FINAL

CLOSURE ACTIVITIES WORK PLAN
BUILDING 1601
RAVENNA ARMY AMMUNITIONS PLANT
RAVENNA, OHIO

F.CA.WP.B1601 33.07F

Contract No. DACA27-97-D-0005
Delivery Order No. 0009

Prepared for:

U.S. Army Corps of Engineers
Louisville District
Louisville, Kentucky

Prepared by:

IT Corporation
312 Directors Drive
Knoxville, Tennessee 37923

Rev. 2
August 1998

INTERNATIONAL TECHNOLOGY CORPORATION

U.S. Army Corps of Engineers
Louisville District

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~~Draft~~FINAL
Closure Activities Work Plan
Building 1601 RCRA Storage Facility
Ravenna Army Ammunition Plant
Ravenna, Ohio

Contract Number DACA27-97-D-0005
Delivery Order 0006

Prepared for:

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Louisville District

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Knoxville, Tennessee 37923

~~July~~AUGUST 1998

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List of Acronyms

ASTM	American Society for Testing and Materials
AR/COC	analysis request/chain of custody
DI	deionized
DNT	dinitrotoluene
DO	delivery order
DOT	U.S. Department of Transportation
DQO	data quality objective
EPA	Environmental Protection Agency
HMX	octogen
IDW	investigation-derived waste
IT	IT Corporation
MDL	maximum detection limit
MS/MSD	matrix spike/matrix spike duplicate
PPE	personal protective equipment
PRAC	Preplaced Remedial Action Contract
QA	quality assurance
QC	quality control
Quanterra	Quanterra Environmental Services
RDX	cyclonite
RL	reporting limit
RPD	relative percent difference
RVAAP	Ravenna Army Ammunition Plant
SHP	facility-wide safety and health plan
SOP	standard operating procedure
SSHP	site-specific safety and health plan
TAL	target analyte list
TNT	trinitrotoluene
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
VOC	volatile organic compound

1.0 Introduction

1.1 Facility Description

The Ravenna Army Ammunition Plant (RVAAP) is located approximately 20 miles east of Akron Ohio, near Ravenna Ohio. The installation covers approximately 21,419 acres, and is 11 miles long and 3.5 miles wide. The facility is located within Portage and TrumBUll counties as shown on Figure 1-1. Activities at RVAAP began in August of 1940. During its operation, the primary purpose of RVAAP was to load explosives into medium and major caliber artillery ammunition, bombs, mines, fuses, boosters, primers, and percussion elements. Land use surrounding the facility is primarily agricultural with sparse private residence. Currently, RVAAP is in an inactive status.

Originally, RVAAP was divided into two separate units; one was designated the Portage Ordinance Depot, with the primary mission as storage activity, while the other designated portion was known as the Ravenna Ordnance Plant with the primary mission of munitions loading. Over the years, RVAAP has handled and stored strategic and critical materials for various government agencies as well as received, stored, and maintained the capabilities to load, assemble, and pack military ammunition. Currently, these operations are inactive; however, as part of the RVAAP mission, inactive facilities are maintained in a standby status by keeping equipment in a condition to permit resumption of production.

1.2 Site Description

The RVAAP facility operated a Resource Conservation and Recovery Act (RCRA) storage facility identified as Building 1601, which is located just off D Road in the central portion of the base (Figure 1-2). This facility was used in conjunction with RVAAP's demilitarization by open ground burning, and open detonation of munitions. Building 1601 consist of a 484 square foot remote control structure constructed of concrete (Figure 1-3). The structure was previously covered by soil. Available as-built drawings indicate that the floor of Building 1601 is constructed on 3.5 feet of fill material. The walls of the building are anchored by a steel reinforced concrete footer that is 2 feet wide and 1 foot thick.

Building 1601 was used as a RCRA storage facility beginning in March of 1984. Dry ash material generated from the open burning was placed into 55-gallon drums and stored at this facility. Fifty-five gallon drums of dry spent activated carbon used to treat explosive-contaminated water were also stored at Building 1601. According to available information the drums

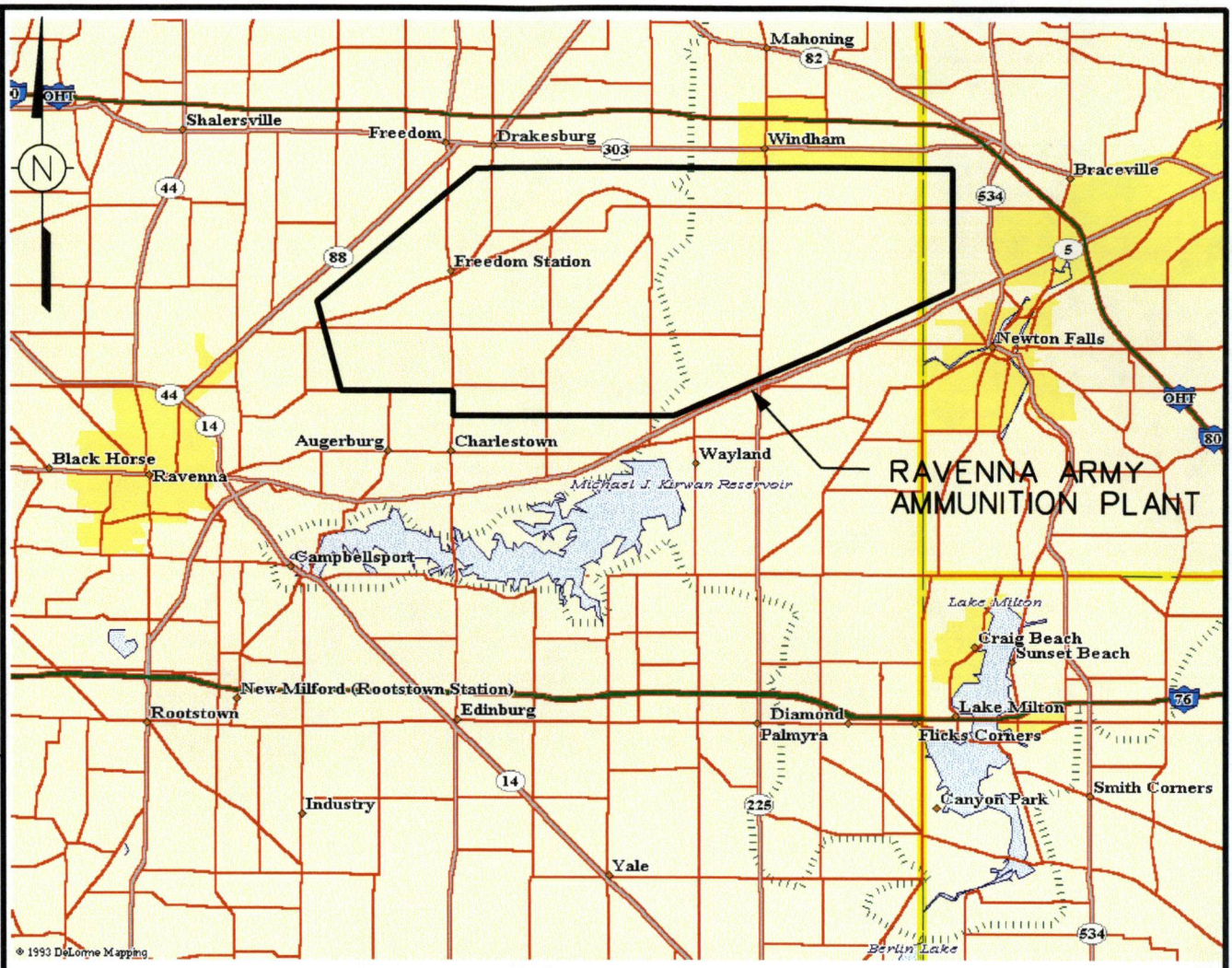

FIGURE 1-1
RAVENNA ARMY AMMUNITION PLANT & VACINITY

U.S. ARMY CORPS OF ENGINEERS
NASHVILE DISTRICT
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

NOT TO SCALE

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO.:\775574ES.006 | PROJ. NO.:775574
INITIATOR: C. WALLACE | PROJ. MGR.: C. SHAFER
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY:
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 6/18/98 | DRAWN BY: M. CRAFT

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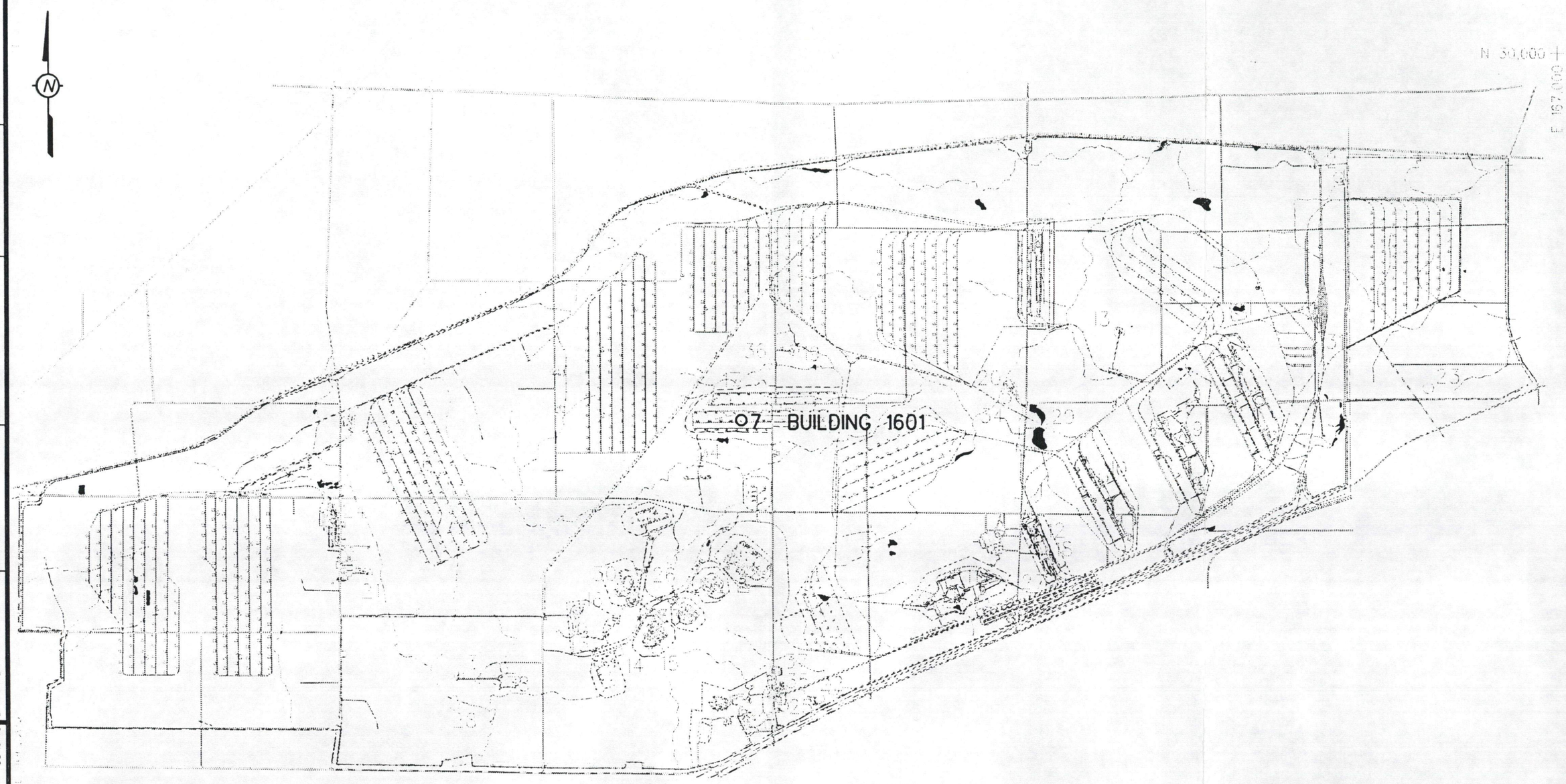


SCALE:
0 4000 8000 FEET

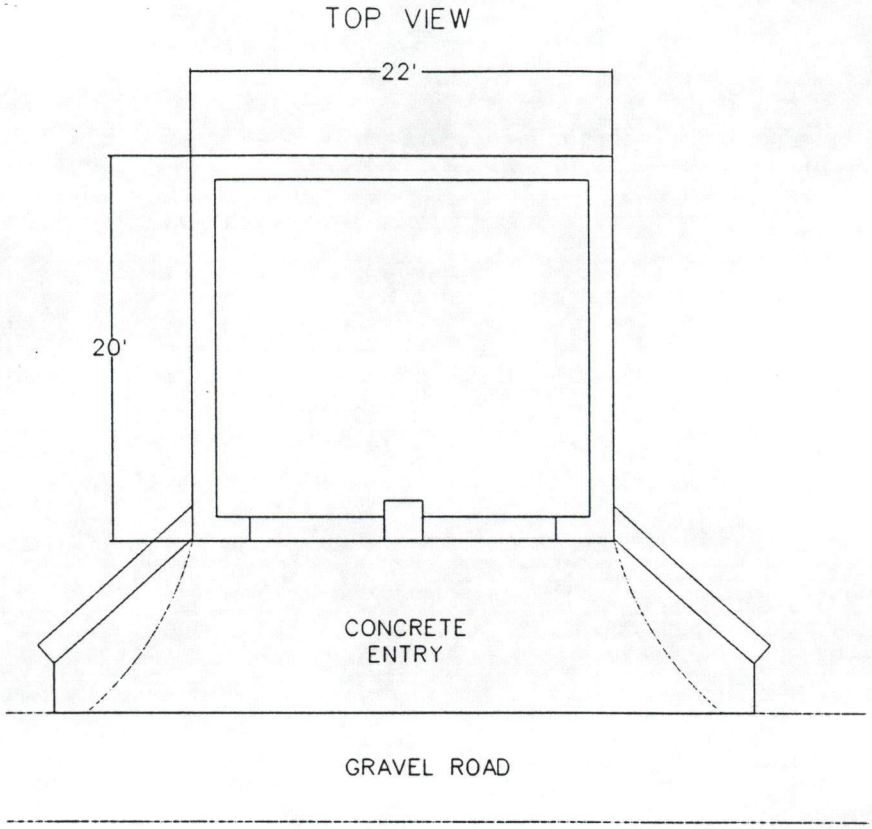
LEGEND OF SITES:

1 .....RAMSDELL QUARRY LANDFILL
2 .....ERIE BURNING GROUNDS
3 .....DEMOLITIONS AREA #1
4 .....DEMOLITIONS AREA #2
5 .....WINKLEPECK BURNING GROUNDS
6 .....C BLOCK QUARRY
7 ....BLDG 1601 HAZARDOUS WASTE STORAGE
8 . LOAD LINE 1 AND DILUTION/SETTLING POND
9 .LOAD LINE 2 AND DILUTION/SETTLING POND
10 .LOAD LINE 3 AND DILUTION/SETTLING POND
.LOAD LINE 4 AND DILUTION/SETTLING POND
12 LOAD LINE 12 AND DILUTION/SETTLING POND
13 .. BLDG 1200 AND DILUTION/SETTLING POND
14 .....LOAD LINE 6, EVAPORATION UNIT
15 .....LOAD LINE 6, TREATMENT PLANT
QUARRY LANDFILL/FORMER
16 .....FUZE & BOOSTER BURNING PITS
17 .....DEACTIVATION FURNACE
18 ....LOAD LINE 12 PINK WASTE WATER TREATMENT
19 LANDFILL NORTH OF WINKLEPECK BURNING GROUND
20 .....SAND CREEK SEWAGE TREATMENT PLANT
21 .....DEPOT SEWAGE TREATMENT PLANT
22 .....GEORGE ROAD SEWAGE TREATMENT PLANT
23 .....UNIT TRAINING SITE WASTE OIL TANK
24 RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK
25 .....BLDG 1034 MOTOR POOL WASTE OIL TANK
26 .....FUZE BOOSTER AREA SETTLING TANKS
27 ..... BLDG 854-PCB STORAGE
28 .....MUSTARD AGENT BURIAL SITE
29 ...UPPER AND LOWER COBBS POND COMPLEX
30 .LOAD LINE 7 PINK WATER TREATMENT PLANT
31 .....ORE PILE RETENTION POND
32 .....40 AND 60 MM FIRING RANGE
33 ..... FIRESTONE TEST FACILITY
34 .....SAND CREEK DISPOSAL ROAD LANDFILL
35 ..1037 BUILDING-LAUNDRY WASTEWATER SUMP
36 .....PISTOL RANGE
37 ..PESTICIDE BUILDING S-44S2
38 .....NACA TEST AREA

FIGURE 1-2
SITE LOCATION
BUILDINGS 1601

U.S. ARMY CORPS OF ENGINEERS
NASHVILLE DISTRICT
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

IT *INTERNATIONAL TECHNOLOGY CORPORATION*



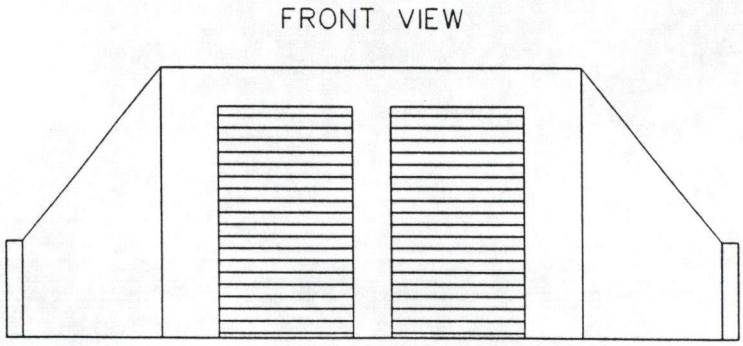


FIGURE 1-3
BUILDING 1601

U.S. ARMY CORPS OF ENGINEERS
NASHVILE DISTRICT
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

SCALE:

0 10 20 FEET

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 6/18/98	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: C. WALLACE	DWG. NO.:\775574ES.002
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were stored on pallets and stacked three-high. Storage activities of RCRA waste at Building 1601 were discontinued in April 1994.

1.3 DESCRIPTION OF WORK

ALL SUBSTANTIVE WORK WILL PROCEED IN ACCORDANCE WITH THE APPROVED "REVISED CLOSURE PLAN" DATED OCTOBER 1997 (SAIC, 1997). MINOR AMENDMENTS TO THE APPROVED PLAN ARE REQUESTED AND ARE DETAILED HEREIN.

2.0 Closure Activities

Closure activities for Building 1601 will consist of the following:

- Removal of any debris from within Building 1601.
- Removal and containerization of loose sediment or soil within Building 1601.
- Installation of soil borings both within and around the surrounding exterior of Building 1601 for the collection of confirmational soil samples for chemical analysis.
- Removal from the interior surfaces of the structure any observed staining or other types of demarcation that could be indicative of contamination.
- Decontamination and removal of the temporary scales located within Building 1601.
- Decontamination of the interior of Building 1601 by high-pressure wash and rinse.
- Collection of confirmatory rinsate samples for chemical analysis.
- Collection, characterization, and disposal of investigation-derived waste (IDW).

2.1 Facility Preparation

Prior to initiating decontamination activities all loose sediment and soil within Building 1601 will be collected by either brooming the material into small manageable piles or by utilizing a portable vacuum. IF DUST SUPPRESSION IS REQUIRED, ONLY A MIST OF CLEAN WATER WILL BE USED. This material will be placed into 55-gallon U.S. Department of Transportation (DOT) rated drums and transported to a temporary staging area on site to be designated by RVAAP personnel. Once the material has been containerized, a composite sample will be collected for disposal criteria as defined in Chapter 4.0. Any debris such as wooden pallets, etc., will be removed from the facility and placed in a predesignated area identified by RVAAP personnel.

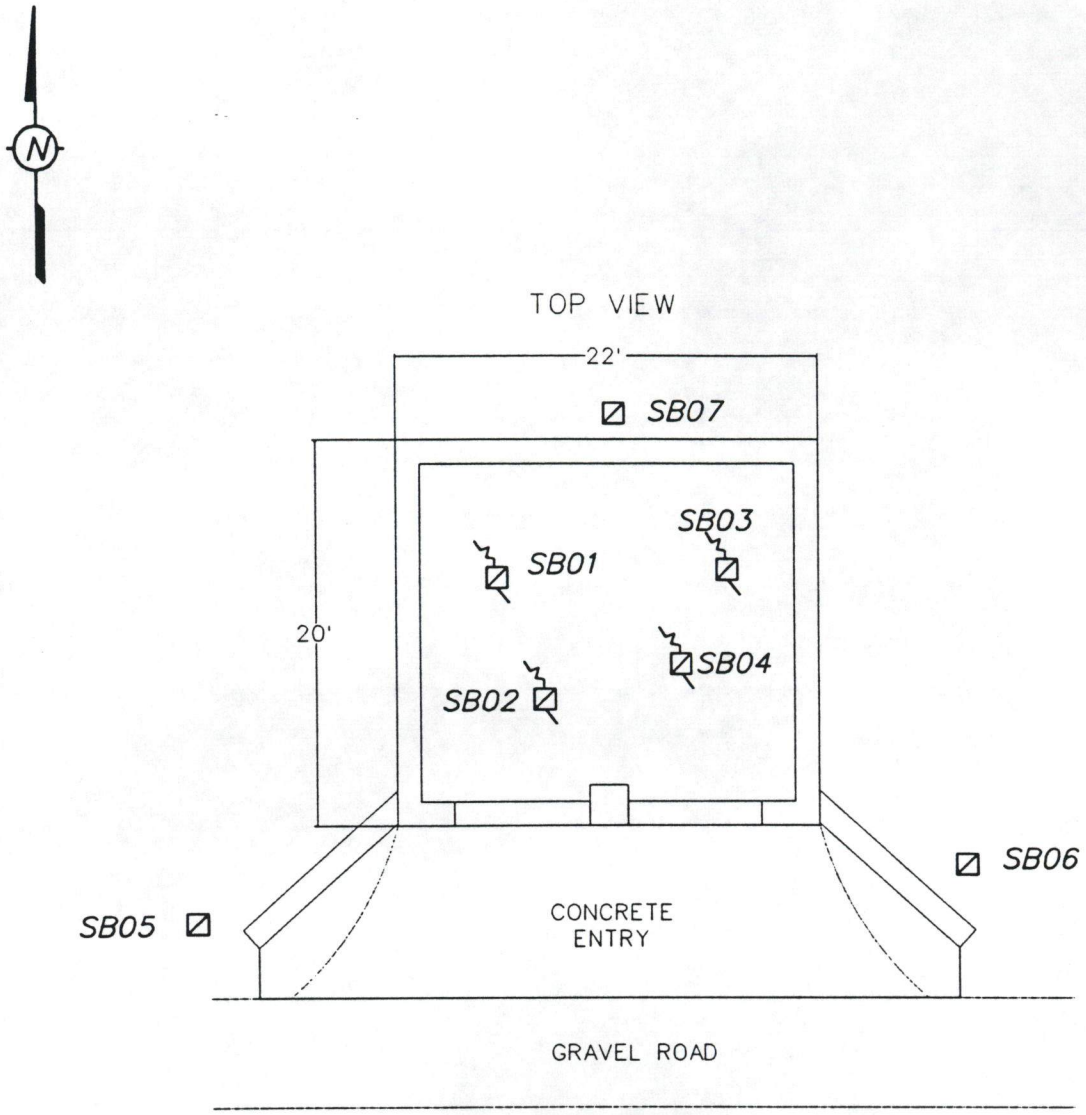
2.2 Soil Boring Installation

Seven soil borings will be installed at Building 1601. Soil samples will be collected for chemical analysis in order to determine if contaminants have been released into the surrounding environment. Four borings will be installed within the interior of Building 1601. Once the loose sediment has been removed from within the building, the floor will be visually inspected for

staining or cracks which may be indicative of possible contaminant migratory pathways. If the floor is stained near a cracked area, a soil sample will be collected from this location. If no staining is observed in the vicinity of a crack, then soil sample locations will be installed in the vicinity of a cracked area associated with a low spot within the floor. The remaining three soil sample locations will be installed around the exterior of Building 1601. ALTHOUGH THE APPROVED CLOSURE PLAN CALLS FOR A TOTAL OF TWO EXTERIOR SOIL SAMPLING LOCATIONS, AN AMENDMENT IS REQUESTED TO ALLOW THREE LOCATIONS TO BE SAMPLED. These sample locations will be installed adjacent to the asphalt driveway along the front of Building 1601. Proposed sample locations are shown on Figure 2-1. FINAL LOCATIONS OF ALL SOIL BORINGS WILL BE APPROVED BY THE U. S. CORPS OF ENGINEERS (USACE), AND, IF POSSIBLE, BY THE OHIO ENVIRONMENTAL PROTECTION AGENCY (OEPA).

Sample locations within Building 1601 will be installed by coring through the concrete slab using an air rotary drill or similar equipment. In order to minimize possible contaminant migration, water will not be induced into the borehole while advancing the air rotary bit through the concrete slab. Once the borehole has been advanced through the concrete slab and possible gravel backfill, a stainless steel hand auger will be used to collect soil samples for chemical analysis. Each boring will be advanced to a depth of approximately ~~6 feet below the surface of the concrete slab or until the~~2 INCHES INTO THE first impervious soil ~~is~~ encountered. Soil borings installed along the exterior of Building 1601 will also be installed using a stainless steel hand auger. Each sample location along the exterior of the building will be installed to a depth of approximately ~~4 feet~~6 INCHES below the ground surface. One composite sample will be collected from each of the seven soil boring locations for chemical analysis as described in Chapter 4.0 AND IN ACCORDANCE WITH APPENDIX B OF THE APPROVED CLOSURE PLAN.

Once soil sampling has been completed, each sample location within Building 1601 will be ABANDONED USING A BENTONITE GROUT ~~backfilled with excess soil cuttings~~ to within 2-feet of the concrete slab. The remaining 2-feet will be filled with concrete to its original grade. Also any floor areas with cracks or broken concrete will be sealed with a soft caulking compound or similar material to prevent possible migration of contaminated liquids during decontamination efforts. Soil borings from along the exterior of Building 1601 will be backfilled with ~~soil cuttings~~, ~~followed by~~ a 6-inch bentonite-cement slurry cap at each location.



LEGEND:

SB01 PROPOSED SOIL BORING LOCATION

CRACKED AREA IN FLOOR

SCALE:

0 10 20 FEET

FIGURE 2-1
BUILDING 1601
PROPOSED SOIL BORING LOCATIONS
U.S. ARMY CORPS OF ENGINEERS
NASHVILE DISTRICT
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

INTERNATIONAL TECHNOLOGY CORPORATION

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			PROJ. NO.:775574

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2.3 Decontamination Procedures

The interior walls, ceiling, and floor of Building 1601 will be triple-washed and rinsed using a high-pressure, low-phosphorate, detergent (Alconox® or equivalent) wash. Prior to decontamination activities, the floor and floor joints will be covered by visqueen or similar material to prevent the migration of potentially contaminated liquid through any openings. Minimal amounts of detergent will be used in order to facilitate the treatment of generated liquid waste. As the interior of the walls and ceiling are cleaned, the liquid spray will collected onto the floor. Sorbent material along with brooms, squeegees, and a wet/dry vacuum will be used to collect the excess liquid. A temporary dike will be constructed along the doorway entrance to insure that all generated waste is kept within Building 1601. Once the ceiling and walls have been decontaminated, the visqueen cover will be removed and the floor of Building 1601 will be decontaminated in similar fashion.

Scales used to weigh the drums stored at Building 1601 will be triple-washed similar to the walls and ceiling of Building 1601. A sample of the final rinsate water will be collected and analyzed to ensure that the scales are not contaminated. Once the scales have been adequately decontaminated, they will be wrapped in visqueen and transported to a predesignated area by base personnel for storage.

After initial decontamination activities are completed at Building 1601, the floor cracks and joints will be reinspected for structural integrity and for the presence of any remaining contamination. If the inspection indicates contamination still exists at the joints the contaminated area may be removed by chipping, scabbling, or a similar method.

A final ambient temperature rinse of the building will be conducted for collection of the rinsate sample to ensure that Building 1601 has been adequately decontaminated. This sample will be collected from the interior walls, ceiling, and floor surfaces of the building by running deionized water over the surface features and collecting a portion for chemical analysis. If analytical results from the ambient rinsate indicate contamination still exist on the building surfaces, the decontamination process will be repeated. FINAL RINSATE WILL BE COMPARED TO THE APPROVED PERFORMANCE STANDARDS, TABLE 2 OF THE APPROVED CLOSURE PLAN, TO DETERMINE THE ADEQUACY OF DECONTAMINATION EFFORTS, DECONTAMINATION WILL CONTINUE UNTIL THESE STANDARDS ARE MET.

All collection equipment such as brooms, squeegees, and the shop vacuum will be decontaminated prior to and immediately following all field activities. Sorbent material and personal

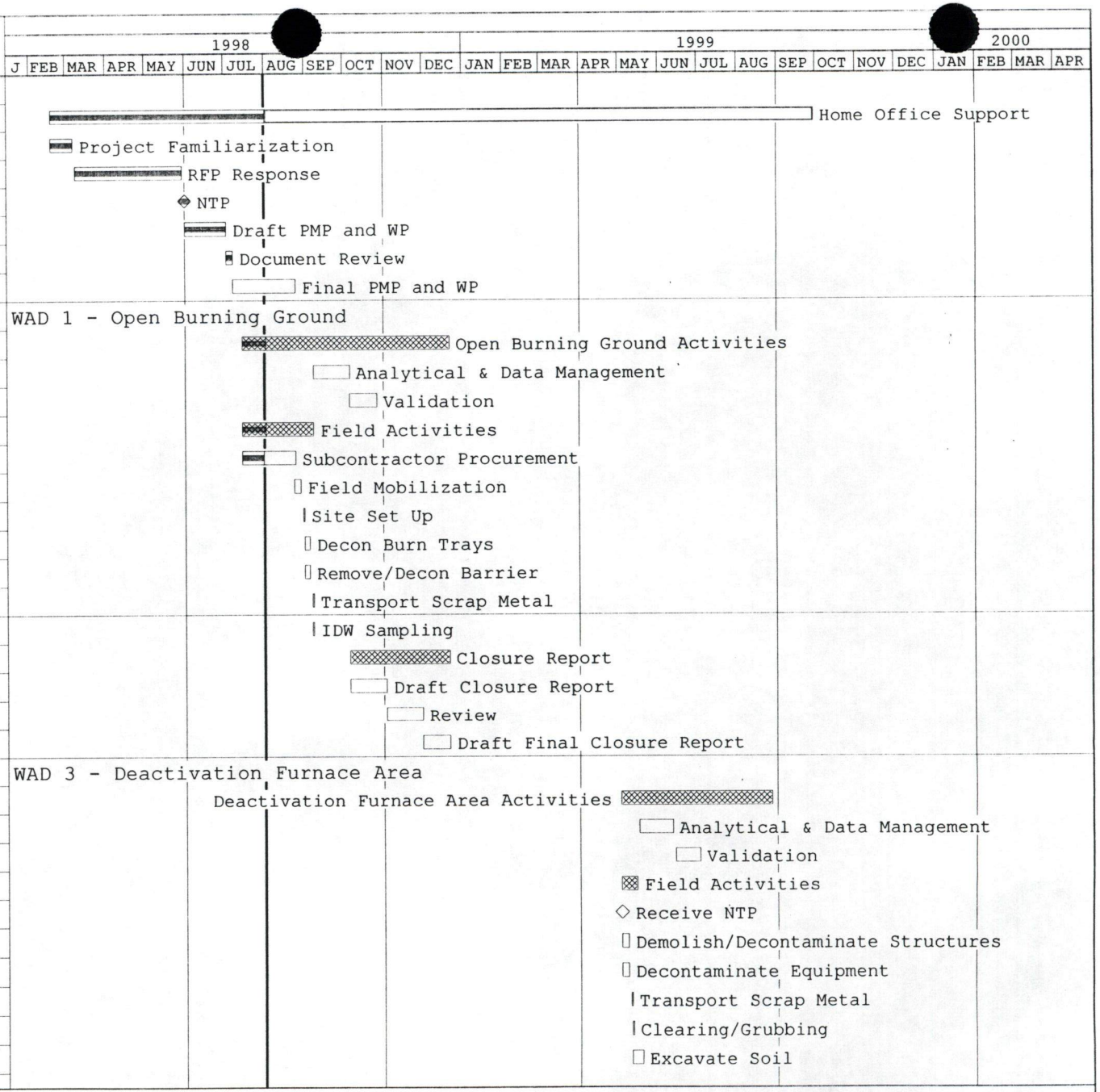
protective equipment (PPE) generated during decontamination activities will be placed into 55-gallon DOT rated drums and transported to a temporary staging area on site which will be identified by RVAAP personnel until disposal. Excess liquid generated from the decontamination procedures will be transported to a central staging area on site which will be defined by RVAAP personnel. This material will be containerized on site in 1,500-gallon polyvinyl holding tanks. A sample will be collected for analyses to determine the final disposal method of the liquid IDW.

Sampling collection procedures and analytical requirements for confirmatory rinsate and IDW management sampling are presented in Chapter 4.0.

3.0 Project Schedule

~~A proposed schedule for RVAAP is presented on Table 3-1. As indicated in the schedule, closure activities are to be ongoing for a period of approximately 6 months. During this time, a total of five sites will undergo closure activities. The anticipated start-up for closure activities at Building 1601 are to begin on September 1, 1998 and will continue for six days. However, the schedule is dependant upon regulatory review and approval of the closure activity work plans for each site and may be adjusted accordingly.~~A PROPOSED SCHEDULE FOR RVAAP IS PRESENTED ON TABLE 3-1. AS INDICATED IN THE SCHEDULE, CLOSURE ACTIVITIES ARE TO BE ONGOING FOR A PERIOD OF APPROXIMATELY 21 MONTHS, WITH A PERIOD OF INACTIVITY DURING THE WINTER MONTHS OF 1998-1999. THE PERIOD OF INACTIVITY HAS BEEN IMPOSED BY HUD REQUIREMENTS FOR SPECIAL PERMITS REQUIRED TO DEMOLISH STRUCTURES ON THE DEACTIVATION FURNACE AREA, AND THE PESTICIDE BUILDING T-4452, AND ALSO TO AVOID EXCAVATION AT THESE SITES DURING THE WET MONTHS. DURING THE 21 MONTH PERIOD, A TOTAL OF FIVE SITES WILL UNDERGO CLOSURE ACTIVITIES. THE ANTICIPATED STARTUP DATE FOR THE BUILDING 1601 AREA IS 8 SEPTEMBER, WITH FIELD WORK TO BE COMPLETED BY 15 SEPTEMBER, 1998. HOWEVER, THE SCHEDULE IS DEPENDANT UPON REGULATORY REVIEW AND APPROVAL OF THE CLOSURE ACTIVITY WORK PLANS FOR EACH SITE AND MAY BE ADJUSTED ACCORDINGLY.

ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
00000100	18FEB98A	29SEP99	421
00000200	18FEB98A	6MAR98A	15
00000300	9MAR98A	29MAY98A	15
00000400	1JUN98A		0
00000500	1JUN98A	2JUL98A	20
00000600	3JUL98A	7JUL98A	15
00000700	8JUL98A	24AUG98	10
01000000	15JUL98A	21DEC98	114
01020100	8SEP98	5OCT98	20
01020200	6OCT98	26OCT98	15
01040000	15JUL98A	7SEP98	39
01040010	15JUL98A	24AUG98	27
01040110	24AUG98	28AUG98	5
01040120	31AUG98	31AUG98	1
01040210	1SEP98	4SEP98	4
01040220	1SEP98	4SEP98	4
01040230	7SEP98	7SEP98	1
01040240	7SEP98	7SEP98	1
01050100	6OCT98	21DEC98	55
01050110	6OCT98	2NOV98	20
01050120	3NOV98	30NOV98	20
01050130	1DEC98	21DEC98	15
02000000	3MAY99	27AUG99	85
02020100	17MAY99	11JUN99	20
02020200	14JUN99	2JUL99	15
02040000	3MAY99	14MAY99	10
02040100	3MAY99		0
02040110	3MAY99	7MAY99	5
02040120	3MAY99	7MAY99	5
02040130	10MAY99	10MAY99	1
02040140	11MAY99	11MAY99	1
02040150	11MAY99	18MAY99	6



Activity Classification: Code
Hammock

Plot Date 24AUG98
Data Date 1AUG98
Project Start 16MAR98
Project Finish 29SEP99

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

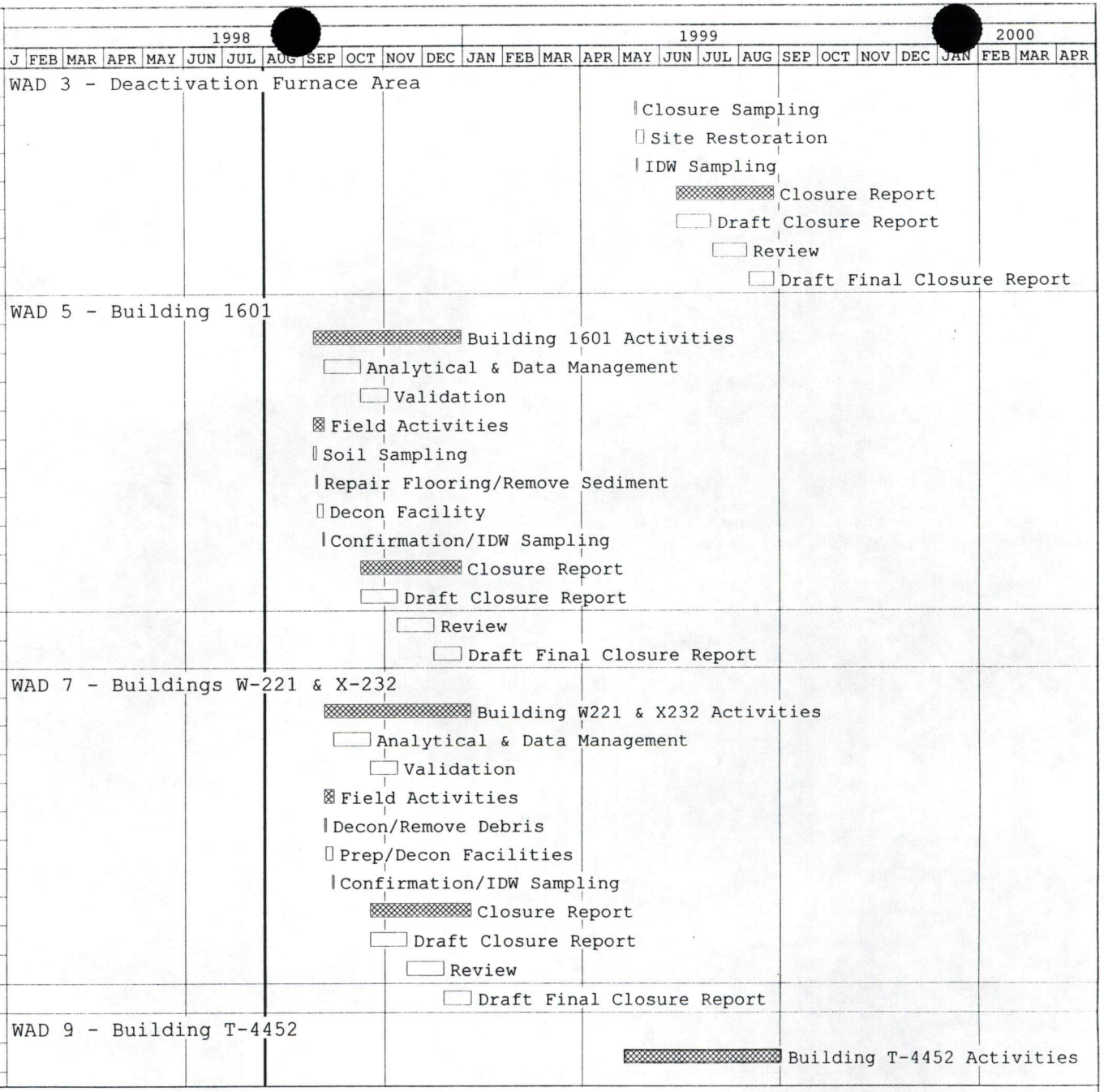
Sheet 1 of 3

Figure 3-1
Ravenna AAP
Louisville PRAC, DO 009 Schedule

Louisville PRAC, DO 09 Schedule

Date	Revision	Checked	Approved

ACTIVITY	EARLY START	EARLY FINISH	ORIG DUR
02040160	13MAY99	13MAY99	1
02040170	14MAY99	19MAY99	4
02040180	14MAY99	14MAY99	1
02050100	14JUN99	27AUG99	55
02050110	14JUN99	9JUL99	20
02050120	12JUL99	6AUG99	20
02050130	9AUG99	27AUG99	15
03000000	8SEP98	29DEC98	81
03020100	16SEP98	13OCT98	20
03020200	14OCT98	3NOV98	15
03040000	8SEP98	15SEP98	6
03040110	8SEP98	9SEP98	2
03040120	10SEP98	10SEP98	1
03040130	11SEP98	14SEP98	2
03040140	15SEP98	15SEP98	1
03050100	14OCT98	29DEC98	55
03050110	14OCT98	10NOV98	20
03050120	11NOV98	8DEC98	20
03050130	9DEC98	29DEC98	15
04000000	16SEP98	5JAN99	80
04020100	23SEP98	20OCT98	20
04020200	21OCT98	10NOV98	15
04040000	16SEP98	22SEP98	5
04040110	16SEP98	16SEP98	1
04040120	17SEP98	21SEP98	3
04040130	22SEP98	22SEP98	1
04050100	21OCT98	5JAN99	55
04050110	21OCT98	17NOV98	20
04050120	18NOV98	15DEC98	20
04050130	16DEC98	5JAN99	15
05000000	3MAY99	1SEP99	88



Activity Classification: Code
Hammock

Plot Date 24AUG98
Data Date 1AUG98
Project Start 16MAR98
Project Finish 29SEP99

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

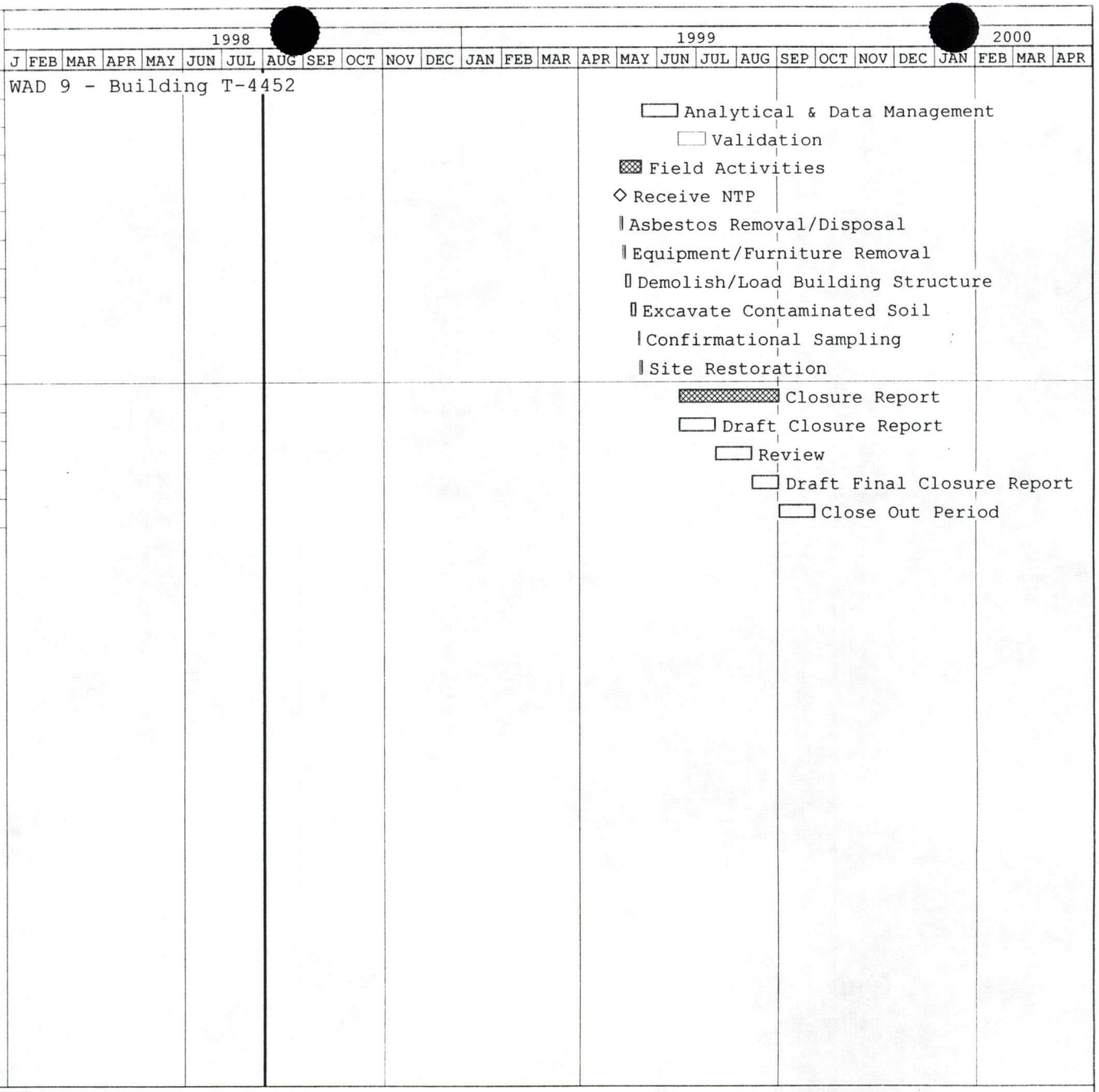
Sheet 2 of 3

Figure 3-1
Ravenna AAP
Louisville PRAC, DO 009 Schedule

Louisville PRAC, DO 09 Schedule

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	ORIG DUR
05020100	20MAY99	16JUN99	20
05020200	17JUN99	7JUL99	15
05040000	3MAY99	19MAY99	13
05040100	3MAY99		0
05040110	3MAY99	4MAY99	2
05040120	5MAY99	6MAY99	2
05040130	7MAY99	10MAY99	2
05040140	11MAY99	14MAY99	4
05040150	17MAY99	17MAY99	1
05040160	18MAY99	19MAY99	2
05050100	17JUN99	1SEP99	55
05050110	17JUN99	14JUL99	20
05050120	15JUL99	11AUG99	20
05050130	12AUG99	1SEP99	15
05880000	2SEP99	29SEP99	20



Activity Classification: Code
Hammock

Plot Date 24AUG98
Data Date 1AUG98
Project Start 16MAR98
Project Finish 29SEP99

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

Sheet 3 of 3

Figure 3-1
Ravenna AAP
Louisville PRAC, DO 009 Schedule

Louisville PRAC, DO 09 Schedule

Date	Revision	Checked	Approved

4.0 Site-Specific Sampling and Analysis

The following text describes methods and procedures for accomplishing the sampling and analysis required for closure of the RCRA Container Storage Unit (Building 1601) site. Site closure requirements are specified in the revised closure plan for Building 1601 (Science Applications International Corporation [SAIC], 1997). Sampling at Building 1601 will consist of waste disposal characterization sampling, decontamination process confirmation sampling, and investigatory soil sampling beneath and around the structure.

4.1 Waste Characterization Sampling

Waste characterization sampling will be performed on all collected/containerized IDW to facilitate proper disposal IN ACCORDANCE WITH ALL APPLICABLE STATE AND FEDERAL RULES, LAWS, AND REGULATIONS. Expected IDW at the Building 1601 site includes wastewater and sorbent materials from the decontamination of the building interior. DECONTAMINATION WASTES WILL BE CONTAINERIZED AS DESCRIBED IN SECTION 2.3. Composite samples will be collected, handled, and shipped in accordance with the facility-wide sampling and analysis plan (SAP [SAIC, 1996]). Sample analysis will comply with methods and procedures provided in the site-specific quality assurance project plan (QAPP) for the Building 1601 project (presented in Section 5.0). Sample collection equipment will be single-use disposable equipment or will be decontaminated as described in Section 5.4.

4.1.1 Decontamination Wastewater Sampling

The interior of Building 1601 will be decontaminated as discussed in Section 2.3. The decontamination process will utilize high-pressure, low-phosphate, detergent (Alconox® or equivalent) wash. Decontamination wastewater will be collected and transferred to polytanks to await sampling and disposal. The polytanks will be used to containerize decontamination wastewater from each of the five sites under this delivery order (DO) (Open Burning Ground, Deactivation Furnace Area, Building 1601, Buildings W-221 and X-232, and Building T-4452). After completing all decontamination/demolition activities at these five sites, three composite samples of the wastewater will be collected as follows:

- Polytanks will be segregated into three groups representing initial, intermediate, and final wash water.
- Three composite wastewater samples will be collected, one each from the initial, intermediate, and final polytank groups.

- Each composite sample will consist of equal aliquots collected from each polytank within an individual group.

- Aliquots will be composited for sampling in accordance with Section 7.4.2 of the facility-wide SAP.

- Each composite sample will be analyzed for parameters that are required by the subcontracted waste hauling/disposal facility and that meet ~~Ohio Environmental Protection Agency (EPA)~~OEPA and other state and federal waste disposal regulations.

All temporary waste storage and off-site waste hauling/disposal will be coordinated through the RVAAP environmental coordinator, Mr. Mark Patterson.

4.1.2 Confirmation Sampling

Sampling will be performed on the decontaminated building interior to confirm appropriate decontamination. Confirmation samples will be collected from the final rinse water after decontamination has been accomplished. Sample collection procedures will follow those stated for equipment rinsate samples in Section 4.3.7, of the facility-wide SAP. Specifically, American Society for Testing and Materials (ASTM) Type I (or equivalent) water be poured over randomly selected sections of the decontaminated interior and collected directly into the appropriate sample containers. If it is not practical to collect the rinsate directly into individual sample containers, it is acceptable to divert the rinsate into a clean stainless-steel bowl or equivalent container. The rinsate can then be transferred to the appropriate sample containers. Three confirmation rinsate samples will be collected and submitted for off-site laboratory analysis for low-level explosives, total analyte list (TAL) metals, and cyanide in accordance with the site-specific QAPP (as presented in Section 5.0). Excess rinsate will be collected and placed with the decontamination water in polytanks and handled as IDW. Sample collection equipment will be single-use disposable equipment or will be decontaminated as described in Section 5.4.

4.1.3 Investigatory Soil Sampling

Soils beneath and surrounding Building 1601 will be sampled to determine if past waste storage practices have permitted the degradation of the subsurface at the site. Specifically, seven subsurface soil samples will be collected at the site, four within the interior and three around the exterior of the building. Samples from within the building will be collected beneath cracks that exist in the structure's floor that potentially have been a conduit for stored hazardous materials to enter the subsurface. Exterior soil samples will be located near areas of potential subsurface contamination. Two exterior soil samples will be collected off the edge of the asphalt drive

approaching the building, one on each side. The remaining exterior soil sample will be collected adjacent to the north side of the building (Figure 2-1).

Interior soil samples will be collected (after removing the concrete floor slab and gravel sub-base) by hand augering to a depth of ~~6-feet below floor grade or~~ APPROXIMATELY 2 INCHES INTO the first ~~impenetrable~~IMPERVIOUS soil ~~is~~ encountered. The concrete and sub-base will be removed as described in Section 2.2. The pre-cleaned stainless steel hand auger will be advanced in accordance with Section 4.5.2.1.1, of the facility-wide SAP. Beginning just below the gravel sub-base, the auger will be advance until it ~~fills with soil (typically 4 to 6 inches)~~REACHES A DEPTH OF APPROXIMATELY 2 INCHES. The auger will be extracted, using care to prevent gravel or concrete chips from entering the borehole. The soil will be removed from the auger and ~~staged on plastic sheeting on the concrete floor, adjacent to the borehole. The auger will then re-enter the borehole and be advanced until full, then extracted. This process will continue until the borehole reaches a depth of approximately 5.5 feet below the floor grade. Beginning at 5.5 feet, the auger will be advanced until full, but the soil removed from the auger will be~~ placed in a stainless-steel bowl or similar container. ~~The borehole will be advance to a depth of 6 feet and soils from 5.5 to 6 feet will be placed in the stainless-steel bowl. After completing the borehole to 6 feet, the~~THE soil collected in the stainless-steel bowl will be homogenized as described in Section 4.4.2.5.1, of the facility-wide SAP. After homogenization, samples will be placed in prelabeled sample jars and placed on ice to await shipment to the laboratory. Samples will be submitted for off-site laboratory analysis for low-level explosives, TAL metals, and cyanide in accordance with the site-specific QAPP (as presented in Section 5.0). ANALYSES FOR FULL TAL METALS AND CYANIDE REPRESENTS A REQUEST TO AMEND THE APPROVED CLOSURE PLAN FOR THIS SITE, WHICH REQUIRES ANALYSES ONLY FOR LOW-LEVEL EXPLOSIVES AND 11 SITE-RELATED METALS.

After collection of the interior soil samples, the ~~remaining soil cuttings will be returned to the respective boreholes, tamped by hand, and covered with the gravel sub-base material. The concrete around the borehole will be repaired, as described in Chapter 2.0~~BOREHOLES WILL BE BACKFILLED WITH GROUT TO WITHIN 2 FEET OF THE CONCRETE SURFACE. THE REMAINING 2 FEET WILL BE FILLED WITH CONCRETE TO ITS ORIGINAL GRADE.

Soil samples taken on the exterior of Building 1601 will also be collected using the hand auger method. Three sampling locations will be chosen, one on either side of the asphalt drive and one along the north side of Building 1601, based on visible conditions at the surface. Areas of

stressed vegetation or visible staining will be targeted; however, if no visible degradation of surface soils is observed, representative sampling locations will be chosen along the asphalt drive and north of the building.

To facilitate the collection of exterior soil samples, a hand auger will be used as described for the interior soil sampling, above. TO ENSURE THAT A REPRESENTATIVE SAMPLE IS OBTAINED, EACH SAMPLING LOCATION WILL CONSIST OF THREE POINTS ARRANGED IN A TRIANGULAR PATTERN WITH APPROXIMATELY 1 FOOT BETWEEN POINTS, AS DESCRIBED IN THE APPROVED CLOSURE PLAN (SAIC, 1997). The auger will be advanced from ground surface to a depth of approximately ~~5.5 feet, staging the recovered soil cuttings on plastic sheeting near the borehole~~6 INCHES AT EACH OF THE THREE POINTS. Soils recovered from ~~5.5 to 6 feet~~FROM EACH OF THE THREE POINTS will be collected in a decontaminated stainless-steel bowl and homogenized as described in Section 4.4.2.5.1, of the facility-wide SAP. After homogenization, samples will be placed in prelabeled sample jars and placed on ice to await shipment to the laboratory. Samples will be submitted for off-site laboratory analysis for low-level explosives, TAL metals, and cyanide in accordance with the site-specific QAPP (as presented in Section 5.0).

Upon completing exterior soil sampling, ~~soil cuttings will be returned to the respective boreholes and tamped by hand to prevent settling. The borehole will be capped with~~THE BOREHOLES WILL BE BACKFILLED WITH a 6-inch thick bentonite-cement slurry CAP.

Sample collection equipment will be single-use disposable equipment or will be decontaminated as described in Section 5.4.

5.0 Site-Specific Quality Assurance Project Plan

5.1 Introduction

This QAPP is an investigation-specific addendum which will supplement the information summarized in the facility-wide QAPP and SAP. Where appropriate, sections of the facility-wide documents will be reference and not repeated. This document will summarize the general specifications to be used during closure activities.

This QAPP is written to provide site-specific information for closure activities at Building 1601. Closure activities will consist of the collection of soil samples from within and around Building 1601 for chemical analysis followed by a thorough decontamination of the interior surfaces of the building itself, as described in Chapter 2.0 of this document.

5.1.1 Past Data Collection Activities

This information is contained in Section 1.2 of the facility-wide SAP.

5.1.2 Project Objectives and Scope of Work

The primary objective of this task will be to remove any potential contaminants from the site by washing the interior of the building and investigating the soil beneath and around the building. IT Corporation (IT) will confirm that this task objective has been met by establishing and implementing a sample collection and analysis program which verifies that these objectives have been met. Overall project objectives are discussed in the closure plan for Building 1601 (SAIC, 1997).

5.1.3 Project Schedule

The project schedule for this site is discussed in Chapter 3.0.

5.2 Project Personnel and Organization

This project will be executed as a part of the Louisville Preplaced Remedial Action Contract (PRAC) Program, under the direction of Program Manager, John Razor. The PRAC Program maintains a small, focused program staff dedicated to Louisville PRAC DOs, which provides cost/schedule support, and client invoicing services for active PRAC DOs. In addition, IT maintains numerous technical resource groups, from which the Project Manager draws technical resources for project execution. This section identifies key members of the project staff and their respective roles in this project.

5.2.1 Personnel, Roles, and Responsibilities

This project will be executed under the technical direction of the IT Corporation (IT) Project Manager, who reports directly to the Program Manager. The following key project positions have been identified and assigned for the execution of this DO.

- ***Program Manager.*** The Program Manager serves as a point of contact (POC) for the U.S. Army Corps of Engineers (USACE) on all program issues, as well as DO-specific problems or issues as they may arise. The Program Manager is Mr. John Razor. Mr. Razor will ensure that contractual obligations are observed. In addition, Mr. Razor will conduct monthly review of project costs, schedule, and general progress.

- ***Project Manager.*** The Project Manager reports directly to the Program Manager. W. Charles Shafer will serve as the Project Manager for this DO. Responsibilities of this position include initial project setup and ongoing maintenance of cost and schedule reporting systems; preparation of monthly status reports; and general management of all project documentation preparation, field execution efforts, and analytical services required to execute this DO. In addition, the Project Manager is responsible for ensuring that all applicable USACE and IT policies and procedures are followed, including health and safety (H&S) requirements, quality assurance (QA) procedures, and existing site-wide documentation. Finally, the Project Manager serves as the single POC for the USACE contracting office's representative and technical manager on DO-related issues.

- ***Field Superintendent.*** The field superintendent reports directly to the Project Manager and will be responsible for all procurement, mobilization, field execution, and demobilization activity. Mr. Tom Randolph will serve as the field superintendent, and will be active in the month leading up to mobilization, accomplishing procurement, and identifying field and operating personnel. Mr. Randolph will also manage and direct all field activity.

- ***Project Engineer.*** The project engineer will direct all work plan preparation, assist the field superintendent in identifying field personnel, review the field activity as several points during execution, and direct preparation of the closure reports. Mr. Bill Norton will serve as the project engineer and will report to the Project Manager.

- ***Project Geologist.*** The project geologist role will be filled by Mr. David Kessler. The project geologist will be responsible for execution of all drilling and sampling conducted in the field, including confirmation sampling and field screening, and for directing and logging soil borings. The project geologist will also support the project engineer in supervision of excavation activity, including initial locations, mapping, sample locations, etc. This position will report to the project engineer and the Project Manager.

- ***Analytical Coordinator.*** Ms. Joyce Dishner will serve as the analytical coordinator and will report directly to the Project Manager. The analytical coordinator is responsible for all aspects of analytical support, including procurement of laboratory services, coordination of field sampling personnel with the analytical laboratory, quality control (QC) and management, review of data deliverables, and all data management functions to include validation and reporting.

- ***H&S Officer.*** Mr. Mike Henderson will serve as the H&S officer and will report to the Project Manager. The H&S officer is responsible for preparation of all H&S plans and documentation, and for establishing and maintaining the H&S program on the site during field execution. The H&S officer will be assisted by field H&S staff on a full-time basis when the project is in the field.

- ***Contract Administrator.*** Mr. Frank Haseltine is the contract administrator, reporting to the Program Manager. Mr. Haseltine is responsible for all contract communications and issues regarding the PRAC contract.

5.3 Project Quality Assurance Objectives

Data quality objectives (DQO) are qualitative and quantitative statements that specify the quality of data required to support decisions during investigation and remedial activities. DQOs are applicable to all data collection activities, and the level of detail and data quality are based on the overall needs of the project and the intended uses of the data produced.

The DQO process helps to define the purpose for which environmental data will be used and sets guidelines for designing a data collection program that meets the regulatory objectives. This process also provides a logical and quantitative framework for determining the time and resources that will be used to generate data of the desired level of quality.

The overall QA objective is to develop and implement procedures for the field sampling and laboratory analysis which will provide results to be used in assessing the sites of interest. The data produced will be used to determine the presence or absence of contamination found at the site. The analytical DQOs established in Tables 3-1 and 3-2 of the facility-wide QAPP will be used to evaluate the precision and accuracy of the analytical data collected. A general description of the DQO process is defined in the facility-wide QAPP Section 3.0.

5.4 Sampling Procedures

Specific sampling procedures will be described in each site-specific SAP as necessary to facilitate sample collection. Table 5-1 summarizes the sample containers, preservation, and holding time requirements for the expected parameters of interest during this investigation for both solid

Table 5-1

Sample Containers, Preservation, and Holding Times for Potential Analyses
Building 1601
Ravenna Army Ammunition Plant, Ohio

Matrix	Analytical Parameter	Analytical Method	Container Type and Quantity	Preservative	Holding Time
Water	Explosives	SW-8330	2 x 1 Liter Amber glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis
	TAL Metals	SW-6010/7000	1 x 1 Liter Poly	Cool to 4°C, HNO_3 to pH<2	6 months
	RCRA Metals	SW-6010/7000	1 x 1 Liter Poly	Cool to 4°C, HNO_3 to pH<2	6 months
	Cyanide	SW-9010A	1 x 1 Liter Poly	Cool to 4°C, NaOH to pH>12	14 days
	Pesticides	SW-8081	2 x 1 Liter Amber glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis
	Herbicides	SW-8151	2 x 1 Liter Amber glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis
Soils	Explosives	SW-8330	4 oz wide-mouth glass	Cool to 4°C	14 days to extraction, 40 days from extract to analysis
	TAL Metals	SW-6010/7000	4 oz wide-mouth glass	Cool to 4°C	6 months
	Cyanide	SW-9010A	4 oz wide-mouth glass	Cool to 4°C	14 days
	Pesticides	SW-8081	4 oz wide-mouth glass	Cool to 4°C	14 days to extraction, 40 days from extract to analysis
	Herbicides	SW-8151	4 oz wide-mouth glass	Cool to 4°C	14 days to extraction, 40 days from extract to analysis
	TCLP Volatiles	SW-1311/8260A	4 oz wide-mouth glass	Cool to 4°C	7 days to extraction, 14 days from extract to analysis
	TCLP Semivolatiles	SW-1311/8270B	4 oz wide-mouth glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis
	TCLP Metals	SW-1311/6010	4 oz wide-mouth glass	Cool to 4°C	7 days to extraction, 6 months from extraction to analysis
	TCLP Mercury	SW-1311/7471	4 oz wide-mouth glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis
	TCLP Pesticides	SW-1311/8081	4 oz wide-mouth glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis
	TCLP Herbicides	SW-1311/8151	4 oz wide-mouth glass	Cool to 4°C	7 days to extraction, 40 days from extract to analysis

Notes:
Method Reference as follows: U.S.EPA, 1986, Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition and its Updates, EPA, Office of Solid Waste.

and aqueous matrices. Table 5-2 summarizes the total number of field and QA/QC samples to be collected at the deactivation furnace area and the analytical parameters of interest at the site.

Decontamination of Equipment and Supplies. One purpose for defining an equipment decontamination procedure is to ensure adequate steps are taken to remove residual chemical contamination before the equipment is used to collect a sample for environmental analysis. Decontamination procedures are also important in reducing the risk of cross contamination and worker exposure when removing contaminated nonsampling equipment from a contaminated area, as discussed in the H&S plans. Different levels of decontamination stringency are applied for the different types of equipment used. For sampling equipment used to collect environmental samples, the most stringent program will be required, and it is this program that is the focus of this discussion. For sampling equipment used to collect samples for geotechnical analysis or soil classification and general nonsampling equipment, a simple soap and water rinse or a high-pressure steam cleaning with soap and water should be sufficient to remove contamination. IT specific H&S requirements are imposed that require a further level of decontamination for grossly contaminated equipment, additional decontamination steps may be required. Usually in both cases, an area of the site will be designated as the decontamination area and decontamination supplies, water, and solvents will be staged in the area for use.

Any field instruments, such as water level meters and pH and temperature probes that come in direct contact with the sample matrix, will be adequately decontaminated between measurements by detergent solution wash, deionized (DI) water rinsing, wiping, and final rinsing with DI water.

To minimize the possible contribution of even trace levels of contamination from sampling equipment, adequate equipment decontamination must be completed prior to the first use of the equipment (if new) or reuse at a different sampling location. The decontamination procedure may vary depending on the sample matrix, the analytical program, or the materials or construction of the sampling equipment used. The following general guidelines will be followed for decontamination of sampling equipment:

- ***Post-Sample Collection Cleanup.*** After the required samples have been properly prepared at a given sampling location, residual visible soil will be removed as much as possible from the sampling equipment by scraping or shaking. These residues will be handled as IDW. For water sampling equipment, residual water should be drained and placed into a waste container.

Table 5-2

Total Number of Field and QA/QC Samples to be Collected From Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Parameters	Analytical Method	Matrix	Number of Sampling Events	Total Number of Samples	Field Duplicate (10%)	MS (5%)	MSD (5%)	Field Blank (1/event)	Equip Rinsate (1/event)	Trip Blank (1/cooler)	TAT Needed	Total Number of Samples
BUILDING 1601												
Building 1601- Structure												
EXPLOSIVES (LOW LEVEL)	SW8330M	Rinsate	1	3	0	0	0	0	0		48 Hour	3
TAL METALS (T)	6010A/7000	Rinsate	1	3	0	0	0	0	0		48 Hour	3
CYANIDE	9010A	Rinsate	1	3	0	0	0	0	0		48 Hour	3
Building 1601 - Closure Soils												
EXPLOSIVES (LOW LEVEL)	SW8330M	Soil	1	7	1	1	1	1	1		Normal	12
TAL METALS (T)	6010A/7000	Soil	1	7	1	1	1	1	1		Normal	12
CYANIDE	9010A	Soil	1	7	1	1	1	1	1		Normal	12
Totals				30	3	3	3	3	3	0		45

NOTES:
1. Unit cost includes Level III data report and electronic deliverable.
2. Multiplier of 1.75 (75%) is applied to the base unit cost of analysis for 48 hour TAT.

- ***Gross Wash and Water Rinse***. Following the recovery of the sampling equipment to the decon area, the equipment will undergo a vigorous brushing with laboratory-grade, phosphate-free detergent in water and will then be rinsed with tap water to remove visible particulate.

- ***Analyte-Free Water Rinse***. Rinse decontaminated equipment with DI analyte-free water. The water used should be certified as analyte-free by the manufacturer and prepared using filters, an activated carbon bed filtration apparatus, and deionizing resin columns. Water that has been field or laboratory prepared using this equipment and has been sampled, analyzed for target parameters, and verified to contain less than detectable quantities may also be used. For all water sources, verify that the same lot or batch that has been documented as analyte free is consistently used or that documentation exists for multiple lots.

- ***Solvent Rinse***. Depending on the target contaminants of concern and sampling matrix, rinse the sample with isopropanol and air dry. This rinse is optional. If testing for pesticides or PCB, perform an additional rinse with hexane.

  All solvents should be certified by the American Chemical Society as "pesticide-grade" or equivalent where such specifications exist. Better grades such as "nano-grade" are also acceptable. Solvents must be stored in a secured, health and safety approved storage cabinet. Each solvent container must be tagged with the date of receipt, date opened, and expiration date(s). The expiration date of the solvent will be calculated as 180 days from the date received or 30 days from the date opened.

- ***Second, Analyte-Free Water Rinse***. Rinse the equipment following the solvent rinse again with analyte-free water. Analyte-free water for this rinse is drawn from a second source (such as a squeeze bottle). (This rinse water may be collected as the equipment rinse sample when such a sample is required.)

- ***Protective Wrap***. Prepare decontaminated equipment for storage by draining all residual DI water from the equipment then allowing equipment to air dry (if possible) or towel dry. Wrap sampling surfaces in layers of aluminum foil and store in a designated storage location, free from sources of contamination. Apply outer protection such as sealing in a ziplock bag or plastic basin/tub with a lid to avoid dust.

When sampling equipment is used to collect samples that contain high concentration organic compounds, oil, grease, or other hard to remove materials, it may be necessary to rinse the equipment several times with pesticide-grade acetone or hexane to remove the materials before proceeding with the soap and water wash. In extreme cases, it may be necessary to steam-clean the field equipment before washing. If the field equipment cannot be adequately cleaned using these procedures, it should be discarded and possibly substituted with equipment constructed from a more resistant material.

5.5 Sample Custody

General sample custody and transportation procedures are described in Section 5.0 of the facility-wide QAPP. Copies of all field forms are attached to this site-specific QAPP as they apply to the sampling program.

5.6 Calibration Procedures and Frequencies

Instrument calibration is described in detail in Section 6.0 of the facility-wide QAPP.

5.7 Analytical Program and Procedures

The purpose of the analytical program is to produce data of known quality that accurately represents the composition of the matrices sampled at each site and that satisfy or exceed the requirements of the site-specific DQOs. To meet the analytical objective, samples will be prepared and analyzed by standard U.S. EPA SW-846 methodologies.

All laboratory personnel will be trained in the correct implementation of the laboratory standard operating procedures (SOP) and the analytical methods referenced in this plan, as well as general laboratory procedures and sound laboratory practices, prior to analyzing samples from RVAAP. The laboratory will be responsible for documenting and maintaining personnel training records, which will be required to be available for review in the event of a laboratory audit.

IT has selected Quanterra Environmental Services (Quanterra), to be the primary supplier of analytical laboratory services for the RVAAP project. Quanterra's North Canton and Knoxville offices will analyze the majority of samples collected from RVAAP. Some tasks or situations may require the procurement of analytical services from another vendor and, in those cases, the qualifications of those vendors will be reviewed by IT and discussed with a USACE project representative before approval is given. The addresses for the Quanterra laboratories to be used are as follows:

Quanterra – North Canton
4101 Shuffle Drive NW
North Canton, Ohio 44720
(216) 497-9396

Quanterra – Knoxville
5815 Middlebrook Pike
Knoxville, Tennessee 37921
(423) 588-6401.

All samples associated with the Building 1601 will be sent to the Quanterra North Canton location and all analyses will be performed by Quanterra. Tables 5-3, through 5-5 present the standard lists of compounds reported for TAL metals, cyanide, and low-level explosives by the method of analysis expected to be used during this investigation, respectively. These tables also summarize the reporting limits (RL) for each compound as statistically determined by Quanterra. The limits provided in the tables may change based on dilution and purge volumes.

5.7.1 Reporting Limits

Reporting Limits vs. Method Detection Limits. Method detection limits (MDL) are determined as required in 40 CFR Part 136, Appendix B or SW-846, Chapter 1 for each method, instrument, project-specified analyte, and applicable matrix (soil/water). The MDLs are recorded and documented and updated annually. After the MDLs are generated, the laboratory establishes its RLs, which are higher than the MDL by a factor of 2 to 5 times the MDL. As the MDLs are re-evaluated, the RLs may be adjusted to reflect the new MDL.

As a rule, the RL cannot be lower than the lowest calibration standard for a given analysis. At a minimum, a verification standard at or near the RL is required to technically support the degree of accuracy indicated by the RL.

The RL for a given analysis will be those listed in Table 5-3 through Table 5-5 of this site-specific QAPP. In the absence of matrix interferences, the sample RL should be equal to the values listed in Table 5-3 through Table 5-5, but in the presence of matrix interferences that require sample dilutions, these RL often cannot be met. When a dilution of a sample is performed, the RL is elevated by multiplying the RL by the dilution factor, and the sensitivity of the measurement is decreased by that same factor. When a dilution of a sample is required, because of confirmed matrix interference or to bring targets into the working calibration range of an instrument, the lowest possible dilution of that sample is to be reported by the laboratory in order to meet or closely meet the project objectives.

5.7.2 Laboratory Sample Custody and Tracking Procedures

Shipments of samples from the field to the laboratory will be typically within 24 hours of collection. Samples requiring analyses with short holding times will be identified and designated as such on the analyte request/chain of custody (AR/COC) forms and will be shipped on the date of collection, if possible.

Table 5-3

Summary of Analytes and Reporting Limits for Metals Analysis by Method SW-6010A/7000 Series Building 1601 Ravenna Army Ammunition Plant, Ohio

Parameter Group	SOIL		WATER	
	RL	Units	RL	Units
Aluminum	20	mg/kg	200	µg/L
Antimony	1	mg/kg	5	µg/L
Arsenic	1	mg/kg	10	µg/L
Barium	20	mg/kg	200	µg/L
Beryllium	0.5	mg/kg	5	µg/L
Cadmium	0.2	mg/kg	2	µg/L
Calcium	500	mg/kg	5000	µg/L
Chromium	0.5	mg/kg	5	µg/L
Cobalt	5	mg/kg	7	µg/L
Copper	2.5	mg/kg	25	µg/L
Iron	10	mg/kg	100	µg/L
Lead	0.3	mg/kg	3	µg/L
Magnesium	500	mg/kg	5000	µg/L
Manganese	1.5	mg/kg	15	µg/L
Nickel	4	mg/kg	40	µg/L
Potassium	500	mg/kg	5000	µg/L
Selenium	0.5	mg/kg	5	µg/L
Silver	0.5	mg/kg	5	µg/L
Sodium	500	mg/kg	5000	µg/L
Thallium	1	mg/kg	10	µg/L
Vanadium	5	mg/kg	50	µg/L
Zinc	5	mg/kg	20	µg/L
Mercury	0.1	mg/kg	0.2	µg/L

Table 5-4

Summary of Reporting Limits for Cyanide Analysis by SW-9010A
Building 1601
Ravenna Army Ammunition Plant, Ohio

	SOIL		WATER	
Parameter Group	RL	Units	RL	Units
Cyanide	0.5	mg/kg	0.01	mg/L

Table 5-5

Summary of Compounds and Reporting Limits for Nitroaromatics and Nitramines (Low-Level Explosives) by Method SW-8330 Building 1601 Ravenna Army Ammunition Plant, Ohio

Parameter Group	Water		Soil	
	RL	Units	RL	Units
HMX	0.5	µg/L	0.5	mg/kg
RDX	0.5	µg/L	0.5	mg/kg
1,3,5-Trinitrobenzene	0.2	µg/L	0.25	mg/kg
1,3-Dinitrobenzene	0.2	µg/L	0.25	mg/kg
Tetryl	0.2	µg/L	0.25	mg/kg
Nitrobenzene	0.2	µg/L	0.25	mg/kg
2,4,6-Trinitrotoluene	0.2	µg/L	0.25	mg/kg
4-Amino-2,6-dinitrotoluene	0.2	µg/L	0.25	mg/kg
2-Amino-4,6-dinitrotoluene	0.2	µg/L	0.25	mg/kg
2,6-Dinitrotoluene	0.2	µg/L	0.25	mg/kg
2,4-Dinitrotolune	0.2	µg/L	0.25	mg/kg
2-Nitrotoluene	0.2	µg/L	0.25	mg/kg
4-Nitrotoluene	0.2	µg/L	0.25	mg/kg
3-Nitrotoluene	0.2	µg/L	0.25	mg/kg

Upon receipt of the samples at the laboratory, the laboratory sample custodian will note the condition and temperature of the cooler received, as well as any questions or observations concerning sample integrity. The laboratory sample custodian will record the condition and verify the presence of each sample named on the AR/COC record. Any nonconformance noted which concerns the sample identifications, type of analysis, or condition upon receipt will be noted and project management will be notified. The laboratory project manager will contact the project chemist and a corrective action will be implemented. The laboratory will maintain an internal sample-tracking record that will document the date of sample removal from storage, extraction, preparation, and analysis, as well as the laboratory-assigned sample number, which is affixed to each sample container upon sample receipt.

Field samples may be held for a reasonable time, such that the required method extraction and analysis holding times are not exceeded or jeopardized. They may be accumulated at the laboratory to form an analytical batch consisting of a maximum of 20 field samples that are of the same matrix or of similar composition. Associated field QC samples, including trip blanks, equipment rinsates, field duplicates, and project-specific matrix spike/matrix spike duplicate (MS/MSD), are to be designated on the AR/COC forms and may be included in the analytical batch.

As part of the information on the AR/COC record, the samples will be marked for laboratory disposal. The laboratory project manager will authorize and oversee the disposal of samples when the project is complete and the samples are no longer needed. The disposal of samples will be performed in accordance with laboratory SOPs and be in compliance with all U.S. EPA and state requirements.

5.7.3 Laboratory Document Storage

All original laboratory documents are to be stored by the laboratory in a safe controlled environment for a period of not less than 7 years. All original documents should be available for review upon request.

5.8 Quality Assurance/Quality Control Program

5.8.1 Intra-Laboratory Quality Control

The contracted laboratory will have a written QA program that provides rules and guidelines to ensure the reliability and validity of the work conducted at the laboratory. Compliance with the QA program is coordinated, monitored, and updated by the laboratory's QA department.

The established QA/QC procedures are implemented to provide the quality of data suitable for their intended purpose and to ensure that the project DQOs are satisfactorily met. Laboratory and field check samples are used to confirm that laboratory as well as field practices are in control. Laboratory checks are performed to verify that the sampling and analytical accuracy and precision of the data are within the target criteria limits established in the analytical method and the QAPP. Laboratory QC check samples consist of the following types of samples: Laboratory control samples, MS/MSD, method blanks and surrogate and internal standard spikes. The purposes of these sample types are defined in the facility-wide QAPP.

5.8.2 Field Quality Control Samples

Field QC samples are collected to check the sampling and analytical accuracy and precision of field data and to determine the origin of contamination originating from the collection, transport, or storage of samples. The purpose of the field QC data is to provide important information about field operations. Analytical data are not changed or altered in any way based on the field QC results. Types of field QC samples are as follows: field duplicates, trip blanks, equipment blanks, and material/source blanks. The requirements and frequencies of collection for these field QC samples are those listed in Table 5-6 of this site-specific QAPP and as specified in the facility-wide QAPP. The following sections provide brief discussions of these sample types.

5.8.2.1 Field Duplicates

Field duplicates are used to assess the precision of the sample collection procedures for a specific matrix. No data are qualified based solely on the results of field duplicate analyses.

Field duplicate sample analysis will be performed on a task-specific frequency to address the variability of contaminant concentrations in the sample matrix. Because of the variability introduced during sampling and analysis of soils, the target acceptance criteria for soil will be less than or equal to 50 percent relative percent difference (RPD) (whereas, analytical duplicates for waters target acceptance criteria is less than or equal to 30 percent RPD). Target acceptance criteria for soils and waters are summarized in Tables 3-1 and 3-2 of the facility-wide QAPP, respectively. Field duplicates will be collected at a frequency of 10 percent (1 in 10 samples) during this task.

5.8.2.2 Trip Blanks

Trip blanks are used to evaluate contamination from volatile organic compounds (VOC) originating from the transport of the samples. In the event of trip blank contamination, the associated sample data are evaluated for false positive results. A trip blank will be included in each ship-

Table 5-6

Frequency of Field QA/QC Samples to be Collected at Building 1601
Ravenna Army Ammunition Plant, Ohio

QA/QC Sample Type	Matrix and Area to be Samples	Frequency of Collection	Est. No.[a] Collected
Field Duplicate	Closure Soils	10% (1 in 10 sampes)	1
Equipment Rinse[b]	Closure Soils	One per Event	1
Field/Material Blank	Closure Soils	One per source water	1

[a]Estimated number of samples collected will change if the overall number of samples collected changes.

[b]Equipment rinsates will not be required for samples collected using disposable or dedicated sampling equipment. These samples will not be counted when calculating percentages.

ment of coolers containing aqueous VOC samples. Based on the planned analytical program at this site, no trip blanks will be required.

5.8.2.3 Equipment Blanks

Equipment blanks are used to check the adequacy of the decontamination procedures applied to the sampling equipment used for the samples collected. In the event of equipment blank contamination, the associated sample data are evaluated for false positive results. Equipment rinsates will be collected at a frequency of 5 percent of all samples collected during this task. Samples, which are collected using disposable or dedicated sampling equipment, will not require associated equipment rinsate samples and will not be counted where frequency is concerned.

5.8.2.4 Material Blanks

Material blanks are used to assess the purity of the source-water and to determine whether contamination originated from the source-water on site or from the decontamination process. One material blank will be collected from each source water used during sampling and decontamination procedures at Building 1601. In the event of material blank contamination, the associated sample data are evaluated for false positive results.

5.9 Data Reduction, Validation and Reporting

5.9.1 Data Reduction

The general data reduction procedures outlined in Section 9.0 of the facility-wide QAPP will be followed by IT and their subcontracted laboratory.

5.9.2 Data Validation

The data validation procedures outlined in the facility-wide QAPP will be followed by IT and their subcontracted data validator service. All data collected in the field and submitted to an off-site analytical laboratory for definitive analysis will be subjected to a Level III data validation as described in Section 9.2 of the facility-wide QAPP.

5.9.3 Data Reporting

The analytical laboratories will prepare and submit analytical data deliverables in hard copy and electronic formats. It will be the laboratory's responsibility to verify that the two versions of data are identical prior to delivery. Electronic data deliverables (EDD) will be submitted to IT from the laboratory in the format outlined in Table 5-7. Level IV hard copy data packages will be

Table 5-7. ITEMS EDT Format Specifications

File Structure: ITEMS uses a standard file format for transmitting analytical data. Each file should be in standard DOS format and consist of:

- A variable number of records containing analytical data
- A trailer record containing three dollar signs (i.e., $$$) followed by 358 blanks.

Each individual analytical record must be 361 bytes long, contain only ASCII characters and be terminated by a carriage return. ITEMS identifies the information included in each record by position. Each value should be left-justified within the defined column. The specific format ITEMS requires is as follows:

Position	Field Length	Content	Required	Comments
1-20	20	Project Sample Number	Y	a
21-28	8	Sample Date (as MM/DD/YY)	Y	b
29-33	5	Sample Time (as HH24:MI)	Y	b
34-48	15	Sample Delivery Group	N	
49-58	10	Lab Matrix	Y	
59-78	20	Lab Sample No	Y	
79-83	5	Laboratory Identification Code	Y	c
84-91	8	Analysis Date (as MM/DD/YY)	Y	
92-96	5	Analysis Time (as HH24:MI)	Y	
97-116	20	QC Batch Number	N	
117-120	4	Result Type	Y	
121-131	11	CAS Number	Y	
132-141	10	Result	Y	
142-148	7	Result Qualifier	N	
149-158	10	2-Sigma Error (for Radiological results only)	N	
159-168	10	Units of Measure	Y	
169-176	8	Retention Time	Y/N	d
177-236	60	Parameter Name	Y	
237-246	10	Detection Limit	Y	e
247-256	10	Method Detection Limit	N	f
257-263	7	Dilution Factor	Y	g
264-269	6	Extraction Method Code	N	h
270-271	2	Result Classification Code	N	h
272-285	14	Expected Result	N	h
286-295	10	Analytical Method Code	N	h
296-299	4	Sample Purpose	N	b
300-303	4	Sample Prep Code	Y	i
304-311	8	Sample Leachate Date (as MM/DD/YY)	N	
312-319	8	Extraction Date (as MM/DD/YY)	Y	i
320-324	5	Extraction Time (as HH24:MI)	N	
325-359	35	Lab Method	Y	
360	1	Sample Filtered	Y	j
361	1	Re-extraction Number	Y	k

Table 5-7. ITEMS EDT Format Specifications (continued)

Comments:

Valid value tables are provided.

- If no valid CAS registry number exists, use code assigned by IT Corporation.

a. The lab should enter the lab sample number in both the project and lab sample number fields when the sample is a laboratory QC sample.
b. The sample date, time are required for all samples, sample purpose for laboratory QC samples only.
c. The code reported by the lab is assigned by IT Corporation.
d. Retention time is required for Tentatively Identified Compounds (TICs) only. For target compounds and surrogates, leave this field blank.
e. The detection limit reported in this field is the actual detection limit that the lab experienced for the particular sample and analysis.
f. The detection limit reported in this field is the limit for the method as reported in the literature.
g. If sample is not diluted, report a value of 1.
h. These fields are intended to be used only by projects that must eventually upload their data from ITEMS into IRPIMS.
i. Sample Prep Code and Extraction Date are required fields.
j. Valid entries are Y/N.
k. Valid entries are 0 - 9. Zero (0) should be reported for normal sample results.

Table 1. Result Types

Result Type	Category	Description
TRG	NF	Target parameter for analysis
TIC	NF	Tentatively identified compound
IS	LQ	Internal Standard added to the sample by the laboratory
SUR	LQ	Surrogate compound added to the sample by the laboratory

Table 2. Result Qualifiers

Qualifier	Qualifier Category	Nondetect Qualifier	Description
U	O	Y	Compound was analyzed for but was not detected ("Non-detect")
J	O	N	Estimated value less than the CRDL
C	O	N	Pesticides only. Presence confirmed by GC/MS
B	O	N	Analyte found in both sample and associated blank
E	O	N	Estimate: result outside linear range of instrument.
D	O	N	Dilution run. Initial run outside linear range of instrument.
A	O	N	Indicates that the TIC is a suspected aldol condensation product.
X	O	N	Indicates manual modification of result or EPA qualifier.
JX	O	N	Result is less than SQL that would have been displayed for "U@.
B	I	N	Value less than the CRDL but greater than or equal to the IDL.
E	I	N	Value estimated due to interference.
M	I	N	Duplicate inject precision did not agree (GFAA).
N	I	N	Spiked sample recovery not within control limits.

Table 5-7. ITEMS EDT Format Specifications (continued)

Qualifier	Qualifier Category	Nondetect Qualifier	Description
S	I	N	Reported value determined by Method of Standard Additions (MSA).
W	I	N	Post-digestion spike out of control limits (GFAA).
*	I	N	Duplicate analysis not within control limits.
+	I	N	Correlation coefficient for the MSA is less than 0.995.
P	I	N	Method qualifier - ICP.
A	I	N	Method qualifier - Flame AA.
F	I	N	Method qualifier - Furnace AA.
CV	I	N	Method qualifier- Manual cold vapor.
AV	I	N	Method qualifier - Automated cold vapor.
NR	I	N	Method qualifier - Analyte was not required.
C	I	N	Method qualifier - Manual spectrophotometric

Table 3. Sample Purpose

Sample Purpose	Category	Description
BKS	LQ	Blank spike
BLK	LQ	Blank
BSD	LQ	Blank spike duplicate
CB	LQ	Calibration blank
LCS	LQ	Laboratory control sample
LR	LQ	Laboratory replicate
MB	LQ	Method blank
MS	LQ	Matrix spike
MSD	LQ	Matrix spike duplicate
REG	NF	Regular environmental field sample
AB	FQ	Ambient condition blank (HAZWRAP definition)
ER	FQ	Equipment rinsate
FB	FQ	Field blank (EPA definition)
FD	FQ	Field duplicate
RD	FQ	Regulatory duplicate collected in the field by a regulator
SMQC	FQ	Source material quality control
SPLT	FQ	Regular sample split in two; each half is sent to a different lab
TB	FQ	Trip blank

Table 4. Sample Prep Codes

Prep Code	Description
CIT	Waste extraction test using sodium citrate
CON1	Confirmation Analysis - First
CON2	Confirmation Analysis - Second
DION	Waste extraction test using de-ionized water
NORM	Normal preparation associated with analytical method used

supplied by the laboratory so that the required Level III data validation effort can be completed with ease allowing for a raw data verification of any detected analytes if necessary.

EDDs should be verified by the laboratory to be free of defects and in agreement with the hard copy data. All disks should be scanned for viruses before submittal. Information should comply with specified ITEMS format and valid values provided in Table 5-7. EDDs found to have significant defects in format or information will be returned to the laboratory for correction and re-submittal. It is the responsibility of the laboratory to perform corrective action to prevent reoccurrence of errors, and to provide the documentation necessary to support the review and correction of the errors.

5.10 Performance and System Audits

Audits will be completed as specified in the facility-wide QAPP.

5.11 Preventative Maintenance Procedures

The preventative maintenance procedures outlined in the facility-wide QAPP will be followed for this task.

5.12 Specific Routine Procedures to Assess Data Precision, Accuracy, and Completeness

The procedures outlined in Section 12.0 of the facility-wide QAPP will be followed.

5.13 Corrective Actions

The procedures outlined for Corrective Actions in the facility-wide QAPP will be followed for this task.

5.14 QA Reports to Management

All performance and system reports described in Section 14.0 of the facility-wide QAPP will be submitted to the project manager for review prior to regulatory submittal. These reports will be submitted to the appropriate parties based on the schedule described in the facility-wide document.

6.0 Site-Specific Safety and Health Plan

6.1 Site Work Plan Summary

Project Objective. The objective of these activities at RVAAP is to perform closure activities for Building 1601.

Project Tasks. Closure activities for Building 1601 will consist of the following:

- Removal of any debris from within Building 1601.
- Removal and containerization of any loose sediment or soil within Building 1601.
- Installation of soil borings both within and around the surrounding exterior of Building 1601 for the collection of confirmational soil samples for chemical analysis.
- Removal of visual staining or other types of demarcation which could be indicative of contamination from the interior surfaces of the structure.
- Decontamination and removal of the temporary scales located within Building 1601.
- Collection of confirmatory rinsate samples for chemical analysis.
- Collection, characterization, and disposal of IDW.

Personnel Requirements. Up to 15 employees

Note: All personnel on this site shall have received training, informational programs, and medical surveillance as outlined in the IT site-wide safety and health plan (SHP) for RVAAP, and be familiar with the requirements of this site-specific SHP (SSHP).

The IT office will have documentation of training and medical surveillance for all personnel on site.

6.2 Site Characterization and Analysis

6.2.1 Anticipated Hazards

The activity hazard analysis in Section 6.5 contains project specific practices utilized to reduce or eliminate anticipated site hazards. The activity hazard analysis indicates specific chemical and physical hazards that may be present and encountered during each task from on-site operations. Below each task is a list of hazards and specific actions that will be taken to control the respective hazards. These control measures may include work practice controls, engineering controls, and/or use of appropriate PPE.

Based on a review of the field activities defined in the scope of work for Building 1601 and contamination information provided in the following sections, the potential for significant exposure of project personnel to hazardous conditions arising from chemical contamination is low. During the work tasks, the most likely mechanism for chemical exposure is through skin contact with soil and rinse water. Chemical exposure through inhalation is unlikely; however, air monitoring of VOC and particulate will be performed.

Table 6-1 contains chemicals anticipated and those to be used at the Building 1601.

6.2.2 General Site Information

Building 1601

Site Location and Description. Building 1601 was used as a RCRA storage facility beginning in March 1984. Dry ash material generated from the demilitarization by open burning was placed into 55-gallon drums and stored at this facility. Fifty-five-gallon drums of dry spent activated carbon used to treat explosive-contaminated water were also stored at Building 1601. According to available information the drums were stored on pallets and stacked 3 high. Storage activities of RCRA waste at Building 1601 were discontinued in April 1994. Building 1601 is located in the central portion of RVAAP.

Site Contaminants of Concern. The primary contaminants of concern for employee exposure at Building 1601 are chromium, dinitrotoluene (DNT), octogen (HMX), lead, cyclonite (RDX), and trinitrotoluene (TNT). Unexploded ordnance (UXO) is not suspected at this site.

Table 6-1

Toxicological and Physical Properties of Chemicals
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
Aluminum powder [7429-90-5]	NA	NA	Inh Ing Con	Irritated eyes, skin, and respiratory system; pulmonary fibrosis	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	5 mg/m^3	--	PEL TLV REL	
Chromium [7440-47-3	NA	NA	Inh Ing Con	Irritated eyes and skin; lung fibrosis.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 0.5 mg/m^3 0.5 mg/m^3		PEL TLV REL	250 mg/m^3
Cyclotetramethylene-tetramine (Octogen) (HMX) [2691-41-0]			Ing		Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention				
Dinitrotoluene [25321-14-6]	?	NA	Inh Abs Ing Con	Anoxia, anemia, jaundice, reproductive effects; reproductive effects. Carcenogenic.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	1.5 mg/m^3 (skin) 0.2 mg/m^3 (skin) 1.5 mg/m^3 (skin)		PEL TLV REL	Ca 50 mg/m^3
Ethyl benzene	8.76	0.09-0.6	Inh Ing Con	Irritated eyes, mucous, membranes; headache; dermatitis; narcosis, coma.	Eye: Irrigate promptly Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	125 ppm 125 ppm 125 ppm	PEL TLV REL	2,000 ppm

Table 6-1

Toxicological and Physical Properties of Chemicals
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
Fuel oil (diesel oil, medium)	?	?	Ing Inh Con	Ingestion causes nausea, vomiting, and cramps; depressed central nervous system, headache, coma, death; pulmonary irritation; kidney and liver damage; aspiration causes severe lung irritation, coughing, gagging, dyspnea, substernal stress, pulmonary edema; bronchopneumonia; excited, then depressed, central nervous system.	Eye: Irrigate promptly Skin: Soap wash Breath: Respiratory support Swallow: Immediate medical attention Aspiration: Immediate medical attention			PEL TLV REL	
Gasoline [8006-61-9]	?	0.3	Inh Ing Con	Intoxication, headaches, blurred vision, dizziness, nausea; eye, nose throat irritation; potential kidney and other cancers. Carcinogenic.	Eye: Irrigate immediately (15 min) Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	300 ppm 300 ppm Ca, lowest feasible conc. (LOQ 15 ppm)	500 ppm 500 ppm	PEL TLV REL	?
Hydrogen chloride (hydrochloric acid) [74-90-8]	12.74	0.255–10.6	Inh Ing Con	Inflamed nose, throat, larynx; cough, burns throat, choking; burns eyes, skin; dermatitis; in animals; laryngeal spasm; pulmonary edema.	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention		C5 ppm C5 ppm C5 ppm		
Hydraulic oil [NA]	?	?						PEL TLV REL	
Lead	NA	NA	Inh Ing Con	Weak, insomnia, facial pallor, constipated, abdominal pain, colic, anemia, irritated eyes, paralysis of wrists and ankles, encephalopathy.	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention				

Table 6-1

Toxicological and Physical Properties of Chemicals
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
Methanol	10.85	4.2-5960	Inh Abs Ing Con	Irritated eyes, headache, drowsiness, lightheadedness, nausea, vomiting, disturbance in vision, blindness.	Eye: Irrigate immediately Skin: Water flush promptly Breath: Fresh air Swallow: Immediate medical attention		200 ppm (skin) 200 ppm (skin) 200 ppm	PEL TLV REL	6,000 ppm
Methyl chloride (chloromethane) [74-87-3]	11.28	>10	Inh Con	Dizziness, nausea, vomiting; visual disturbances, stagger, slurred speech, convulsions; liver and kidney damage reproductive and teratogenic defects	Eye: Irrigate immediately Skin: Water flush promptly Breath: Fresh air Swallow: Immediate medical attention	100 ppm 50 ppm (skin) lowest feasible	C 200 ppm 100 ppm (skin) --	PEL TLV REL	Ca (2,000 ppm)
Motor oil [NA]	?	?	Inh Ing	See oil mist; usually only a problem if misted or ingested.	Eye: Irrigate immediately (15 mins) Skin: Soap wash immediately Swallow: Immediate medical attention			PEL TLV REL	
Nitric acid [7697-37-2]	11.95	0.3–1	Inh Ing Con	Irritated eyes, mucous membranes, and skin; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion.	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	2 ppm 2 ppm 2 ppm	4 ppm 4 ppm 4 ppm	PEL TLV REL	25 ppm
Nitroglycerine [55-63-0]	?		Inh Abs Ing Con	Throbbing headache, dizziness, nausea, vomiting, abdominal pain; hypotension; delirium; CNS depression; angina, skin irritation.	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	C0.2 ppm (skin) 0.005 ppm (skin) ---	--- 0.1 mg/m^3	PEL TLV REL	75 mg/m^3
PCBs (see Chlorodiphenyl)									

Table 6-1

Toxicological and Physical Properties of Chemicals
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Substance [CAS]	IP[a] (eV)	Odor Threshold (ppm)	Route[b]	Symptoms of Exposure	Treatment	TWA[c]	STEL[d]	Source[e]	IDLH (NIOSH)[f]
Portland cement			Inh	Fine gray powder that can be irritating if inhaled or in eyes.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention		10 mg/m^3 10 mg/m^3/ total dust 5 mg/m^3 respirable fraction	TLV PEL/REL	
RDX (Cyclonite) (Cyclotrimethylene trinitramine) [121-82-4]			Inh Con	Nausea, convulsion, chronic CNS effects. (Explosive material)	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	1.5 mg/m^3 (skin) 1.5 mg/mg^3 (skin)	-- 3 mg/m^3 (skin)	TLV REL	
Sodium hydroxide [1310-73-2]	NA	NA	Inh Ing Con	Irritated nose; pneumonitis; burns eyes, and skin; temporary loss of hair.	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention		C2 mg/m^3 C2 mg/m^3 C2 mg/m^3	PEL TLV REL	10 mg/m^3
Sulfuric acid [7664-93-9]	?	0.15	Inh Ing Con	Irritated eyes, nose, and throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatitis; dental erosion; tracheobronchitis; skin and eye burns; dermatitis.	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 1 mg/m^3 1 mg/m^3	3 mg/m^3	PEL TLV REL	15 mg/m^3
2,4,6-Trinitrotoluene [118-96-7]				Explosive material	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	1.5 mg/m^3 (skin) 0.1 mg/m^3 (skin) 0.5 mg/m^3 (skin)	--- --- ---	PEL TLV REL	500 mg/m^3

[a]IP = Ionization potential (electron volts).
[b]Route = Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; Con, Skin and/or eye contact.

Table 6-1

Toxicological and Physical Properties of Chemicals
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

[c]TWA = Time-weighted average. The TWA concentration for a normal work day (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.
[d]STEL = Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.
[e]PEL = Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).
AEL = Airborne Exposure Limit.
TLV = American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value—TWA.
REL = National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.
[f]IDLH (NIOSH)—Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
NE = No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 97-140, June 1997).
C = Ceiling limit value which should not be exceeded at any time.
Ca = Carcinogen.
NA = Not applicable.
? = Unknown.
LEL = Lower explosive limits.
LC_{50} = Lethal concentration for 50 percent of population tested.
LD_{50} = Lethal dose for 50 percent of population tested.
NIC = Notice of intended change (ACGIH).
NR = No recommendation.

6.3 Personal Protective Equipment

The work activities will begin in the following levels of protection.

Building	Task	Initial Level of PPE
1601	- Removal of any debris from within Building 1601 for disposal by RVAAP personnel	Modified Level D[a]
	- Removal and containerization of any loose sediment or soil within the building	Modified Level D[a]
	- Installation of soil borings within and around the surrounding exterior of Building 1601 for the collection of confirmational soil samples for chemical analysis	Modified Level D[a]
	- Removal of any visual staining or other types of demarcation that could be indicative of contamination from all interior surfaces	Modified Level D[a]
	- Decontamination and removal of the temporary scales located within Building 1601	Modified Level D[a]
	- Decontamination by high-pressure wash and rinse of the interior of Building 1601	Modified Level D[a]
	- Collection of confirmatory rinsate samples from the building for chemical analysis	Modified Level D[a]
	- IDW management, including collection, temporary storage, characterization, and disposal	Level D

[a]Initial level will be raised to Level C or higher if air monitoring results in the worker's breathing zone are greater than action levels.

A complete description of Level D, Modified Level D, and Level C follows.

Level D. The following equipment will be used for Level D protection:

- Coveralls or work clothing
- Steel-toed safety boots
- Safety glasses
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

Modified Level D. The following equipment will be used for Modified Level D protection:

- Saran-coated Tyvek, Kleenguard, or its equivalent taped at gloves and boots
- Latex boot covers
- Nitrile gloves (outer)
- Latex or lightweight nitrile gloves (inner)

- Steel-toed safety boots
- Safety glasses
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

Level C. Level C protection will not be used unless air monitoring data indicate the need for upgrade; however, the equipment shall be readily available on site. The following equipment will be used for Level C protection:

- National Institute of Occupational Safety and Health approved self-contained breathing full-face, air-purifying respirators equipped with organic vapor/acid gas cartridge in combination with high-efficiency particulate air filter
- Hooded, saran-coated Tyvek, taped at gloves, boots, and respirator
- Nitrile gloves (outer)
- Latex or lightweight nitrile gloves (inner)
- Neoprene steel-toed boots or polyvinyl chloride overbooties/steel-toed safety boots
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

Note: In addition to Level C PPE, the operator of high-pressure water jetting equipment shall wear metatarsal guards for the legs and feet.

6.4 Site Monitoring

The primary contaminants of concern resulting from operations at Building 1601 are chromium, DNT, HMX, RDX, and TNT. Table 6-2 contains action levels for site monitoring at Building 1601.

UXO. The presence of UXO is not suspected within the building.

Chemical. Monitoring will be conducted by the site safety and health officer during the performance of staging and cleanup activities. A calibrated flame ionization detector (i.e., OVA 128 or equivalent) or photoionization detector (i.e., HNu, Microtip, or equivalent) organic vapor analyzer will be utilized to determine if any organic material may be present that would necessitate

Table 6-2

Action Levels
Building 1601
Ravenna Army Ammunition Plan, Ravenna, Ohio

When in Level C PPE

Analyte	Action Level	Required Action[a]
VOHs	≥ 10 ppm above background in breathing zone (BZ)	Stop work, evacuate work area, upgrade to Level B.
Oxygen	≥ 20%, < 23% < 20%, > 23%	Normal operations. Stop work, evacuate work area.
Flammable vapors	≥ 10% LEL ≤ 10% LEL	Stop work, evacuate work area. Notify project manager and H&S manager. Continue operations, monitor for VOCs.
Dust	≥ 5 mg/m^3	Stop work/initiate dust suppression

When in Level D Modified PPE

Analyte	Action Level	Required Action[b]
VOHs	≥ 5 ppm above background in BZ	Stop work, suspend work activities for 15 to 30 minutes; if readings are sustained, then upgrade to Level C PPE.
Oxygen	≥ 20%, < 23% < 20%, > 23%	Normal operations. Stop work, evacuate work area.
Flammable vapors	≥ 10% LEL ≤ 10% LEL	Stop work, evacuate work area. Notify project manager and H&S manager. Continue operations, monitor for VOCs.
Dust	≥ 5 mg/m^3	Level C PPE/initiate dust suppression

When in Support Zone

Analyte	Action Level	Required Action[b]
VOHs	≥ 1 ppm above background in BZ	Evacuate support zone and re-establish perimeter of exclusion zone.
Dust	≥ 5 mg/m^3	Initiate dust suppression.

[a]Four instantaneous peaks in any 15-minute period or a sustained reading for 5 minutes in excess of the action level will trigger a response.
[b]Contact with the health and safety manager (H&S) manager must be made prior to continuance of work. The H&S manager may then initiate perimeter/integrated air sampling along with additional engineering controls.

No one is permitted to downgrade levels of PPE without authorization from the H&S manager.

upgrading of protection level. Table 6-3 contains the air monitoring frequency and location for site monitoring at Building 1601.

Particulate. Ambient air monitoring for dust will be employed during the removal of soil and debris. Particulate monitoring will not be conducted during pressure-washing operations. In the event of excessive airborne dust, dust suppression shall be implemented. Table 6-3 contains the air monitoring frequency and location for site monitoring at Building 1601.

6.5 Activity Hazard Analysis

The attached activity hazard analysis (Table 6-4) is provided for the following activities:

- Setup of equipment and general field activities
- Removal of debris, loose sediment, soils, and visual staining
- Installation of soil borings
- Decontamination and removal of temporary scales
- Decontamination and rinse of the buildings
- Collection of confirmatory rinsate samples
- Collection, storage, and disposal of IDW.

All injuries and illnesses must be immediately reported to the site manager or the site safety and health officer, who will then notify off-site personnel and organizations as necessary.

If hospital care must be provided, the victim shall be treated at Robinson Memorial Hospital. Directions to the hospital are provided in Figure 6-1.

Ravenna Army Ammunition Project Emergency Contacts

Fire Department (City of Ravenna)	(330) 297-5738
Emergency Medical Service (Borowski Funeral Home, Ravenna)	(330) 872-5050
Robinson Memorial Hospital (Ravenna)	(330) 297-2449
	(330) 297-0811
Hazardous Materials Response (Silas Mason Company, Inc.)	(330) 358-7406
	(330) 358-7409
USACE, Louisville District	(502) 582-5424
National Response Center	(800) 424-8802
Poison Control Center	(800) 462-0800
U.S. EPA Region V	(312) 353-2000

Table 6-3

Air Monitoring Frequency and Location
Building 1601
Ravenna Army Ammunition Plan, Ravenna, Ohio

Work Activity	Instrument	Frequency	Location
Staging Equipment	OV Monitor	Initially for area	Breathing zone (BZ) of employees
Removal of Debris, Loose Sediment, and Visual Sediment	OV Monitor LEL/O_2 Monitor Particulate Monitor	Periodically Continuously Continuously	BZ of employees Work area BZ of employees
Soil borings	OV Monitor LEL/O_2 Monitor Particulate Monitor	Continuously Continuously Continuously	BZ of employees Work area BZ of employees
Decontamination and removal of scales	OV Monitor LEL/O_2 Monitor Particulate Monitor	Periodically Continuously Continuously	BZ of employees Work area BZ of employees
Decontamination and Rinse of Buildings	OV Monitor LEL/O_2 Monitor	Periodically Periodically	BZ of employees Work area

OV - Organic vapor.

LEL/O_2 - Lower explosive level/oxygen.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Staging Equipment	Unexploded ordnance (UXO)	• If UXO is found, cease all activities, mark area, and notify the site manager.
	Slip, trip, and fall hazards	• Determine best access route before transporting equipment. • Practice good housekeeping; keep work area picked up and clean as feasible. • Continually inspect the work area for slip, trip, and fall hazards. • Look before you step; ensure safe and secure footing.
	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment.
	Falling objects	• Stay alert and clear of materials suspended overhead; wear hard hat and steel-toed boots.
	Flying debris, dirt, dust, etc.	• Wear safety glasses/goggles; ensure that eye wash is in proper working condition
	Pinch points	• Keep hands, fingers, and feet clear of moving/suspended materials and equipment. • Beware of contact points. • Stay alert at all times!
	Cuts/bruises	• Use cotton or leather work gloves for material handling.
	Bees, spiders, and snakes	• Inspect work area carefully and avoid placing hands and feet into concealed areas.
	Fire	• Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Contact with moving equipment/vehicles	• Work area will be barricaded/demarcated. • Equipment will be laid out in an area free of traffic flow.
	Hazard communication	• Label all containers as to contents and dispose of properly. • Ensure Material Safety Data Sheets (MSDS) are available for hazardous chemicals used on site.
	Noise	• Sound levels above 85 A-weighted decibels (dBA) mandates hearing protection.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Staging Equipment (continued)	Lighting	• Adequate lighting will be provided to ensure a safe working environment.
	Poison ivy/oak/sumac	• Avoid plant areas if possible. • Wear long sleeves and long pants. • Promptly wash clothing that has contacted poisonous plants. • Wash affected areas immediately with soap and water.
	Ticks	• Wear light colored clothing (can see ticks better). • Mow vegetated and small brush areas. • Wear insect repellant. • Wear long sleeves and long pants. • Visually check oneself promptly and frequently after exiting the work area.
	Heat rash	• Keep the skin clean and dry. • Change perspiration-soaked clothing, as necessary. • Bathe at end of work shift or day. • Apply powder to affected area.
	Heat cramps	• Drink plenty of cool fluids even when not thirsty. • Provide cool fluid for work crews. • Move victim to shaded, cool area.
	Heat exhaustion	• Conduct physiological worker monitoring as needed (i.e., heart rate, oral temperature) • Set up work/rest periods. • Use the buddy system. • Allow workers time to acclimate. • Have ice packs available for use. • Take frequent breaks.
	Heat stroke	• Evaluate possibility of night work. • Perform physiological monitoring on workers during breaks. • Wear body cooling devices.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Staging Equipment (continued)	Contact with moving equipment/vehicles	• Work area will be barricaded/demarcated. • Equipment will be laid out in an area free of traffic flow. • Barricades shall be used on or around work areas when it is necessary to prevent the inadvertent intrusion of pedestrian traffic. • Barriers shall be used to protect workers from vehicular traffic. • Barriers shall be used to guard excavations adjacent to streets or roadways. • Flagging shall be used for the short term (less than 24 hours) to identify hazards until proper barricades or barriers are provided. • Heavy equipment shall have backup alarms.
	Forklift operations	• Use qualified and trained forklift operators. • The operator shall not exceed the load capacity rating for the forklift. • The load capacity shall be clearly visible on the forklift. • Forklift operators shall inform their supervisor of any prescribed medication that they are taking that would impair their judgement.
	Portable electric tools	• Portable electric tools that are unsafe due to faulty plugs, damaged cords, or other reason, shall be tagged (do not use) and be removed from service. • Portable electric tools and all cord and plug connected equipment shall be protected by a ground-fault circuit interrupter (GFCI) device. • Electrical tools shall be inspected daily prior to use.
	Extension cords	• Extension cords that have faulty plugs, damaged insulation, or are unsafe in any way shall be removed from service. • Cords shall be protected from damage from sharp edges, projections, pinch points (doorways), and vehicular traffic. • Cords shall be suspended with a nonconductive support (rope, plastic ties, etc,). • Cords shall be designed for hard duty. • Cords shall be inspected daily.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Staging Equipment (continued)	Lightning strikes	• Whenever possible, halt activities and take cover. • If outdoors, stay low to the ground. • Limit the body surface area that is in contact with the ground (i.e., kneeling on one knee is better than laying on the ground). • Seek shelter in a building if possible. • Stay away from windows. • If available, crouch under a group of trees instead of one single tree. • Keep all body parts in contact with the ground as close as possible. • Remain 6 feet away from tree trunk if seeking shelter beneath tree(s). • If in a group, keep 6 feet of distance between people.
	Thunderstorms, tornadoes	• Listen to radio or TV announcements for pending weather information. • Cease field activities during thunderstorm or tornado warnings. • Seek shelter. Do not try to outrun a tornado.
Removal of Debris, Soils, Loose Sediment, and Visual Staining	UXO	• If UXO is encountered, cease all activities, mark the location, and notify the site manager.
	Overhead hazards	• Always stay a safe distance from power lines.
	Faulty or damaged equipment being utilized to perform work	• All machinery or mechanized equipment will be inspected by a competent mechanic and be certified to be in safe operating condition. • Equipment will be inspected before being put to use and at the beginning of each shift. • Faulty/unsafe equipment will be tagged and if possible locked out. • Heavy equipment shall be equipped with reverse signal alarm, backup warning lights, or the vehicle shall be backed up only when an observer signals it is safe to do so.
	Uneven terrain, poor ground support, inadequate clearances, contact with utilities	• Inspections or determinations of road conditions and structures shall be made in advance to ensure that clearances and load capacities are safe for the passage or placing of any machinery or equipment. • All mobile equipment and areas in which they are operated shall be adequately illuminated. • Aboveground and belowground utilities will be located prior to staging equipment. • Whenever the equipment is parked, the parking brake shall be set. • Equipment parked on inclines will have the wheels chocked.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Removal of Debris, Soils, Loose Sediment, and Visual Staining (continued)	Falling objects	• Stay alert and clear of materials suspended overhead.
	Pinch points	• Keep feet and hands clear of moving/suspended materials and equipment. • Stay alert at all times!
	Fire	• Mechanized equipment shall be shut down prior to and during fueling operations. • Have fire extinguishers inspected and readily available.
	Fall hazards	• Personnel are not allowed to work off of machinery or use them as ladders. • Use fall protection when working above 6 feet.
	Noise	• Hearing protection is mandatory above 85 dBA.
	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment; sizeup the lift.
	Slip, trip, and fall hazards	• Use good housekeeping; keep work area picked up and clean as feasible. • Continually inspect the work area for slip, trip, and fall hazards.
	Contact with potentially contaminated materials	• Real time air monitoring will take place. • Stop immediately at any sign of obstruction. • Upgrade to respirator if necessary. • Avoid skin contact with debris or soils. Wear gloves.
	Heat rash	• Keep the skin clean and dry. • Change perspiration-soaked clothing, as necessary. • Bathe at end of work shift or day. • Apply powder to affected area.
	Heat cramps	• Drink plenty of cool fluids even when not thirsty. • Provide cool fluid for work crews. • Move victim to shaded, cool area.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Removal of Debris, Soils, Loose Sediment, and Visual Staining (continued)	Heat exhaustion	• Conduct physiological worker monitoring as needed (i.e., heart rate, oral temperature) • Set up work/rest periods. • Use the buddy system. • Allow workers time to acclimate. • Have ice packs available for use. • Take frequent breaks.
	Heat stroke	• Evaluate possibility of night work. • Perform physiological monitoring on workers during breaks. • Wear body cooling devices.
	Drum handling	• Be careful not to breathe air from around open drum any more than necessary. Monitor with photoionization detector/flame ionization detector (PID/FID) equipment and upgrade to respirator if necessary. • When filling a drum (with either soil or water), be careful not to make contact with the contained waste. Wear appropriate gloves. Make sure lid or bung of drum is secure. • If moving a drum unassisted, be sure to leverage properly, use proper lifting techniques, and wear safety glasses and steel-toed boots. • When using a drum dolly, make sure straps and lid catch are securely attached. Leverage properly when tilting drum. Be sure toes stay away from drum.
Soil boring and surface/subsurface sampling	Access/egress hazards	• Use qualified and trained bushhog operator. • Keep employees out of the bushhog work area. • Utilize good housekeeping practices. • Keep aisleways, pathways, and work areas free of obstruction. • Clean ice or snow off of walkways or work stations. • Use appropriate footwear for the task assigned.
	Heat rash	• Keep the skin clean and dry. • Change perspiration-soaked clothing, as necessary. • Bathe at end of work shift or day. • Apply powder to affected area.
	Heat cramps	• Drink plenty of cool fluids even when not thirsty. • Provide cool fluid for work crews. • Move victim to shaded, cool area.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Soil boring and surface/subsurface sampling (continued)	Heat exhaustion	• Conduct physiological worker monitoring as needed (i.e., heart rate, oral temperature). • Set up work/rest periods. • Use the buddy system. • Allow workers time to acclimate. • Have ice packs available for use. • Take frequent breaks.
	Heat stroke	• Evaluate possibility of night work. • Perform physiological monitoring on workers during breaks. • Wear body cooling devices.
	UXO	• If UXO are found, cease all activities, mark area, and notify the site manager.
	Cross-contamination and contact with potentially contaminated materials	• Stop immediately at any sign of obstruction. • Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination. • Only essential personnel will be in the work area. • Real-time air monitoring will take place before and during sampling activities. • All personnel will follow good hygiene practices. • Proper decontamination procedures will be followed. • All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Cut hazards	• Use care when handling glassware. • Wear adequate hand protection.
	Slip, trip, and fall hazards	• Site workers will be required to wear hard hat, safety glasses with side shields, work gloves, and steel-toe/shank boots when working in the field. • Whenever possible, avoid routing cords and hoses across walking pathways. • Flag or cover inconspicuous holes to protect against falls.
	Bees, spiders, and snakes	• Workers shall inspect the work area carefully and avoid placing hands and feet into concealed areas. • Evaluate need for sensitive workers to have prescribed antibiotic or medicine to combat onset of symptoms.
	Poison ivy/oak/sumac	• Avoid plant areas if possible. • Wear long sleeves and long pants. • Promptly wash clothing that has contacted poisonous plants. • Wash affected areas immediately with soap and water.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Soil boring and surface/subsurface sampling (continued)	Lightning strikes	• Whenever possible, halt activities and take cover. • If outdoors, stay low to the ground. • Limit the body surface area that is in contact with the ground (i.e., kneeling on one knee is better than laying on the ground). • Seek shelter in a building if possible. • Stay away from windows. • If available, crouch under a group of trees instead of one single tree. • Keep all body parts in contact with the ground as close as possible. • If in a group, keep 6 feet of distance between people.
Decontamination and removal of temporary scales	Heavy lifting	• Use proper lifting techniques. • Lifts greater than 60 pounds require assistance or mechanical equipment. • Size up the lift.
	Slip, trip, and fall hazards	• Good housekeeping shall be implemented. • The work area shall be kept clean as feasible. • Inspect the work area for slip, trip, and fall hazards.
	Fueling	• Only approved safety cans shall be used to store fuel. • Do not refuel equipment while it is operating. • Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Faulty or damaged equipment	• Equipment shall be inspected before being placed into service and at the beginning of each shift. • Preventive maintenance procedures recommended by the manufacturer shall be followed. • A lockout/tagout procedure shall be used for equipment found to be faulty or undergoing maintenance.
	High-pressure water	• Jetting gun operator must wear appropriate PPE including hard hat, impact-resistant safety glasses with side shields, water-resistant clothing, metatarsal guards for feet and legs, and hearing protection (if appropriate). • One standby person shall be available within the vicinity of the pump during jetting operation. • The work area shall be isolated and adequate barriers will be used to warn other site personnel.
	Unqualified operators	• Only qualified and trained personnel are permitted to operate machinery and mechanized equipment associated with water jet cutting and cleaning.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Decontamination and removal of temporary scales (continued)	Out-of-control equipment	• No machinery or equipment is permitted to run unattended. • Machinery or equipment will not be operated in a manner that will endanger persons or property nor will the safe operating speeds or loads be exceeded.
	Noise	• Sound levels above 85 dBA mandates hearing protection by nearby site personnel.
	Activation during repairs	• All machinery or equipment will be shut down and positive means taken to prevent its operation while repairs or manual lubrications are being done.
	Heat rash	• Keep the skin clean and dry. • Change perspiration-soaked clothing, as necessary. • Bathe at end of work shift or day. • Apply powder to affected area.
	Heat cramps	• Drink plenty of cool fluids even when not thirsty. • Provide cool fluid for work crews. • Move victim to shaded, cool area.
	Heat exhaustion	• Conduct physiological worker monitoring as needed (i.e., heart rate, oral temperature) • Set up work/rest periods. • Use the buddy system. • Allow workers time to acclimate. • Have ice packs available for use. • Take frequent breaks.
	Heat stroke	• Evaluate possibility of night work. • Perform physiological monitoring on workers during breaks. • Wear body cooling devices.

Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Decontamination and removal of temporary scales (continued)	Pinch points	• Keep feet and hands clear of moving/suspended materials and equipment. • Stay alert and clear of materials suspended
	Falling objects	• Hard hats are required by site personnel. • Stay alert and clear of material suspended overhead.
	Flying debris	• Impact-resistant safety glasses with side shields are required.
	Contact with potentially contaminated materials	• All site personnel will wear the appropriate PPE.
Confirmatory rinsate sampling	Cross-contamination and contact with potentially contaminated materials	• Sampling technicians will wear proper clothing and equipment to safeguard against potential contamination. • Avoid skin contact with water. • Handle samples with care. • only essential personnel will be in the work area. • All personnel will follow good hygiene practices. • Proper decontamination procedures will be followed. • All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Cut hazards	• Use care when handling glassware. • Wear adequate hand protection.
	Hazard communication	• MSDSs shall be obtained for chemicals brought on site. • Label all containers as to contents.
	Strains/sprains	• Use the proper tool for the job being performed. • Get assistance if needed. • Avoid twisting/turning while pulling on tools, moving equipment, etc.
	Spills/residual materials	• Absorbent material and containers will be kept available where leaks or spills may occur.
	Lighting	• Adequate lighting will be provided to ensure a safe working environment.
	Unattended worker	• Use "buddy system" - visual contact will be maintained with the sampling technician during sampling activities.

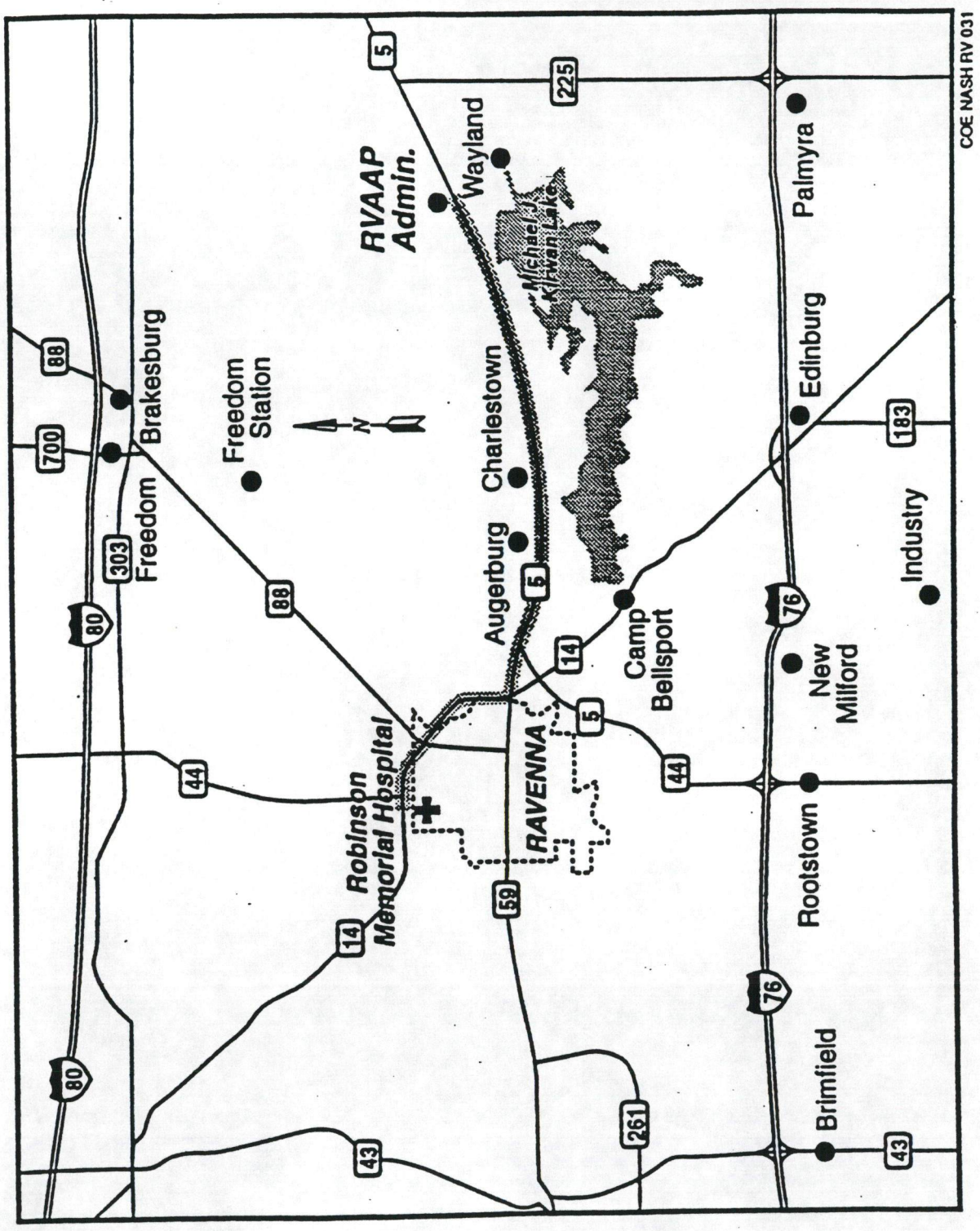
Table 6-4

Activity Hazard Analysis
Building 1601
Ravenna Army Ammunition Plant, Ravenna, Ohio

Activity	Potential Hazards	Recommended Controls
Moving and Shipping Collected Samples	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 pounds require assistance or mechanical equipment; size-up the lift.
	Pinch points	• Keep hands, fingers, and feet clear of moving/suspended materials and equipment. • Beware of contact points. • Stay alert at all times!
	Cut hazards	• Wear adequate hand protection. Use care when handling glassware.
	Hazard communication	• Label all containers as to contents and associated
Material Storage	Flammable and combustible liquids	• Store in NO SMOKING AREA. • Fire extinguisher readily available. • Transfer only when properly grounded and bonded.
Disposal of IDW (Forklift Operation)	Personnel injury, property damage, and/or equipment damage	• Use qualified and trained forklift operators. • The operator shall not exceed the load capacity rating for the forklift. • The load capacity shall be clearly visible on the forklift. • Forklift operators shall inform their supervisor of any prescribed medication that they are taking that would impair their judgement.
	Cross-contamination and contact with potentially contaminated materials	• Stop immediately at any sign of obstruction. • Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination. • Only essential personnel will be in the work area. • Real-time air monitoring will take place before and during sampling activities. • All personnel will follow good hygiene practices. • Proper decontamination procedures will be followed. • All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Cut hazards	• Use care when handling glassware. • Wear adequate hand protection.

FIGURE 6-1

HOSPITAL ROUTE MAP



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