



**Thermal Decomposition and 5X Certification  
of Load Lines 6, 9 and  
Wet Storage Igloos 1, 1A, 2, & 2A**

**Ravenna Army Ammunition Plant  
8451 St. Rte. 5  
Ravenna, Ohio 44266**

*Prepared for:*



**US ARMY TACOM  
BRAC Technical Support Office  
Rock Island, Illinois 61299-7630**

*Prepared By:*



**MKM Engineers, Inc.  
4153 Bluebonnet Drive  
Stafford, TX 77477**

**Contract No. DAAA09-02-C-0029**

**December 2005**



## TABLE OF CONTENTS

<b>LIST OF APPENDICIES .....</b>	<b>ii</b>
<b>LIST OF ACRONYMS.....</b>	<b>iii</b>
<b>DOCUMENT DISTRIBUTION.....</b>	<b>iv</b>
<b>EXECUTIVE SUMMARY .....</b>	<b>v</b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
1.1 RVAAP SITE HISTORY .....	1
1.2 LOAD LINE 6, 9 AND WET STORAGE BACKGROUND.....	2
<b>2.0 TD AND 5X CERTIFICATION ACTIVITIES.....</b>	<b>4</b>
2.1 BUILDING HAZARD ANALYSIS AND ENGINEERING SURVEY.....	4
2.2 PAINT SAMPLING .....	5
2.3 FLOOR SWEEPING.....	5
2.4 REMOVAL OF HAZARDOUS ITEMS OF CONCERN.....	5
2.5 ASBESTOS ABATEMENT .....	6
2.6 THERMAL DECOMPOSITION (TD).....	7
2.7 ASH SAMPLING AND DISPOSAL .....	8
2.8 DEMOLITION OF WALLS, SURFACE DEBRIS, CONCRETE FLOORS AND STEEL REMOVAL.....	8
2.9 DEMOLITION OF SUMPS AND BASEMENTS .....	9
2.10 DEMOLITION OF LL 6 BUILDINGS 2F-3, 2F-7, 2F-8 AND 2F-9.....	10
2.11 SITE RESTORATION .....	12



## **LIST OF APPENDICIES**

Appendix A	Scope of Work
Appendix B	Figures
Appendix C	LL 6, 9 And Wet Storage Area Weekly Reports & Photo Documentaion
Appendix D	Building Hazard Analysis and Engineering Survey Reports
Appendix E	PCB Paint Sampling Plan and Report
Appendix F	Floor Sweeping Waste Characterization Sample Reports and Disposal Manifests
Appendix G	Recycled Waste Bill of Ladings and Certificates of Recycling
Appendix H	Notifications of Demolition and Asbestos Removal Activities
Appendix I	Asbestos Disposal Manifests
Appendix J	Asbestos Visual Inspection Clearance Letters
Appendix K	Bulk Asbestos Sampling Results
Appendix L	Asbestos Removal Air Monitoring Results
Appendix M	Open Burn Applications and Approved Permits
Appendix N	Weather Monitoring Data
Appendix O	Demolition Shot Records
Appendix P	Thermocouple and Thermal Paint and Pellet Data
Appendix Q	Ash Sampling Results and Disposal Manifests
Appendix R	Scrap Metal Bill of Ladings, Weight Tickets, 5X Letters and Smelter Verification Letters
Appendix S	Sump Water Sampling Results and Disposal Manifests
Appendix T	Bldgs 2F-3, 7, 8 & 9 Dust Control Procedures
Appendix U	RVAAP PCB Bulk Waste Correspondence
Appendix V	Bldgs 2F-3, 7, 8 & 9 Disposal Records



## LIST OF ACRONYMS

ACM	Asbestos Containing Material
AOC	Area of Concern
BRAC	Base Realignment and Closure
C&D	Construction and Demolition
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CY	Cubic Yards
DA	Department of the Army
DDESB	Department of Defense Explosives Safety Board
DoD	Department of Defense
ESS	Explosives Safety Submission
GOCO	Government Owned Contractor Operator
IAW	In Accordance With
IOC	Industrial Operations Command
JMC	Joint Munitions Command
LL	Load Line
MKM	MKM Engineers, Inc
MOA	Memorandum of Agreement
NGB	National Guard Bureau
ODH	Ohio Department of Health
OE	Ordnance and Explosives
OEPA	Ohio Environmental Protection Agency
OHARNG	Ohio Army National Guard
OSC	Operations Support Command
PCB	Poly Chlorinated Biphenyl
ppm	Parts Per Million
RVAAP	Ravenna Army Ammunition Plant
SOW	Scope of Work
SUXOS	Senior UXO Supervisor
TD	Thermal Decomposition
TSCA	Toxic Substances Control Act
USEPA	U.S. Environmental Protection Agency
USATCES	US Army Technical Center for Explosives Safety
UXO	Unexploded Ordnance
WS	Wet Storage



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

## DOCUMENT DISTRIBUTION

<u>Name/Organization</u>	<u>No.of Copies</u>
Eileen Mohr/OEPA	1
Mark Patterson/RVAAP	2
Lt. Col. Tom Tadsen/OHARNG	1
William Ingold/BRAC	1
Richard Callahan/MKM	1
JoAnn Watson AEC	1



## EXECUTIVE SUMMARY

MKM Engineers, Inc. was awarded Contract No. DAAA09-02-C-0029 by the US Army Tank-Automotive and Armaments Command (TACOM), Rock Island, Illinois to certify (to a 5X designation) and demolish the buildings within Load Lines 6 and 9 and Wet Storage Igloos 1, 1A, 2, 2A at the Ravenna Army Ammunition Plant to one-foot below ground surface. The scope of work called for thermal decomposition (TD) of the buildings prior to demolition. However, due to the presence of PCBs in paint in excess of 50 parts per million (ppm) at buildings 2F-3, 2F-7, 2F-8 and 2F-9 at Load Line 6, these buildings could not be subjected to TD operations but instead were inspected, tested for explosives, certified 5X and demolished using hardened equipment in accordance with (IAW) the Department of Defense Explosives Safety Board (DDESB) approved (09 June 05) Explosives Safety Submission (ESS). TD was conducted at all the other buildings at Load Line 6 and all the buildings at Load Line and the four Wet Storage Igloos.

Following TD operations, all the buildings at Load Lines 6 (excluding buildings 2F-3, 2F-7, 2F-8 and 2F-9), Load Line 9 and the four Wet Storage igloos were demolished, the floor slabs removed and foundations removed to 1-foot below ground surface. However, at the contractors' discretion and as agreed upon by RVAAP representatives, the footers at twenty of the thirty-four Buildings at Load Line 9 were completely removed. The concrete side walks at all the buildings were also removed. Upon 5X certification, all brick and concrete from Load Lines 6 and 9 were crushed to two-inch minus and staged within the load lines for re-use. All the concrete from the four Wet Storage Igloos were transported to the RVAAP approved clean hard area in Load Line 1. Structural steel from Load Lines 6 and 9 was removed for offsite recycling. A survey of the building locations was not included in the scope of work; however a survey of the building locations was performed during previous Remedial Investigation operations conducted at LL 6 and LL 9 (including the Wet Storage Igloos). This survey information is to be included in the LL 6 and LL 9 RI reports which are currently being drafted.

Following inspection, testing and 5X certification, all painted brick and painted concrete from Buildings 2F-3, 2F-7, 2F-8 and 2F-9 at Load Line 6 was loaded for off-site disposal as PCB Bulk Product Waste at the approved facility. All the structural steel from these buildings was transported off-site for recycling since the paint on the structural steel contained PCBs at concentrations less than 50 ppm. The footers at Buildings 2F-7 and 2F-8 were completely removed and the footers at Buildings 2F-3 and 2F-9 were removed to 1-foot below ground



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

surface. Following completion of the demolition operations the sites were re-graded, seeded, and mulched to match pre-existing site conditions.



## **1.0 INTRODUCTION**

This report describes the activities performed to complete the Thermal Decomposition (TD) and 5X Certification of Load Lines 6, 9 and Wet storage Igloos 1, 1A, 2 & 2A at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. The objective of this project was to certify the aboveground components of the LLs and WS igloos to a 5X designation as per Industrial Operations Command Publication 385-1, Classification and Remediation of Explosive Contamination (IOCP 385-1) and demolish and remove all buildings to one-foot below ground surface (bgs). IOCP 385-1 outlines the explosive safety aspects for ordnance and explosives (OE) decontamination from a 3X explosive designation to a 5X explosive designation of "no significant amounts of contaminants remain." MKM Engineers, Inc. (MKM) performed this project, under Contract Number DAAA09-02-C-0029, with the US Army Joint Munitions Command (JMC), Rock Island, Illinois. A copy of the Scope of Work for this project is provided in Appendix A.

### **1.1 RVAAP Site History**

The RVAAP is located within the confines of OHARNG Ravenna Training and Logistics Site (RTLS) which is in northeastern Ohio within Portage and Trumbull counties, approximately 4.8 kilometers (3 miles) east northeast of the city of Ravenna and approximately 1.6 kilometers (1 mile) northwest of the town of Newton Falls. The RVAAP portions of the installation are solely located within Portage County. The installation consists of 17.7-kilometer (11-mile) long 5.6-kilometer (3.5-mile)-wide tract bounded by State Route (SR) 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garrett, McCormick and Berry roads to the west; State Route 534 to the east, and the Norfolk Southern Railroad on the north, and the Conrail Railroad on the north. The installation is surrounded by several communities: Windham on the north, Garrettsville 9.6 kilometers (1 mile) to the east, Charlestown to the southwest, and Wayland 4.8 kilometers (3 miles) southeast (Figure 1, Appendix B).

Past Department of Defense (DOD) activities at the RVAAP date back to 1940. The RVAAP was constructed primarily as a site for loading medium and major caliber artillery ammunition, bombs, mines, fuze and boosters, primers and percussion elements as well as storing finished ammunition and ammunition components. These industrial operations were conducted within 12 munitions assembly facilities referred to as "load lines" (LLs) (Figure 2, Appendix B). The RVAAP installation also had several areas used for burning, demolition and testing of munitions





Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

and buildings/areas designated for clean up and decontamination activities for production equipment. Additionally, over the years the RVAAP has handled and stored strategic and critical materials for various government agencies and received, stored, maintained, transported, and demilitarized ammunition and explosive items.

Up until 1999, the RVAAP was a 21,419 acre installation. A total of 19,938 acres of the former 21,419-acre RVAAP was transferred to the United States Property and Fiscal Officer (USP&FO) for Ohio in 1996 and 1999 for use by OHARNG as a military training site. The current RVAAP consists of 1,481 acres in several distinct parcels scattered throughout the confines of OHARNG RTLS. The RVAAP and RTLS are co-located on contiguous parcels of property and the RTLS perimeter fence encloses both installations. Since the Installation Restoration Program encompasses past activities over the entire 21,419 acres of the former RVAAP, the site description of the RVAAP includes the combined RTLS and RVAAP properties. The RVAAP was previously operated as government owned, contractor-operated (GOCO) JMC facility.

## **1.2 Load Line 6, 9 and Wet Storage Background**

### **Load Line 6**

Load Line 6 (LL 6) is located at the intersection of Fuze and Booster Road and Fuze and Booster Spur Road in the south central region of the RVAAP (Figure 3, Appendix B). During the 1941 to 1945 time frame, Load Line 6 operated primarily as a fuze assembly line with exception of fulminate mixing at Building 2F-4. In 1945, the load line was deactivated and the equipment was removed. In 1950, LL 6 was used by Firestone Defense Research, a subsidiary of Firestone Tire and Rubber Company, for defense work under contract to Picatinny Arsenal. Firestone Defense Research used the load line for research and development of various kinds of charges (e.g., shaped, fragmenting disc) for armor penetration. The most recent activity at LL 6 occurred during the late 1970's when it was again used for applied research and development (by Firestone Defense Corporation) on shaped charges for the Department of Defense.

### **Load Line 9**

Load Line 9 (LL 9) is located in the south central region of the RVAAP along Fuze and Booster Road (Figure 4, Appendix B). During the 1941 to 1945 time frame LL 9 was used to produce fuze component parts and detonators. In 1945 the load line was deactivated and its equipment removed.

### **Wet Storage Igloos 1, 1A, 2, 2A**



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

The Wet Storage (WS) Area is located at the intersection of George Road and Newton Falls Road near the geographic center of the facility (Figure 5, Appendix B). The Wet Storage Area is secured by chain link fence and contains a total of 6 earthen igloos. Wet Storage (WS) Igloos 1, 1A, 2, 2A are located on the western side of the fenced area, and each igloo is separated by approximately 150 feet. Two other igloos are located on the eastern side of the fenced area. The Wet Storage Area was used from 1941 to 1945. WS 1 and WS 1A were used to store lead azide. WS 2 and WS 2A were used to store mercury fulminate. The product inside the igloos was stored in a water/alcohol mix, in drums. There is no documentation concerning any spills in the area. All the igloos at the WS Area are currently empty.



## **2.0 TD AND 5X CERTIFICATION ACTIVITIES**

The approved October 2002 Thermal Decontamination and 5X Certification of Load Lines (LLs) 6, 9 and Wet Storage Igloos 1, 1A, 2, and 2A Work Plan, Explosive Safety Submission and Site-Specific Safety and Health Plan were prepared for implementation of all TD and demolition activities. The Load Line 6, 9, and Wets Storage Igloos field activities were initiated on October 3, 2002 and completed August 31, 2005.

The following is the general operational sequence conducted for execution of TD and Demolition of LL 6, 9 and Wet Storage Igloos 1, 1A, 2, 2A:

- Building Hazard Analysis and Engineering Survey;
- Paint Sampling;
- Floor sweeping to remove organic materials, lead paint chips, explosive contaminated debris;
- Removal hazardous items of environmental concern (i.e., fluorescent light bulbs PCB light ballasts) ;
- Asbestos Abatement;
- Thermal Decomposition;
- Ash sampling and disposal;
- Demolition of walls, surface debris and steel;
- Demolition of sumps and basements as applicable;
- Onsite crushing of concrete and brick materials for reuse by RVAAP;
- Removal of scrap metal for off-site recycling;
- Site restoration.

Photo documentation of the LL6, 9, and Wet Storage Igloos TD and 5X certification operations are provided in Appendix C. Specific details of the LL 6, 9 and Wet Storage TD and demolition activities are described in the subsections that follow.

### **2.1 Building Hazard Analysis and Engineering Survey**

Prior to initiating the TD and 5X certification activities, the MKM Senior Unexploded Ordnance Supervisor (SUXOS) and UXO Safety Officer (UXOSO) performed a hazard analysis (evaluation) of the buildings to uncover any previously unknown or unsuspected contaminants or hazards (none found). In addition, a Certified Structural Engineer performed a structural survey as part of the hazard analysis to evaluate and report the structural integrity and condition of buildings prior to the removal of transite roofing (LLs), and during building/igloo alterations that



may be required to facilitate equipment removal and the strategic placement of dunnage. The building hazard analysis and engineering survey was initiated on October 3, 2002. Copies of the building hazard assessment and engineering survey reports are provided in Appendix D.

## **2.2 Paint Sampling**

Paint on the interior each building at LL 6 & 9 was sampled on October 28, 2002 in order to determine regulatory status of the applied dry paints. No painted surfaces were present at the Wet Storage Igloos. The paint samples were analyzed to determine the concentration of Polychlorinated Biphenyls (PCBs) and if the dried paints, as wastes, were subject to regulation under 40 CFR 761. Concentrations of PCBs less than 50 ppm are not regulated. In addition, the paint samples were analyzed for the eight (8) RCRA heavy metals to determine the potential combined loading with respect to NESHAPs emissions relative to TD operations.

Paint sampling was performed in accordance with the USEPA and OEPA approved Sampling and Analysis Plan for Applied Dry Paints at RVAAP (October 2002). Sample results indicated that the PCB concentrations in the applied dry paint at all buildings in LL9 and all but four (4) buildings in LL6 were less than 50 ppm. The four buildings with paint containing PCBs in excess of 50 ppm at LL6 were 2F-3, 2F-7, 2F-8 and 2F-9 and were certified 5X and demolished as described in Section 2.10. A copy of the approved paint sampling plan and sampling report detailing results and findings are provided in Appendix E.

## **2.3 Floor Sweeping**

The floors of each building at LLs 6 and 9 were swept prior to initiating the transite removal and demolition activities in order to remove the loose paint chips and other potentially contaminated debris. Due to the condition of the wet storage igloos (i.e., not painted and high potential for the presence of residual explosives), floor sweeping was not conducted within these structures. Floor sweeping operations were initiated October 7, 2002 and completed in November 2002. A total of one cubic yard of material was removed, containerized, sampled and disposed of from each load line. Copies of the waste characterization sample results and disposal manifests are provided in Appendix F.

## **2.4 Removal of Hazardous Items of Concern**

Hazardous items of environmental concern including mercury containing fluorescent lights and PCB light ballasts were removed from all buildings in order to promote safe execution of the



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

decontamination, burning, demolition and removal operations. Removal of these items was performed concurrently with the asbestos abatement operations described in Section 2.5. Copies of the Bill of Ladings and certificates of recycling for light ballasts and fluorescent bulbs from the load lines are provided in Appendix G. No fluorescent lights or PCB light ballasts were present in the wet storage igloos.

## **2.5 Asbestos Abatement**

The asbestos containing roofing material (transite & composition rolled roof material) was removed from all the buildings at LL6 and LL9 to facilitate the TD and 5X Certification operations. No transite or other ACM roofing material was present at Wet Storage Igloos 1, 1A, 2, & 2A. Transite removal operations at LL 6 took place from October 17, 2002 through November 2002. LL 9 asbestos removal operations took place from December 3, 2002 through March 2002. A total of 131,774 square feet of asbestos containing roofing material was removed from LL 6 and a total of 127,119 square feet of asbestos containing roofing material was removed from LL 9.

In addition to the roofing material, an asbestos liner/matting material identified under the lead floor liners at LL 6, 9, and Wet Storage Igloos and the lead sump linings at LL 6 and LL 9 was also removed and disposed of during building demolition operations (see Sections 2.8 & 2.9). All asbestos removal operations were performed by a State of Ohio licensed asbestos removal contractor.

Prior to initiating any of the asbestos removal operations, the Ohio EPA and Ohio Health Department 10 day notification of asbestos removal and demolition operations were completed. Personnel air monitoring was conducted throughout the asbestos removal operations. All asbestos containing materials were disposed of off-site in accordance with federal, state, and local rules laws and regulations. Copies of the OEPA and Ohio Department notification of demolition and asbestos abatement operations are provided in Appendix H. Copies of all the asbestos disposal manifests are provided in Appendix I. Copies of the asbestos visual clearance certificates from the asbestos contractor and third party visual clearance letters are provided in Appendix J. The bulk asbestos sample results for each site are provided in Appendix K and copies of the asbestos air monitoring results are provided in Appendix L.



## 2.6 Thermal Decomposition (TD)

TD essentially equates to burning structures in-place in order to remove potentially explosive residue from building materials in order to achieve a 5X status. During the burning process, as per IOCP 385-1, the contaminated buildings and equipment were heated to temperatures, (“a level above the decomposition temperature of the contaminant” i.e. TNT, Lead Azide, Mercury Fulminate) for a pre-determined time duration, (“long enough to assure the largest mass is at that temperature, consuming contaminants by oxidation”) to ensure buildings materials (i.e. porous items such as brick and cinder block etc.) were decontaminated and free of any explosive hazards. Based upon historical use of explosives at these facilities, the target decomposition temperature for LLs 6 & 9 was 800 degrees Fahrenheit and the target decomposition temperature for Wet Storage was 570 degrees Fahrenheit, each for a sustained period of 30 minutes.

TD was accomplished by first loading the buildings and igloos with clean wooden pallets to augment the burning process. Pallets were loaded in LL 6 and LL 9 buildings from November 2002 through February 2003. The Wet Storage Igloos were uploaded with pallets in January 2003. In order to facilitate controlled burning during TD operation, fire breaks were cut around the structures at strategic locations as approved by representatives from the Ravenna City Fire Department. On the day of the burns the pallets were lightly sprayed with diesel fuel and small (one gallon) containers of fuel were placed at various locations within the dunnage and rigged to detonation cord to trigger and initiate the burn.

The burns were initiated and completed on February 9, 2002 at the Wet Storage Igloos, May 5, 2002 at LL 6 and May 8, 2002 at LL9. Copies of the Akron Regional Air Quality Management District open burn permit application and subsequently approved permits for each site are provided in Appendix M. All TD operations were performed by trained and experience UXO personnel in accordance with the approved Work Plans. The controlled TD of LL 6, 9 and Wet Storage Igloos 1, 1A, 2, 2A was conducted with the support of the Ravenna City Fire Department. Continuous weather monitoring was performed by a professional meteorologist on the day of each burn to monitor for potential inversion and record metrological conditions. Copies of the meteorological data are provided in Appendix N. Copies of the demolition shot records (to initiate the burns) are provided in Appendix O.

Heat sensing devices including thermocouples, temperature indicating paint (applied to outside surface of steel pipes placed in various bldgs) and temperature indicating pellets (placed inside steel pipes) were strategically placed within the buildings/igloos to record the temperatures



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

and time/duration of temperatures achieved during each burn event. Results from thermocouples and temperature paint/pellets at each site indicate the target temperatures were met and/or exceeded for the required time durations. Copies of the results from the thermal couple data recorders and temperature indicating paint and pellets along with maps showing the locations of the devices are provided in Appendix P.

Due to the presence of PCBs in excess of 50 ppm in the paint at buildings 2F-3, 2F-7, 2F-8 and 2F-9 at LL 6, these buildings could not be subjected to TD operations but instead were evaluated and demolished in accordance with (IAW) the DDESB-approved (09 June 05) Amendment 1 – Revision 1 ESS known as the RVAAP Explosives Safety Submission for the Decontamination and Demolition of Load Lines 1-5, 7, 8, 10, 11, Buildings 1039, F15, 1200, S4605 and T4602 dated September 24, 2004 (further referred to as "RVAAP ESS"). Details pertaining to the 5X certification and demolition of buildings 2F-3, 2F-7, 2F-8 and 2F-9 at LL 6 are provided in Section 2.10.

## **2.7 Ash Sampling and Disposal**

Following completion of the burn operations, composite samples of the resultant ash material were collected from each site for waste characterization purposes. Upon receipt of the analytical results the ash was collected and loaded into roll off containers during the debris removal operations for transport to off-site to the appropriate permitted disposal facility. Copies of the ash sampling results and disposal manifests are provided in Appendix Q.

## **2.8 Demolition of Walls, Surface Debris, Concrete Floors and Steel Removal**

Once the fire had been extinguished for a minimum of 72 hours, removal of walls, surface debris, ash, floor slabs, footers and steel began. Long boomed, hardened excavators equipped with bucket, shear and hammer attachments were used to demolish the wet storage igloos, take down brick walls at the load lines and remove concrete floor slabs, sidewalks and footers to one foot below grade. However the footers at LL 9 Buildings DT-3, 4, 6, 7, 8, 9, 10, 11, 12, 15, 17, 19, 23, 25, 26, 27, 33, 34, 35, and 9-51 were completely removed at the contractors discretion and as approved by RVAAP representative. It should be noted that a survey of building locations (by a licensed surveyor) was not included in the scope of work; however a survey of the building locations was performed during previous Remedial Investigation operations conducted at LL 6 and LL 9 (including the Wet Storage Igloos). This survey information is to be included in the LL 6 and LL 9 RI reports which are currently being drafted



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

All brick and concrete from LLs 6 and 9 were crushed to 2-inch minus for re-use at the RVAAP. Concrete from the Wet Storage Igloos was transported to approved RVAAP clean hard fill area in LL 1. Each load of scrap steel was inspected and field screened using EXPRAY prior to exiting the site for off-site recycling. All lead floor lining material from buildings DT-1, DT-2, DT-5 and DT-11 at LL 9 and in each of the Wet Storage Igloos was removed prior to demolition of the floor slabs for off-site recycling. An asbestos liner/matting material found under the lead liner was also removed and disposed off-site as asbestos containing material. Demolition operations at LL 6 (excluding 2F-3, 2F-7, 2F-8 and 2F-9- see Section 2.10) and LL 9 began in July 2003 and were completed in November 2003. Demolition of the Wet Storage Igloos was initiated in November 2003 and completed in July 2004. Copies of all the 5X letters and Bill of Ladings for LLs 6, 9 and the Wet Storage Igloos scrap steel and lead are provided in Appendix R. Copies of the asbestos liner/matting material disposal manifests are contained in Appendix I.

Since the Wet Storage igloos were used for storage of primary explosives (lead azide and mercury fulminate), the work plan called for collecting sub floor soil samples following removal of the slabs in order to check for the presence of explosives. As such, 2 sub-floor samples were collected on June 24, 2004 at each of the igloo locations following slab removal operations. The samples from Igloos WS-1 and WS-1A were analyzed for total lead and the samples from Igloos WS-2 and WS-2A were analyzed for mercury. Results indicated no explosively hazardous concentrations of lead azide or mercury fulminate were present. All mercury sample results were reported below the RVAAP background limit. Only one of the lead samples was detected slightly above the RVAAP background limit. A summary table of results and copy of the analytical report for the Wet Storage Soil Samples is provided in Appendix Q. Additional sampling was performed during the 14 AOC initiative between 10-26-04 and 12-3-04. These samples were collected from outside the doorway and within drainage ditches associated with the igloos. Results for these samples will be included in the RVAAP 14 AOC Report.

## **2.9 Demolition of Sumps and Basements**

During the demolition operations, the sumps (5 total) at building 2F-3 (LL 6) and buildings DT-1, DT-2, DT-5 and DT-11 (LL 9) were removed and the basements at buildings 2F-36, 2F-14 and Test Chamber #1 (LL 6) and DT-28 and DT-29 (LL 9) were demolished in place to three feet below grade. Prior to removal the water contained in the sumps and basements were sampled to determine proper disposition. Based upon analytical results all sump water was disposed of off-site. Contaminant concentrations in the basement water were low enough to allow for ground





application as per conditions of the Ohio EPA. Copies of the sump and basement water analytical results and sump water disposal manifests are provided in Appendix S.

Once the water was removed from each sump, the lead and asbestos liners were removed. All lead was collected for recycling and the asbestos liner was removed, containerized and disposed of off-site. Upon removal of the liners the sumps were broken into manageable pieces and crushed for recycling. Copies of the Bill of Lading, 5X certification letter and weight tickets for the lead from the recycling facility are included in Appendix R and copies of the disposal manifests for the asbestos sump liner material are included in Appendix I.

## **2.10 Demolition of LL 6 Buildings 2F-3, 2F-7, 2F-8 and 2F-9**

TD operations were not conducted at LL 6 buildings 2F-3, 2F-7, 2F-8 and 2F-9 prior to demolition due to the elevated concentrations of PCBs in the applied paints. As such alternative decontamination and demolition techniques were needed which required development and approval the RVAAP ESS Amendment 1 document. Upon approval of the revised ESS, demolition of buildings 2F-3, 2F-7, 2F-8 and 2F-9 was initiated in June 2005 and completed in August 2005. However, the floor sweeping, removal of hazardous items of concern and asbestos abatement tasks were performed earlier (in 2002) along with all other buildings at LL 6 as described in the previous subsections. The following is the general operational sequence conducted for execution of demolition of 5X certification and demolition of LL 6 buildings 2F-3, 2F-7, 2F-8 and 2F-9 as per the approved RVAAP Amendment 1 ESS:

- Building Hazard Analysis;
- Demolition of walls, surface debris and steel;
- Visual inspections of building debris;
- Sampling and analysis of building debris for explosives;
- Off-site disposal of painted brick and concrete as PCB Bulk Product Waste;
- Transport unpainted concrete to approved Clean Hard Fill area;
- Removal of scrap metal; and
- Site restoration.

Photo documentation of the demolition operations conducted at LL 6 building 2F-3, 2F-7, 2F-8 and 2F-9 are included in Appendix C. Demolition operations at the 4 buildings were initiated the end of June 2005 and were concluded in August 2005. Specific details of the demolition activities are described in the paragraphs that follow.



### **Hazard Analysis Building Inspections**

Prior to initiating demolition operations at buildings 2F-3, 2F-7, 2F-8 and 2F-9 a thorough hazard evaluation was performed on each of the structures. The walls, floors and structural steel members of each building were thoroughly inspected for residual explosives paying particular attention to suspect areas such as wall penetrations and cracks and crevices. Copies of the results of the Hazard Analysis Building Inspections are provided in Appendix D.

### **Building Decontamination**

No bulk or visible explosives accumulation was present within any of the buildings as determined by the hazard analysis building inspections. As a result building decontamination prior to demolition was not required.

### **Building Demolition**

Upon completion of inspection operations, the buildings were demolished using long boomed hardened excavators equipped with grappler, bucket and shear attachments. Hardened loaders were used to load debris into dump trucks. Throughout demolition, surface debris (wood, brick, tile, concrete and block) and structural steel were visually inspected and documented by the SUXO to ensure no explosive hazard exists prior to final disposition. Additionally, composite samples of the building material were collected for laboratory analysis of explosives as per RVAAP ESS Amendment 1 document to further verify no explosive hazard exists for 5X certification. Sampling was achieved by collecting aliquots of the resultant brick, mortar, fines etc. from the piled debris at the building slabs following demolition using decontaminated stainless steel trowels and bowls. Dust abatement operations were performed during demolition operations as detailed in the June 22, 2005 letter to Ohio EPA to ensure potential dust emissions were kept under control and in compliance with health and safety regulations. A copy of the letter along with along with an e-mail acknowledgement from Ohio EPA and the analytical results from the dust monitoring operations are provided in Appendix T.

Once certified 5X, all painted brick and concrete was loaded for off-site disposal as PCB Bulk Product Waste and all unpainted concrete was deposited in the approved clean hard fill area at RVAAP LL 1. A copy of the letter sent to Ohio EPA regarding disposition of PCB Bulk Product Waste from the RVAAP is provided in Appendix U. All structural steel from buildings 2F-3, 2F-7, 2F-8 and 2F-9 exhibited applied dry paint with PCBs concentrations < 50 ppm.



Thermal Decomposition and 5X Certification of Load Lines 6, 9 and Wet Storage Igloos 1, 1A, 2, & 2A

---

Consequently this steel was inspected for 5X conditions and loaded for off site recycling. Copies of all the visual inspection forms, sample results, Bill of Ladings and 5X certification letters for the painted brick/ construction debris and summary of clean hard fill activities are provided in Appendix V. Copies of the Bill of Ladings and 5X certification letters for the scrap steel are also included in Appendix V.

### **2.11 Site Restoration**

Upon completion of the demolition activities, all areas were re-graded to ensure positive drainage, seeded and mulched. Final site restoration operations were completed at the Wet Storage Igloos in July 2004, November 2003 at LL9 and August 2005 at LL 6.