Lakeshore Group

Lakeshore Engineering Services, Inc.

FINAL PROJECT COMPLETION REPORT

Final Project Completion Report

Munitions Response for the Demolition of Load Lines 5, 7, Building 1039, Transite Removal at Building T-1604 Removal of Remaining Concrete and Miscellaneous Debris at Load Lines 6, 9 and 11

December 2007

At Ravenna Army Ammunition Plant,
Ravenna, Ohio

Contract: No. W52H09-06-C-5009

Prepared for:

U.S. TACOM
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Rock Island, IL 61299

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LIST OF ACROYMS

ACM	Asbestos Containing Material
AP	Artillery Primer
bgs	below ground surface
BRAC	Base Realignment and Closure
CAS	Chemical Abstract Service
CFR	Code of Federal Regulations
DA	Department of the Army
ESI	Ecological Services, Inc.
ESS	Explosive Safety Submission
GOCO	Government Owned Contractor Operated
HE	High Explosives
IOCP	Industrial Operations Command
IRP	Installation Restoration Program
LES	Lakeshore Engineering Services, Inc.
LL	Load Line
MKM	MKM Engineers, Inc.
NGB	National Guard Bureau
ODH	Ohio Department of Health
OEPA	Ohio Environmental Protection Agency
OHARNG	Ohio Army National Guard
PCB	Poly Chlorinated Biphenyl
PPE	Personal Protective Equipment
RDX	Cyclotrimethylenetrinitramine
RTLS	Ravenna Training and Logistics Site
RVAAP	Ravenna Army Ammunition Plant
SOW	Scope of Work
SSHP	Site-Specific Safety and Health Plan
SUXOS	Senior UXO Supervisor
TACOM	Tank Automotive and Armament Command
TCLP	Toxic Characteristic Leaching Procedure
TNT	Trinitrotoluene
USATHEMA	United States Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
WWII	World War II

EXECUTIVE SUMMARY

Lakeshore Engineering Services, Inc. (LES) was awarded Contract W52H09-06-C-5009 by the US Army Tank Automotive and Armaments Command (TACOM), Rock Island, Illinois. The project is to demolish and dispose of all buildings and their contents within Load Lines 5 and 7 and demolition and disposal of Buildings 1039 and T-1604. In addition the project calls for removal and disposal of all remaining building footings/foundations, steam stanchions, telephone poles, concrete and miscellaneous surface debris at Load Lines 5, 7, 6, 9, & 11. Site work started in May 2006 and concluded in July 2007. Activities included the removal of all hazardous and non-hazardous materials from the buildings, such as floor sweepings, fluorescent light fixtures, and asbestos containing materials (ACM). Explosive decontamination techniques were used to desensitize any residual explosives within the drains and process pipes at Load Lines 5 and 7 and the Chemical Laboratory, Building 1039. Demolition of all buildings at Load Lines 5 and 7 and Buildings 1039 and T-1604 and the work at Load Lines 6, 9, and 11 involved complete removal of the above ground structures and removal of floor slabs and footers to a minimum of four (4) feet below ground surface.

Following demolition and 5X certification, all PCB contaminated brick and structural steel from the buildings at Load Line 5 and 7 were disposed of off-site at an approved facility. All unpainted or uncontaminated brick and concrete was crushed and recycled off-site. Following completion of the demolition and cleanup, the sites were regraded, seeded, and mulched.

1.0 INTRODUCTION

This report describes the activities performed to complete the Demolition/Decontamination of Load Lines (LL) 5 and 7, Buildings 1039 and T-1604 and miscellaneous work on Load Line 6, 9, & 11 at Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. The objective of this project was to certify the components of the buildings to a 5X designation as per Industrial Operations Command Publication 385-1, Classification and Remediation of Explosive Contamination (IOCP 385-1), demolish and remove buildings to a minimum depth of 4 feet below ground surface (bgs) on LL 5, 6, 7, 9, & 11, plus Buildings 1039 and T-1604, as well as any remaining telephone poles or other materials deemed necessary within the fence boundary of each LL. A copy of the Scope of Work (SOW) for this project is provided in **Appendix A**.

1.1 RVAAP Site History

When the RVAAP Installation Restoration Program (IRP) began in 1989, RVAAP was identified as a 21,419-acre installation. The property boundary was resurveyed by the OHARNG over a two-year period (2002 and 2003) and the actual total acreage of the property was found to be 21, 683 acres. As of February 2006, a total of 20,403 acres of the former 21,683 acre RVAAP have been transferred to the National Guard Bureau (NGB) and subsequently licensed to the OHARNG for use as a military training site. The current RVAAP consists of 1,280 acres scattered throughout the Ravenna Training and Logistics Site (RTLS). The RTLS 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 city of Newton Falls. The RVAAP portions of the property are solely located within Portage County. The RTLS/RVAAP is a parcel of property approximately 17.7 kilometers (11 miles) long and 5.6 kilometers (3.5 miles) wide bounded by State Route 5, the Michael J. Kirwin Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east. The RTLS is surrounded by several communities: Windham on the north; Garrettsville 9.6 kilometers (6 miles) to the northwest; Newton Falls 1.6 kilometers (1 mile) to the south east; Charlestown to the southwest; and Wayland 4.8 kilometers (3 miles) to the south. When RVAAP was operational the RTLS did not exist and the entire 21,683-acre parcel was a government-owned contractor operated (GOCO) industrial facility. The RVAAP IRP encompasses investigation and cleanup of past activities over the entire 21,683 acres of the former RVAAP and therefore references to the RVAAP in this document are considered to be inclusive of the historical extent of the RVAAP, which is inclusive of the combined acreages of the current RTLS and RVAAP, unless otherwise specifically stated. A regional map indicating the location of the RVAAP is presented in **Appendix B as Figure 1**. A site map showing the location of LL5, 6, 7, 9 and 11 within the RVAAP is presented in **Appendix B as Figure 2**.

Production at the facility began in December 1941 with the primary missions of depot storage and ammunition loading. To accomplish these two missions, the installation was divided into two separate units, the Portage Ordnance Depot and the Ravenna Ordnance Plant. The Portage Ordnance Depot's primary mission was depot storage of munitions and components, while the Ravenna Ordnance Plant's mission was loading and packing major caliber artillery ammunition and the assembly of munitions initiating components that included fuses, boosters and percussion elements. In August 1943, the installation was redesignated the Ravenna Ordnance Center and again in November 1945 as the Ravenna Arsenal.

The plant was placed in standby status in 1950 and operations were limited to renovation, demilitarization and normal maintenance of equipment, along with storage of ammunition and components. The plant was reactivated during the Korean Conflict for the loading and packing of major caliber shells and components. All production ended in August 1957, and in October 1957 the installation was again placed in a standby condition. Rehabilitation work started in October 1960 to establish facilities in the ammonium nitrate line for the processing and explosive melt-out of bombs. These operations commenced in January 1961. In July 1961 the plant was again deactivated. In November 1961 the installation was divided into the Ravenna Ordnance Plant and an industrial section, with the entire installation then being designated as the RVAAP. In May 1968, RVAAP began loading, assembling, and packing munitions on three LLs and two component lines in support of the Southeast Asia Conflict. These facilities were deactivated in August 1972. The demilitarization of the M71A1 90MM projectile extended from June 1973 until March 1974. Demilitarization of various munitions was conducted from October 1982 through 1992.

Up until 1999, the RVAAP was a 21,683-acre installation. A total of 19,938 acres of the former 21,683 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 1,280 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 IRP 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.

1.2 Load Line 5

Load Line 5 is located in an area known as the Fuze and Booster Hill, which consists of Load Lines 5, 6, 7, 8, 9, 10 and 11 (**Appendix B as Figure 3**). Fuse and Booster Hill is located in the south central part of the RVAAP facility. Load Line 5 is located south of Fuze and Booster Road, east of Load Line 6 and west of Load Lone 10.

Load Line 5, also designated as Fuze Line #1, was a finished product assembly line, which was operated from 1941 to 1945 to produce fuzes for artillery projectiles. LL5 consisted of

18 process buildings ranging in size between 120 sq ft and 32,910 sq ft. Operations were discontinued at the end of WWII and the process equipment was removed in 1945. LL5 has been inactivated for more than 50 years.

There is no historical evidence that bulk handling of primary explosives lead azide or lead styphnate took place within the boundaries of this load line as reported by USATHEMA (1978). This also applies to the reported use of TNT, Composition B, propellants and explosives other than black powder that was used in the delay component manufactured at this line and LL6. With the exception of the mercury fulminate primer that was loaded and assembled within the line, all other primary explosive products were delivered as sealed, finished sub-assemblies. There is no evidence that the booster component was included in the assembly processes conducted at this line. Below is a summary of the building utilization:

- Buildings 1F-1, 1F-3, 1F-4, 1F-9 and 1F-18 primer manufacturing
- Buildings 1F-6, 1F-7, 1F-8, 1F-19 and 1F-20 delay component manufacturing
- Building 1F-10 detonator service magazine
- Building 1F-11 and 1F-12 assembly testing

The detonator components were manufactured at LL9 and were containerized when they arrived at LL5. The detonating components were stored in 1F-10 until utilization in the assembly process conducted in 1F-11. Unless spillage occurred at the storage magazine, there is no reason to expect wholesale primary explosive contamination.

This information was reported by MKM Engineers, inc. in their report Dated August 2005.

1.3 Load Line 7

Load Line 7 is located in the Fuze and Booster Hill area that consists of Load Lines 5,6,7,8,9,10, and 11 collectively (**Appendix B as Figure 5**). Fuze and booster Hill located in the south central part of the RVAAP facility. Load Line 7 is located on Fuze and Booster Spur Road north of Load Line 6 and south of Load Line 11.

LL7, also known as Booster Line No. 1 was a booster loading and assembly line for artillery projectiles. Operations began in 1941 and were discontinued at the end of WWII. The booster process equipment was removed in 1945. In 1968, the line was modified for the production of M-406 High Explosive (HE) and M-407A1 practice 40mm rounds. Sixteen million 40mm projectiles were assembled at Load Line 7 between 1969 and 1970, after which the line was deactivated and the equipment removed. From 1989 through 1993, pink water associated with the TNT process was treated. The line was reactivated for the Research and Development of high explosive shape charges until 1993. LL7, which has been inactive for more than a decade, is not maintained, and is overgrown with young trees, bushes and weeds.

There is no evidence that bulk handling of primary explosives lead azide or lead styphnate took place within the boundaries of this load line reported by USATHAMA. For the 1940 to 1945 production era, LL7 was identical to LL8 in its production scheme. Detonators used in the assembly of the finished product would have been received as a sealed unit. If any spillage occurred, it would be very localized and it the vicinity of the detonator assembling area. This would also hold true for the 40mm production conducted form 1969 to 1970.

The M-42 primer and the M551 would have been received as sealed finished sub assembly. Dusting from the M-42 primer would have occurred in Bay B Building 1B-13 during the primer insertion process and most likely would have been isolated to the Centran feeder. Since the fuze is a sealed system, no spillage would be expected from the fuze assembly process. Fuze assembly would have occurred in the A Bay of Building 1B-6. Again, if any spillage did occur, it would be localized.

In addition to the explosive components associated with M406 and M407 A1 rounds, the following solvents would have been used: isobutyl acetate, isobutyl alcohol, toluene, xylenes, and isopropyl alcohol. There were no indications of chlorinated solvent being used in this process.

The M407A1 round was a practice round and incorporated a dye (i.e. smoke pellet). The specific dye used was N, N-diethyl-4 (phenylazo)-benzenamine, CAS No. 2481-94-9.

A summary of building utilization is provided below:

1941-1945 Production Era

Buildings 1B-1, 1B-2 and 1B-3 – Explosive Processing
- Expected Secondary Explosive: Tetryl Only

Buildings 1B-4, 1B-17, 1B-12 and 1B-13 – Pellet Mfg and Processing
- Expected Secondary Explosive – Tetryl

Buildings 1B-7 and 1B-18 – Testing
- Expected Secondary Explosive – Tetryl

Building 1B-5 – Detonator Storage
- Expected Secondary Explosive – Mercury Fulminate and Lead Azide

The Detonator components were manufactured at LL9 and arrived containerized at LL7 and were stored in 1B-5 until used in the assembly process conducted in 1B-6. Unless spillage occurred at the storage magazine, there is no reason to expect primary explosive contamination.

Building 1B-22 – Solvent Storage

Building 1B-6 – Assembly and Shipping
- Expected Explosives: Those specified for all the other afore specified buildings.

1969 – 1970 40mm Production Era

Buildings 1B-1 and 1B-18 - Booster Storage (A-5), Pellet Magazine
- Expected Explosive and Other Compounds: RDX and Stearic Acid

Buildings 1B-2, 18-4 and 1B-6A – Main Charge Storage, Melt Pour and Curing
- Expected Explosive: Unknown

Buildings 1B-17 – MSSI Fuze Storage
- Expected Explosive: Unknown

Buildings 1B-22 – M-9 Propellant Storage
- Expected Explosive and Other Compounds: Nitrocellulose, Nitroglycerin, Potassium Nitrate, Diphenylamine

Building 1B-6 – Assembly and Shipping
- Expected Explosive and Other Compounds: All of the previously specified

1969-1970 40mm Washout Era

Buildings 1B-6 and Annex – Washout and Treatment
- Expected Explosive: TNT

This information was reported by MKM Engineers, inc. in their report Dated August 2005.

1.4 Load Line 6

Load Line 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 **(Appendix B as Figure 4)**. The site is approximately 51 acres in size. During the 1941 to 1945 time frame, LL 6 operated primarily as a fuze assembly line with the exception of fulminate mixing at Building 2F-4. In 1945, the load line was deactivated and the equipment was removed. In 1950, LL6 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, etc.) for armor penetration. Frequency of firing was approximately 1-2 charges per week. The most recent activity at LL6 occurred during the late 1970's when it again was used for applied research and development (by Firestone Defense Corporation) on shaped charges for the Department of Defense. The amount of explosives involved during the operation was minimal, not more than 900 kilograms per year. By eliminating pathways into the process, testing can be minimized for azide. There are no indications that any type of bulk azide handling took place on LL6. LL6 was a fuze assembly line with the exception of the Fulminate Mixing at 2F-4. Any contamination would be due to handling, spillage and should be minimal.

Foundation/Footings of demolished buildings 2F-1, 2F-2, 2F-3, 2F-4, 2F-6, 2F-7, 2F-8, 2F-9, 2F-10, 2F-11, 2F-12, 2F-13, 2F-14, 2F-15, 2F-18, 2F-19, 2F-20, 2F-21, 2F-22, 2F-31, 2F-32,

2F-33, 2F-34, 2F-35, 2F-36, and 6-51 on LL6 were removed down to minimum of 4 feet depth bgs. All unused telephone poles and all steam stanchions were removed from the Load Line and disposed of accordingly.

1.5 Load Line 9

Load Line 9 (LL9) is located in the south central region of the RVAAP at the intersection of Fuze and Booster Road and George Road (**Appendix B as Figure 6**). The site is approximately 69 acres in size. During the 1941 to 1945 time frame LL9 was used to produce fuze component parts and detonators. In 1945 the load line was deactivated and its equipment removed. There are not any documented activities at LL9 since closure in 1945. There were a total of 22 foundations/footings removed to a minimum depth of 4 feet bgs located at LL9. Foundations / Footings are for the demolished building (DT-2, DT-5, DT-13, DT-14, DT-16, DT-18, DT-18A, DT-20, DT-22, DT-24, DT28, DT-29, DT-32, DT-41, DT-42, DT-45, DT-46, DT-47, DT-52, DT-55, DT-56 and DT-57). All unused telephone poles and all steam stanchions were removed from the Load Line and disposed of accordingly.

1.6 Load Line 11

Industrial operations at LL11 took place during the 1941 to 1945, 1951 to 1957 and 1969 to 1971 time frames for production of artillery primers and fuzes **(Appendix B as Figure 7)**. According to the installation Assessment of Ravenna Army Ammunition Plant, Report No. 132 dated November 1978, from 1941 to 1945 load lines 5 through 11 combined, and produced 19,257,297 Misc. Fuzes, 44,297,485 Misc. Boosters, 50,660,725 Misc. Primers, 79,580,576 Detonators and 226,387,306 Percussion elements. From 1951 to 1957 LL11 alone produced 9,927,118 MK2A4 Percussion Primers, 24,482,465 MK2A4 Primers and 1,504,935 Repack Primers. During the period of 1969 to 1971 LL11 produced approximately 7,000,000 MR ZA4 fuzes. A total of nineteen (19) Artillery Primer (AP) Buildings were used at the load line to carry out the specific industrial operations. Foundations / Footings of demolished buildings AP-6, AP-7, AP-10, AP-13, AP-14, AP-17 and AP-19 on LL11 were removed down to a minimum depth of 4 feet depth bgs. As a part of this project, all unused telephone poles and all steam stanchions were removed from the Load Line and disposed of accordingly.

1.7 LABORATORY BUILDING 1039

Building 1039 consisted of three powder test rooms for the routine analyses of lead azide, mercury fulminate, and percussion element mixes, which contained explosive-proof fixtures and barricaded ovens (**Appendix B as Figure 8**). A separate ammonium nitrate room was needed in view of the expected large production of this material. A general laboratory for

paints, metals, water, sewage, tapes, and other non-explosive materials was placed across one end of the building. The rest of the space on the first floor was allotted to a nitrometer room, sample room, stockroom, balance room, photographic dark-room, a library, two washrooms and two offices.

One part of the basement was set up as a fuel laboratory, while the other part contained the physical test equipment for metals and adhesive backed tapes. The three rooms in the north section had been made into an auxiliary stockroom, a constant temperature humidity room, and a fireproof shellac preparation room.

Demolition of Building 1039 included the certification of a 5X designate by UXO technicians; removal of all chemical laboratory equipment, removal of all asbestos containing panels and (transite) and removal of all brick and concrete to a minimum depth of 4-foot bgs. The basement area was filled in with approved clean soil and re-seeded to the RVAAP standard of grass seed.

1.8 BUILDING T-1604

Building T-1604 was used as a material storage shed. (**Appendix B as Figure 9**)The task at building T-1604 included the removal of transite, demolition of that building and removal of the concrete slab and foundation to a minimum depth of 4 feet bgs.

2.0 5X CERTIFICATION AND DEMOLITION ACTIVITIES

The approved September 2006 Decontamination/Demolition of Load Lines 5,6,7,9, and 11 and Buildings 1039 and T-1604 Work Plan, Site Safety and Health Plan were prepared for implementation of all Demolition/Decontamination activities. However, paint samples collected by MKM Engineers, Inc. (MKM) prior to demolition operations revealed that the applied dry paint on the interior walls and ceilings of some buildings contained PCBs in excess of 50 pp, which precluded them from being subjected to thermal decomposition. LES utilized the approved September 24, 2004 and amendment 1 – Revision 1 (June 2005) Explosive Safety Submission (ESS) from MKM to address alternative explosive decontamination and demolition techniques specific to demolition and 5X certification for the buildings at RVAAP where thermal decontamination operations can not be conducted.

The following is the general operational sequence conducted for execution of the Demolition/Decontamination project.

- Building Hazard Analysis and Engineering Survey
- Test paint chips for TCLP
- Floor sweeping to remove organic materials, loose paint chips, and contaminated debris
- Removal of hazardous items of environmental concern to enhance safety including mercury switches, PCB light ballasts and fluorescent light bulbs
- Asbestos Abatement
- Removal of unused telephone poles and buried steam stanchions
- Demolition and removal of walls and structural steel
- Demolition of basements
- Site Restoration

Field operations were conducted from May 2006 through March 2007. Photo documentation of the 5X certification and demolition activities for LL 5, 7, and buildings 1039 and T-1604 are provided in the Weekly Reports in **Appendix C**. Specific details of the 5X certification and demolition activities are described in the following sections.

2.1 Building Hazard Analysis and Engineering Survey

A detailed analysis for explosive hazards was conducted for every building at LLs 5 and 7, Building 1039 and Building T-1604. Prior to initiating any building demolition activities, the UXO personnel conducted building walkthroughs to confirm existing conditions, and inspected wall, floor slab, and structural steel surfaces for explosives contamination and other potential explosive hazards. As needed, building surfaces were screened using Exspray Test Kits to determine if explosive residue was present. Wall and floor penetrations,

openings/cavities and large cracks were inspected to determine if accumulated explosives were present. A hazard analysis building inspection form was used to document inspection at each building.

In addition, a Certified Structural Engineer, Mr. Frank Lee, Cleveland, Ohio, 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 and subsequent demolition operations. The building surveys were initiated in July 2006 and carried out as needed throughout the project. Copies of the hazard analysis building inspection forms and engineering survey reports are provided in **Appendix D**.

2.2 Paint Sampling

Dry paint analysis was done by MKM Engineering in the Dec 2005 report "Final Construction Completion Report for Load Lines 6 & 9 and Wet Storage" on Contract DAAA09-02-C-0029, in Appendix E of that report. The appropriate disposal method was based upon the paint color which reflected the PCB concentration levels. The disposal method(s) for the paint found in Load Lines 5 and 7 were based on these MKM Engineers, Inc. samples/test results, and the paint sweepings were disposed of in approved off site landfills.

2.3 Floor Sweeping

The floors of each building were swept in order to remove potentially contaminated debris, including a mixture of the loose paint chips and other miscellaneous debris that could migrate outside the buildings before demolition operations were initiated. Sweeping was conducted in Modified Level C PPE as prescribed in the SSHP. All paint chips were accumulated and a TCLP metals and PCB test was conducted by Cardinal Laboratories in, Youngstown, OH prior to being shipped from the RVAAP. A total of 7,420 pounds of material was removed, containerized, sampled and disposed of from LLs 5 and 7 as well as Buildings 1039 and T-1604. Copies of the waste characterization sample results and disposal manifests are provided in **Appendix G**.

2.4 Removal of Hazardous Items

Hazardous items of environmental concern including PCB light ballasts and mercury containing fluorescent lights were removed from all buildings prior to demolition and recycled. Removal of these items was performed prior to the asbestos removal operations described in section 2.5. LES removed all light fixtures with the ballasts and asbestos gaskets still in tact. A total of nine fixtures were palletized on each pallet and stretch-wrapping was then applied to protect from any possible leakages. Mr. Gregg Orr, OEPA representative, was contacted and visited the site to approve this method prior to the

palletized fixtures leaving the Ravenna site. All the hazardous items were shipped to a licensed facility, Environmental Recycling, Bowling Green, Ohio. Copies of the Bill of Ladings and certificated of recycling for light ballasts and fluorescent bulbs are provided in **Appendix G**.

2.5 Asbestos Abatement

The asbestos containing material (ACM) was removed from all buildings prior to initiating building demolition and removal operations. ACM removal operations took place from June 2006 to November 2006. An approved asbestos contractor from the State of Ohio, Ecological Services, Inc. (ESI), removed the asbestos containing materials (ACM) with the assistance of LES personnel.

Prior to initiating the asbestos removal operations, LES submitted the Ohio EPA and Ohio Department of Health (ODH) 10 day notification of asbestos removal and demolition operations. Personal air monitoring was conducted throughout the asbestos removal operations. All ACM was disposed of off-site in accordance with federal, state, and local rules, laws, and regulations. The ACM was shipped to Minerva Enterprises, Ohio which is a certified landfill facility in the State of Ohio. Copies of the OEPA and Ohio Department of Health (ODH) notification of demolition and asbestos abatement operations are provided in **Appendix H**. Copies of the asbestos disposal manifests are provided in **Appendix I**.

2.6 Removal of Footings/Foundations, Stanchions and Poles

Once the surface debris was removed and after explosive decontamination, field personnel initiated removal of the concrete floor slabs and foundations. All surface concrete, subsurface concrete foundations (along with steam stanchions) of overhead exterior steam lines, telephone poles and surface debris within the LLs 5,6,7,9,and 11 were removed. The poles were recycled whenever possible and disposed of offsite in accordance with federal, state and local laws and regulations. Foundations were removed using a hardened excavator fitted with a bucket or hammer attachment to a minimum of 4 feet below grade surface or totally removed. Upon removal, concrete was visually inspected and documented on the Demolition Material Inspection Form **(See Appendix F)** to ensure no explosive hazards existed prior to final disposition. All concrete floor slabs and foundations from Load Lines 6, 9 and 11 placed in an approved onsite clean hard fill area located at Load line 1. The floor slabs and foundations from Load line 5 and 7 were crushed and removed from the RVAAP site.

2.7 Building Decontamination

UXO personnel visually inspected the buildings as part of the Building Hazard Analysis Survey described in Section 2.1. Exspray Testing was conducted in all buildings in Load Line 5, 7 and Building 1039 to check for explosive contamination and is documented in **Appendix D**. During building demolition, an Exspray test was conducted on steel, wood and/or concrete/brick materials in roll off boxes and/or dump trucks prior to these loads leaving RVAAP and documented in the Weekly Reports **(Appendix C)**.

2.8 Explosive Demolition

Explosive decontamination or desensitizing operations were used to eliminate explosive hazards within the drains and process lines on Load Lines 5 and 7 and Building 1039. At Load Line 5, a total of three explosive shots were initiated. LES used .50 grain detonating cord and non-electric (Non-El) shock tube initiation systems on all the drains.

On Load Line 7, the drains in the Change Houses and the Melt Pour Building required explosive desensitizing or decontaminating. A total of three drains in Building 1B-9 and 12 drains in Building 1B-10 were successfully cleared. The outside process pipes from Building 1B-4 to the 1B-4VP1 vacuum pump house building were cleared using .32 grain perforator charges on the flanges and 100 grain detonating cord running through the pipes. Inside the Melt Pour Building, 1B-4, perforators were set up on each flange and detonating cord was run through all the pipes and the two Roto-Clones which were located above the melt pour pots. There were numerous high order explosions inside building 1-B-4 that resulted from a build-up of high explosives inside the process pipes. LES ran 100-grain detonating cord through all pipes a second time to ensure all explosives were successfully cleared.

In Building 1039, Chemical laboratory, three separate shots were conducted using .50 grain detonating cord on pipes, sink traps and troughs located in the laboratory rooms and .32 grain perforator charges on all the sink traps. After all detonations, an Explosive Quality Control evaluation was conducted to ensure all shots were successful. The Quality Control data is included in **Appendix M**. The demolition shot activities and quantities follow:

Activity	Location	Building	Explosives	Quantity
Demo Shot #1	Drains	1-B-9/1-B-10	50 grain detonating cord	300 ft.
Demo Shot #2	Drain	1-F-11	50 grain detonating cord	5 ft.
Demo Shot #3	Drains	1-F-14	50 grain detonating cord	245 ft.
Demo Shot #4	Drains	1-F-14	50 grain detonating cord	150 ft.
Demo Shot #5	Process Pipes	1-B-4-VP1	100 grain detonating cord	250 ft.
Demo Shot #6	Process Pipes	1-B-4-VP1	100 grain detonating cord	450 ft.
Demo Shot #7	Sink Traps/drains	1039	50 grain detonating cord 32 grain perforators	225 ft. 8 ea.

Demo Shot #8	Sink Traps/drains	1039	50 grain detonating cord 32 grain perforators	275 ft. 5 ea.
Demo Shot #9	Flanges Pre-selected pipes Sink Basin Set-up of trunk line	1039	32 grain perforators 100 grain detonating cord 100 grain detonating cord 50 grain detonating cord	13 ea. 100 ft. 100 ft. 800 ft.
Demo Shot #10	Melt pour pipes (outside) Melt pour pipes (outside) Flanges (inside) Process Pipes Ductwork and Rotor till units	1-B-4	32 grain perforators 100 grain detonating cord 32 grain perforators 100 grain detonating cord 50 grain detonating cord	48 ea. 250 ft. 28 ea. 250 ft. 1400 ft.
Demo Shot #11	Melt Pour Building interior	1-B-4	32 grain perforators	20 ea.
Demo Shot #12	Flash smaller diameter pipes	1-B-4	100 grain detonating cord	150 ft.
Demo Shot #13	Drain	1-F-14	32 grain perforator	1 ea.

2.9 Demolition of Walls, Steel Removal and Surface Debris

Demolition Operations were initiated by LES by removing all non-hazardous materials and hazardous materials which consisted of light fixtures, ballasts and mercury switches from all Buildings in Load Line 5 and 7 with approval from the Ohio EPA. Once all these materials were removed, floor sweepings were collected and removed in accordance with EPA regulations. At the same time these activities were being performed, the LES Heavy Equipment sub contractor removed all footings/foundations, steam stanchions and unused telephone poles from Load Lines 6, 9, and 11. Prior to removing these footings, a licensed surveyor surveyed all corners of each building, which will be required for points of reference by later studies **Appendix K.** Buildings at Load Lines 5 and 7 were demolished onto their slabs using long boomed, hardened excavators equipped with grappler and shear attachments. Contaminated steel from these operations was cut up and tested for explosives using Expray kits and manifested out to approved landfills as documented in **Appendix E**. Hardened loaders and excavators with bucket attachments were used to load PCB contaminated debris and crushed concrete into dump trucks and this material was manifested off site to an approved landfill as documented in **Appendix F**. Once the contaminated steel and construction debris was manifested off site the remaining material was inspected and shipped for recycling using a locally devised control form. Once surface debris was cleared off building slabs, the sidewalks and footers were removed and any basements were demolished in place to four feet below ground surface. Then the cavity was backfilled to grade using approved fill **(test results provided in Appendix O)**. Throughout demolition, surface debris, (wood, brick, tile and block) was visually inspected, sampled, and documented by the SUXOS to ensure no explosive hazard exist prior to final disposition.

All painted brick and structural steel was loaded for offsite disposal as PCB Bulk Product Waste to an approved facility, Minerva Enterprises, Ohio. All unpainted concrete from floor

slabs and footers and steam stanchions from Load Line 6, 9 and 11, was deposited in the approved OHARNG clean hard fill area at RVAAP LL1.

A copy of the letter sent to Ohio EPA regarding Disposal of Demolition Debris with Applied Dried Paint Containing Polychlorinated Biphenyl Concentrations Greater than 50 Part per Million is provided in **Appendix H**. Copies of all the LLs and Buildings construction debris visual inspection forms Bill of Ladings and 5X certification letters are provided in **Appendix L**. Copies of 5X certification letters for the unpainted scrap steel recovered are also included in **Appendix L**. A total of 1,258,750 pounds (629.38 Tons) of unpainted Plate and Structural Steel and Scrap/Sheet Metal was removed from Load Line 5 and 7. A total of 3,320 pounds (1.67 Tons) of Lead was removed from both Load Lines and a total of 6,240 pounds (3.21 Tons) of Sheet Copper were removed. As required by the Scope of Work **(Appendix A)** DA-337 Forms (Request for Approval of Disposal of Buildings and Improvements) were completed on all buildings **Appendix N.**

2.10 Sump Removal

Prior to removal activities, LES placed stakes and obtained GIS coordinates for the proper location of the corners of the sumps. Water contained in the 3 sumps at LL 5 and 7 were removed to facilitate sump demolition operations. A total of 19,700 gallons of water was removed from LL 5 and 25,000 gallons was removed from LL 7 and disposed of off site. Negative test results of the water samples taken from each sump are provided in **Appendix J**.

Once empty the sumps were visually inspected and screened for explosives using Exspray Test kits as needed. Prior to being removed, the integrity of the sump was checked and documented for future environmental restoration efforts. Once removed, the concrete debris from the sumps was visually inspected and tested for explosive contamination. Lead liners were removed and recycled. Asbestos liners were removed; double bagged and disposal of as asbestos containing materials. The sump cavities were backfilled to grade using local soil.

2.11 Site Restoration

Upon completion of the demolition activities, all disturbed areas were re-graded to ensure positive drainage, and seeded. Re-grading was performed in a manner to ensure positive drainage and allow for unimpeded mowing and ground maintenance. A site walkthrough was completed with the Facility Manager to identify and remove any miscellaneous debris. Final site restoration operations were completed at the sites in July 2007.