromium	30	ca	17.4	36	6 / 6	Yes, > BKG & PRG
Cobalt	30	ca	10.4	8.5	6 / 6	No
Copper	313	nc	17.7	15	6 / 6	No
Iron	2346	nc	23100	22000	6 / 6	No
Lead	400	pbk	26.1	23	6 / 6	No
Magnesium	--[n]		3030	3900	6 / 6	No
Manganese	176	nc	1450	1500	6 / 6	Yes, > BKG & PRG
Nickel	156	nc	21.1	18	6 / 6	No
Potassium	--[n]		927	1100	6 / 6	No
Selenium	39	nc	1.4	1.2	6 / 6	No
Sodium	--[n]		123	310	5 / 6	No
Vanadium	7.8	nc	31.1	24	6 / 6	No
Zinc	2346	nc	61.8	57	6 / 6	No
Antimony	3.1	nc	0.96	0.59	1 / 6	No
Mercury	2.3	nc	0.04	0.06	5 / 6	No
Thallium	0.52	nc	0.00	0.22	2 / 6	No
Benzo(b)fluoranthene	0.62	ca	--	0.014	1 / 1	No

Notes:
-- - no value available
BKG - site specific background
PRG - USEPA Region 9 Preliminary Remediation Goals
NTX - no toxicity screening value available
nc - non-cancer basis, value is 1/10 the published PRG
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
*Concentration Units mg/kg

Table ATA-7
Anchor Test Area Human Health Screening Tables for Soil Borings (> 1f t)
RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameter	Region 9 PRG (Res Soil)		Sediment Background	Maximum Detected	Frequency of Detection	COPC
Aluminum	7614	nc	19500	2900	2 / 2	No
Arsenic	0.39	ca	19.8	7.1	2 / 2	No
Barium	538	nc	124	17	2 / 2	No
Beryllium	15	nc	0.88	0.22	2 / 2	No
Calcium	--[n]		35500	19000	2 / 2	No
Chromium	30	ca	27.2	28	2 / 2	No
Cobalt	30	ca	23.2	3.3	2 / 2	No
Copper	313	nc	32.3	14	2 / 2	No
Iron	2346	nc	35200	12000	2 / 2	No
Lead	400	pbk	19.1	6.3	2 / 2	No
Magnesium	--[n]		8790	3500	2 / 2	No
Manganese	176	nc	3030	240	2 / 2	No
Nickel	156	nc	60.7	18	2 / 2	No
Potassium	--[n]		3350	500	2 / 2	No
Selenium	39	nc	1.5	0.44	2 / 2	No
Sodium	--[n]		145	130	2 / 2	No
Vanadium	7.8	nc	37.6	5.9	2 / 2	No
Zinc	2346	nc	93.3	42	2 / 2	No

Notes:
-- - no value available
BKG - site specific background
PRG - USEPA Region 9 Preliminary Remediation Goals
NTX - no toxicity screening value available
nc - non-cancer basis, value is 1/10 the published PRG
ca - cancer basis
pbk - based on PBK modeling
mcl - based on CWA maximum contaminant level
max - ceiling limit
sat - soil saturation
[n] - nutrient
*Concentration Units mg/kg

Table ATA-8

Anchor Test Area Ecological Risk Screening Tables for Shallow Soil (0-1 ft)

RVAAP 14 AOC Characterization

Ravenna Army Ammunition Plant, Ravenna, Ohio

Group	Parameter	Frequency of Detection	Average Concentration	Maximum Detected Concentration	Units	Surface Soil Background Concentration	Maximum Concentration > Background	Screening Value	Maximum Concentration > Screening value	PBT	COPC	COPC Rationale
Metals	Aluminum	6 / 6	10167	13000	mg/kg	17700	No	600 ss2	Yes	No	No	BLBKG
	Arsenic	6 / 6	16	54	mg/kg	15.4	Yes	9.9 ss1	Yes	No	Yes	ASL
	Barium	6 / 6	82	130	mg/kg	88.4	Yes	283 ss1	No	No	No	BSL
	Beryllium	6 / 6	0.79	1.2	mg/kg	0.88	Yes	10 ss1	No	No	No	BSL
	Cadmium	3 / 6	0.12	0.18	mg/kg	0.00	Yes	4 ss1	No	No	No	BSL
	Calcium	6 / 6	12133	18000	mg/kg	15800	Yes	NUT	No	No	No	BSL
	Chromium	6 / 6	22	36	mg/kg	17.4	Yes	0.4 ss1	Yes	No	Yes	ASL
	Cobalt	6 / 6	7.3	8.5	mg/kg	10.4	No	20 ss1	No	No	No	BLBKG
	Copper	6 / 6	12	15	mg/kg	17.7	No	60 ss1	No	No	No	BLBKG
	Iron	6 / 6	17000	22000	mg/kg	23100	No	200 ss2	Yes	No	No	BLBKG
	Lead	6 / 6	17	23	mg/kg	26.1	No	40.5 ss1	No	No	No	BLBKG
	Magnesium	6 / 6	3200	3900	mg/kg	3030	Yes	NUT	No	No	No	BSL
	Manganese	6 / 6	912	1500	mg/kg	1450	Yes	100 ss2	Yes	No	Yes	ASL
	Nickel	6 / 6	16	18	mg/kg	21.1	No	30 ss1	No	No	No	BLBKG
	Potassium	6 / 6	910	1100	mg/kg	927	Yes	NUT	No	No	No	BSL
	Selenium	6 / 6	0.80	1.2	mg/kg	1.4	No	0.21 ss1	Yes	No	No	BLBKG
	Silver	0 / 6	0.48		mg/kg	0.00		2 ss1		No		
	Sodium	5 / 6	232	310	mg/kg	123	Yes	NUT	No	No	No	BSL
	Vanadium	6 / 6	17	24	mg/kg	31.1	No	2 ss1	Yes	No	No	BLBKG
	Zinc	6 / 6	55	57	mg/kg	61.8	No	8.5 ss1	Yes	No	No	BLBKG
	Antimony	1 / 6	0.67	0.59	mg/kg	0.96	No	5 ss1	No	No	No	BLBKG
	Mercury	5 / 6	0.042	0.06	mg/kg	0.04	Yes	0.00051 ss1	Yes	Yes	Yes	ASL
	Thallium	2 / 6	0.26	0.22	mg/kg	0.00	Yes	1 ss1	No	No	No	BSL
SVOCs	Benzo(b)fluoranthene	1 / 1	0.014	0.014	mg/kg	--	NA	59.8 ss4	No	No	No	BSL

Notes:

ss1 - Preliminary Remediation Goals (Efroymson et al., 1997a)

ss2 - Toxiclogolgical Benchmarks for Soil and Litter Invertebrates (Efrymonson et al 1997b)

ss3 - Toxiclogolgical Benchmarks for Terrestrial Plants (Efrymonson et al 1997c)

ss4- Ecological Data Quality Level (USEPA Region 5, 1999)

-- - no value available

NA - not applicable

NUT - nutrient

BLBKG - below background concentration

PBT- persistent, bioaccumulative and toxic

NSL - no screening level

ASL- above screening level

BSL - below screening level

Table ATA-9
Anchor Test Area Ecological Risk Summary of Quantitative and Qualitative COPCs for Environmental Media

RVAAP 14 AOC Characterization
Ravenna Army Ammunition Plant, Ravenna, Ohio

Group	Parameter	Shallow Soil
Metals	Chromium	X
	Magnesium	
	Mercury	X

Notes
COPC - chemical of potential concern
X - quantitative COPC
Q - qualitatative COPC

Total PAHs are only applicable to sediments. For soil and surface water, only the individual PAHs are screened