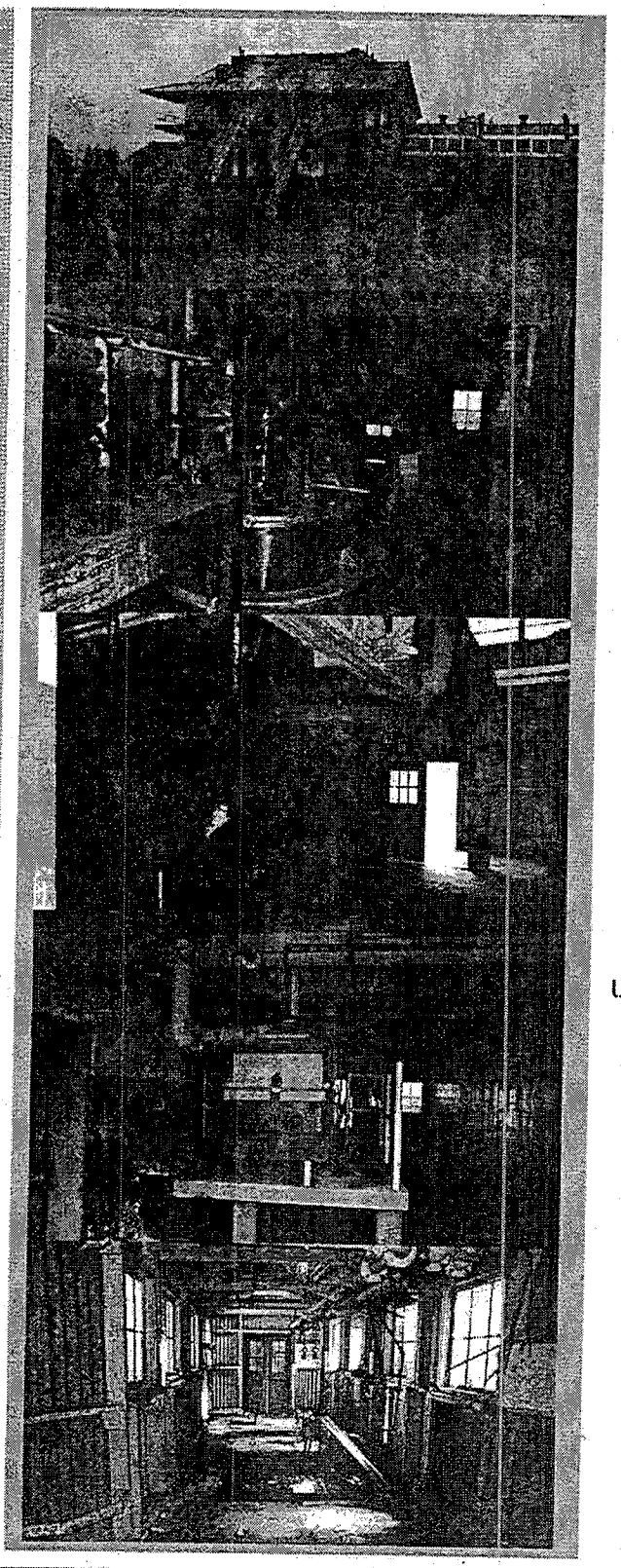
MKM Engineers, Inc.

PROPOSAL



5X CERTIFICATION OF
LOAD LINES 2, 3 and 4

at

Ravenna Army Ammunition Plant
8451 State Route 5
Ravenna, Ohio 44266
(330) 358-7311

Submitted to:

U.S. Army, HQ Operations Support Command
Environmental Contracting Team
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Introduction

Ravenna Army Ammunition Plant (RVAAP) is a government-owned, contractor-operated (GOCO) Operation Support Facility (OSC). RVAAP is located in northeastern Ohio within Portage and Trumbull Counties, approximately 4.8 km (3 miles) east-northeast of the town of Ravenna and approximately 1.6 km (1 mile) northwest of the town of Newton Falls. The installation consists of 8668.3 ha (21,419 acres) contained in a 17.7 km (11-mile) long by 5.6-km (3.5 mile) wide tract. The site is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX Railroad on the south; State Route 534 on the east; Garrettsville and Berry Roads on the west; and the CONRAIL Railroad on the north. The land use surrounding the installation is primarily farmland with sparse private residences. Several communities that are more populous surround the installation: the village of Windham, which borders the installation to the north, Garrettsville to the northwest, Newton Falls to the east, Charlestown to the southwest, and Wayland to the southeast.

Past Department of Defense (DoD) activities at the RVAAP date back to 1940 and include storage, handling, and packing of military ammunition and explosives. The facility is jointly operated by the U.S. Army Operations Support Command (OSC), Ohio Army National Guard and current operating contractor Toltest, Inc. The industrial operations at RVAAP consisted of 12 munitions assembly facilities referred to as "load lines". In addition, RVAAP also had several areas used for burning, demolition and testing of munitions and buildings/areas designated for clean up and decontamination activities for the production equipment. In May 1999, the National Guard Bureau assumed operational control of 16,164 acres of RVAAP and licensed Ohio Army National Guard to use the acreage for training and other activities.

Site Description

Load Line 2

LL-2 was used to melt and load Trinitrotoluene (TNT) and Composition B into larger caliber shells and bombs. The line operated during World War II, from 1951 to 1957, and again from1969 to 1971. In addition, munitions demilitarization activities (debanding and TNT washout) were conducted during the late 1940s, and cartridge reclamation work was performed from 1951 to 1957. Pink water generated from the munitions assembly operations was collected in concrete sumps located throughout the load line, which were connected to the settling tanks. After settling, the water was pumped by low-pressure steam ejectors into two tanks, approximately 26,200 liters (6,900 gallons) in volume for cooling. When the water cooled to 80°F, it was pumped through an overhead pipe to a sawdust filtration unit. The sawdust filtration unit consisted of a set of three parallel 3 x 9.1 x 0.9 meter (10 x 30 x 3 feet) concrete settling tanks and a set of three 1.5 x 4.6 x 0.9 meter (5 x 15 x 3 feet) filter blocks in the bottom of the filtration tanks. The contaminated sawdust used in the filter tanks and the settled sludge were periodically removed and destroyed at Winklepeck Burning Grounds (WBG). The effluent from the sawdust filtration units was discharged to Kelly's Pond, a triangular, unlined earthen settling impoundment, which is approximately 0.8 hectares (2 acres) in size and from 1.8 to 2.4 meters (6 to 8 feet) deep. The discharge from the impoundment was channeled to a surface stream that immediately exits the installation south of the load line and ultimately empties into West Branch of the Mahoning River (Source: SAP Addendum No.1 for the

Phase II RI of Load Lines 2, 3, & 4 at the RVAAP. Prepared by SAIC for the USACE, Louisville District. July 2001).

During its operational history, Load Line 2 produced about 10 million munitions and salvaged about 1.8 million kilograms (4 million pounds) of TNT during demilitarization work. When the facility was at full capacity, Load Line 2 generated approximately 3,192,000 liters (842,688 gallons) of pink water per month (Jacobs Engineering 1989). In addition, chromic acid waste was discharged from building 802 into a ditch that ultimately discharges to Kelly's Pond (USACE 1998).

Load Line 3

Load Line 3 had a similar operational history as Load Line 2. Demilitarization activities were also conducted between 1951 and 1957. Pink water generated from assembly of munitions was collected in concrete sumps located throughout the Load Line 3 area and pumped into settling tanks via steam ejectors. Sawdust used in filtration tanks the settled sludge were periodically removed and destroyed at the WBG. Effluents were discharged to unlined drainage ditches that ultimately emptied into Upper Cobbs Pond and then into Lower Cobbs Pond for settling. During its operational history, Load Line 3 produced approximately 6.5 million munitions and processed about 228,000 munitions during demilitarization work. Approximately 9,173 kilograms (20,226 pounds) of explosives scrap and sludge and 304,800 liters (80,467 gallons) of pink water were generated per month when the facility was at full capacity.

Beginning in the early 1950s, the Defense Logistics Agency (DLA) conducted a strategic materials storage mission at Load Line 3. One-hundred above-grade storage tanks (Tank Nos. 1401-1500) having a capacity of 500 barrels (21,000 gallons) were constructed to store strategic materials. Tanks Nos. 1401-1476 were used to store silica carbide. The remainder was used to store various other strategic solid materials. By the late 1970s, all but 20 tanks were removed; those remaining were used to store antimony, asbestos, and magnesium silicate (talc). All DLA storage tanks are now empty; the remaining materials were removed during 1998 and 1999 (Source: SAP Addendum No.1 for the Phase II RI of Load Lines 2, 3, & 4 at the RVAAP. Prepared by SAIC for the USACE, Louisville District. July 2001).

Load Line 4

Load Line 4 operated during WWII and from 1951 to 1957. Pink water from munitions assembly operations was collected in concrete sumps, pumped to a sawdust filtration system, and discharged to surface ditch. Effluent from the filtration unit was then conveyed to a 0.8 hectare (2 acre) settling pond within the Load Line 4 area. This pond discharges to a surface stream that exits the RVAAP facility south of Load Line 4. Sludge and spent sawdust from the filtration units were periodically removed and destroyed at WBG. During its operational history, Load Line 4 produced approximately 1.4 million munitions (primarily 8-inch projectiles, 500 and 1,000 pound bombs, and heavy anti tank mines). An estimated 11,930 kilograms (26,305 pounds) of explosives scrap and sludge; 14,900,000 cubic meters (421,917 cubic feet) of explosives dust; and 3,390 liters (894,960 gallons) of pink water were generated per month when the load line was at full capacity (Source: SAP Addendum No.1 for the Phase II RI of Load Lines 2, 3, & 4 at the RVAAP. Prepared by SAIC for the USACE, Louisville District. July 2001).

Table 1 provides the operational chronology for Load Lines 2, 3, and 4.

Project Description

MKM scope of work (SOW) includes explosive disassembly and decontamination of all process equipment and piping, and 5X certification of buildings in LL 2, 3 and 4 except the boiler houses and water treatment plants in all LLs, Igloos DB-27A and DB-27C in LL2, and Building G-1, G-1A and G-3 in LL4. 5X certification of buildings will be conducted using one of the following methods: (1) thermal decomposition and burning; or (2) conventional demolition and removal of surface walls and concrete floors/slabs using hardened equipment. Removal of concrete floors and building footers will be to a depth of one foot below grade.

All operations will be conducted in accordance with (IAW) the requirements of IOCP 385-1, *Classification and Remediation of Explosive Contamination.*

The task breakdown of the scope of work and the order of their operations are as follows:

Task 1 – Project and Plans Preparation

The objective of this line item is to prepare the Work Plan and Health and Safety Plan in accordance with the appropriate guidance documents. MKM's project manager, senior UXO supervisor (SUXOS) and UXO Safety Officer (UXOSO) will review previous reports, investigations and any other baseline surveys to develop a checklist for verification of site specific concerns and actual work activities to complete the scope of work.

Task 2 –Notifications

Prior to initiating site activities, MKM will submit notifications to local police, fire, medical and aviation agencies. MKM will also provide notification to Akron Regional Air Quality Management District prior to asbestos/transite abatement. MKM will provide each contact with the appropriate information describing the nature of MKM's site operations. RVAAP personnel will be responsible for notifying all other government and base employees, and private contractors working at RVAAP.

Task 3 - Hazard Analysis and Classification

Prior to any demolition activities, MKM Senior UXO Supervisor and UXO Safety Officer will perform a hazard analysis (evaluation) of the buildings to identify unknown/unsuspected contaminants or hazards. Site work plans may be adjusted by addendum based on the results of the hazard analysis to ensure the safety and health of all workers and the surrounding environment.

Assigning a hazard classification to various buildings within each LL may theoretically simplify the explosive safety precautions used to decontaminate and 5X the load line buildings. These hazard classifications will be used to determine the manner in which the various buildings are decontaminated.

Table 2 provides the number and usage data, along with the hazard classification category for each building at Load Line 2, 3, and 4. The classifications used are as follows:

1. Explosive Building (EB) – This designation has been applied to any buildings where the listed function is definitely associated with the use of explosives.

2. Non-explosive Building (NEB) – This designation has been applied only to those buildings where it can be positively determined that no explosive contamination will be present in the building. This designation has been applied only to those buildings that are located on the periphery of each LL and whose function would certainly preclude the potential for explosives to be present in the building. Examples of this would be the gatehouses, and line offices.

3. Potential Explosive Building (PEB) – This designation has been applied to any buildings within the LLs that cannot be expressly designated as never having been used in any phase of the explosives loading, assembly or packaging process.

The technical approach applied to this project requires the same level of explosive precautions to be applied to both EBs and PEBs.

Task 4 – Engineering Survey

MKM will conduct a structured engineering survey of all buildings to be decontaminated at LLs 2, 3 and 4. The purpose of the structural survey is to evaluate the structural integrity and current condition of the building/structure prior to building alterations for equipment removal or building demolition. The survey will also provide recommendations regarding the integrity of building structures during shape charge disassembly of equipment, and the protection of the workers in nearby buildings. The engineering survey will plan for potential hazards such as fires, collapses, cave-ins, and injuries. If it is determined that the integrity of the structure to be demolished has been compromised, appropriate measures, including bracing and shoring of walls and floors, shall be taken to protect workers and any adjacent structures during the field efforts.

Task 5 – Removal of Loose Equipment/ Organic Debris

Under the direction of MKM SUXO Supervisor and Site Safety Officer, any loose 5X equipment, e.g. trolleys, carts, canisters, furniture, and miscellaneous debris will be removed from the buildings and taken to the interim staging area. After visual inspection, the loose items will be staged for future salvage.

The interior floors of buildings will be cleared of organic debris (floor sweepings). MKM will containerize and stage the organic debris at the biopad area for future bioremediation (composting). Vacuuming and sweeping of the floors will be conducted in Level C PPE.

Task 6 – Abatement of Transite and Asbestos Containing Materials (ACM)

Asbestos insulation on overhead process piping and the transite roofing and wall sidings will be removed prior to any explosive disassembly operations. ACM and transite will not be removed from buildings that are to be left in-place; i.e. boiler houses and water treatment plants on all LLs, igloos DB-27A and DB-27C at LL2, and buildings G-1, G-1A and G-3 on LL4. Removal will be performed without the use of encapsulants. MKM will also remove and properly dispose of asbestos gaskets, brake linings, hose casings, and belts encountered during manual disassembly of lighting fixtures, motors, etc. Air monitoring will be conducted according per OSHA, EPA and State requirements.

Task 7 – Abatement of Peeling Lead Based Paint (LBP)

Peeling lead-based paint (LBP) on the interior walls, floors and ceilings of all buildings and the exterior surfaces of equipment/piping and structural steel members will be removed and containerized for disposal prior to explosive disassembly activities. Peeling LBP will not be removed from the boiler houses and water treatment plants on all LLs, igloos DB-27A and DB-27C at LL2, and buildings G-1, G-1A and G-3 on LL4. LBP abatement will be conducted in Level C PPE. Air monitoring will be conducted as required, according to 29 CFR 1910 requirements.

Task 8 – Removal of Miscellaneous Hazardous Wastes

Mercury switches, PCB ballasts, fluorescent bulbs, lead anchors, hydraulic fluids from equipment sumps and transformers, and other hazardous materials/wastes will be identified, containerized, labeled and disposed to an approved facility. Sludge from underground sumps and pits will be containerized and staged at the biopad area for future bioremediation composting.

Task 9 - Initial Pressure Wash-down of Building

MKM would conduct an initial medium pressure wash down of building floors to remove gross surface contamination. Decontamination fluids will be controlled by sweeping or by squeegee, or picked up using HEPA vacuums. The collected fluids will be containerized and disposed of at an approved facility.

Task 10 – Process Equipment and Piping Inspection Using Borescope

MKM will inspect the interior of all explosives contaminated equipment and process piping using a fiber optic borescope. The purpose of the borescope inspection is to assess the explosive hazard of disassembling the components (equipment and piping) by determining the presence and relative amounts of residual explosives. The presence of residual explosives will determine the method for disassembly and removal (i.e., explosive shape charge or remote cutting or manual disassembly).

Task 11 – Explosive Disassembly/Inspection (D/I)

EBs and PEBs may require some level of explosive D/I to remove gross contamination sources prior to decontamination of buildings. Based on the results of the fiber optic borescope inspection and EXPRAY field screening results, disassembly and removal of explosive contaminated equipment and

process piping will be accomplished utilizing state of the art remotely detonated micro shape charges to severe them into appropriate sections. Shape charges will be specifically designed to use minute amounts of explosives to cut/disassemble the components. Site workers will be educated/trained to recognize the explosives that may be encountered during this process. No power/spark generating tools are permitted during D/I operations.

Explosive disassembly and removal will be conducted according to the general steps outlined below. Available archival data related to the function of buildings within each LL (as presented in **Table 2**) and the existing structural integrity of the buildings would be used to determine the magnitude and extent of D/I operations.

1. The location of all floor drains will be verified and marked to facilitate their relocation after burn or demolition of the buildings.
2. Explosive process piping in the EBs or PEBs will be inspected using fiber optic borescope and disassembled using shape charges prior to building burn or demolition.
3. Process equipment, ventilation (air collection) ducts and pink water lines with potential explosive contamination will be inspected, and if necessary, flashed with detonation (det) cord, and removed from the EBs or PEBs.
4. The 3X process equipment and piping will be taken to the onsite demolition area for flashing using det cord to expose all surfaces. The flashed exposed metal will be visually inspected, downsized and transported to a smelter facility.

Task 12 – Decontamination by Pressure Washing or Thermal Treatment

The non-process equipment and utility piping will be decontaminated, only if required as determined by MKM SUXOS and UXO QC Manager, using a combination of pressure washing and thermal treatment, IAW IOCP 385-1,10.a.(2)(3).

Decontamination by Pressure Washing

- Disassembled items will be moved to the Interim Accumulation (staging) Area.
- If an item has not been det cord-flashed or if power washing is deemed necessary, it will be taken to the Decon Power Wash (DPW) Area where it will be pressure washed to at least 3X levels.
- The component will then be inspected in the Inspection and Certification (ICA) Area to ensure that there are no visible traces of explosives and to determine if further disconnection/demolition is needed to expose all surfaces.
- The component will be severed into manageable sections to expose all surfaces. Once all surfaces are exposed, the items are sent back to the DPW area for further power washing to achieve 5X level.
- The material will then be carefully examined by MKM UXO QC Manager to determine if visible explosives are present. The result of this examination will determine whether the material re-enters the processing flow for further washing, or is taken to the clean material staging area.
- Only clean material certified as 5X by the QC Manager and SUXO Supervisor will be taken to the Direct Disposal Operations (DDO) Area where the material is staged for final disposal to a scrap recycling or salvage facility.

Decontamination by Thermal Treatment

The MKM Mobile 5X Furnace is a state of the art car-bottom flashing furnace that heats the explosive contaminated materials to destroy any residual contamination to a 5X level. The contaminated materials are heated over 1,000 degrees Fahrenheit for at least 15 minutes, which will thermally decontaminate all materials. Explosives are oxidized to carbon dioxide and water during this thermal destruction process. Only if required by the SUXOS and UXO QC Manager, unpainted (exposed) metal equipment and piping (process or non-process related) will be flashed in the furnace to achieve 5X levels.

- The UXO Supervisor will inspect the material and load the furnace with this suspect contaminated material for thermal treatment.
- Treatment cycles typically take approximately 1-3 hours per cycle depending upon the density of the load and the thickness of the material placed in the load.
- After the material has cooled sufficiently the UXO QC Manager will visually inspect all thermally treated materials and verify that the decontaminated pieces have attained 5X level.
- The SUXOS and UXO QC Manager will provide certification documentation for every scrap container generated.
- After thermal treatment and certification, all decontaminated 5X materials will be taken to the Direct Disposal Operations (DDO) Area for final disposal to a scrap recycling or salvage facility.

Task 13 – 5X Certification of Buildings

Thermal Decomposition (TD) or Burn

Burning will be the cost effective way to protect worker and public health and safety while ensuring the decontamination of buildings to 5X levels.

TD consists of burning the structures with a majority of the equipment in-place, thereby negating the need to D/I every piece of equipment. During the burning process, as per IOCP 385-1, the equipment is heated to a minimum temperature, (a level above the decomposition temperature of the contaminant) for a pre-determined time duration, (i.e., "long enough to assure the largest mass is at that temperature, consuming contaminants by oxidation".) which assures a 5X decontamination level. Subsequently, the equipment typically becomes useless for its intended purpose and is then deemed as scrap.

Buildings to be burned will have utilities disconnected and a minimum of 10-ft zone surrounding the site will be cleared of excessive vegetation (mowed). Floor drains will be plugged unless the building has been condemned. If additional ventilation is required, glazing on the ground floor shall be knocked out from the outside of the building. Hay, fuel oil and wooden pallets or other dunnage materials will be added to the buildings to augment the fuel within the buildings. Remote ignition will be conducted from outside the Minimum Separation Distance (MSD) of 1,250 feet. The local fire department's presence will be required during the burn process. No personnel will be allowed within the MSD until the "all clear" status has been announced, and a fire watch will be maintained at the site until all visible smoke has been extinguished. MKM Engineers will divert traffic during

the burn process until the "all clear" determination is announced utilizing a siren blast and radio communication.

MKM Engineers will use various methods to determine temperature and the period that the subject temperature has been reached. These methods are as follows:

- Thermocouples: The thermocouples/ recorders will record temperature versus time on a graph for a specific thermocouple location. There will be a strategic number (as deemed necessary by the SUXOS and UXO QC Manager) of thermocouples per building recording this information during a burn.

- Visual Observation: Confirmation of the temperature and duration is also done with the recognized criteria of the NFPA and the Factory Mutual Engineering Corporation. Visual observation of the flames emanating from the structure provides temperature data (all burns are also videotaped).

- Time calculations for the period required for complete explosive desensitization were calculated using thermodynamics. For a 4-foot metal sphere, it takes 32 minutes with a surface temperature of 1500 F to heat the core of the sphere to 446 F. Since most facilities burn slowly for a half hour, are fully engulfed for one hour, and take another half hour to cool down, it is assumed that most fires are sufficient to decompose all explosives/propellants.

- Temperature Indicating Paint/Lacquer: These temperature indicators identify when a certain temperature has been exceeded on the surface of the painted item (this does not denote period temperature has been retained to). The indicator is relied upon when the explosives are assumed to be present only on exterior metal surfaces, and are only used as a secondary consideration.

- Other Observations: Other observations of metal/glass/concrete deformation are also used as justification evaluators (i.e. glass melted denotes a temperature of 2000 degrees F has been reached at the fixture during the burn).

Building Demolition

Walls and Surface Debris Removal

Long boomed, hardened excavators will be used to take down the building roofing and walls, and hardened track loaders will be used to remove the debris from the site to a pre-designated location. The excavators and tracked loaders will be hardened against blast hazards through the use of lexan shielding being mounted over the exposed (front) window surface. Additionally, as needed, a ¾" plywood sheet with 1 row of sandbags will be added on the roof of the equipment for additional operator protection.

The concrete and brick surface debris will be used as clean hard fill in the grade depressions within corresponding LL boundaries. Structural wood from buildings will be chipped and left on site within the corresponding LL. Creosote wood from blast walls will be left on site.

Inspection of Associated Floor Drains

After surface debris has been removed, floor drains under the slab will be inspected to enhance safety during concrete floor removal operations. The inspection will be accomplished utilizing the fiber optic borescope to assess the degree of contamination. MKM anticipates minimal explosive residues inside the floor drains. The explosive residue inside the drains will be flashed using det cord. The SUXOS will provide the initiation order once all personnel have exited the area to the MSD and all traffic has been stopped from entering the 1,250 feet MSD. Once the drains have been flashed, the concrete slab will be removed.

Concrete Slab/Foundation Removal

After removal of surface debris, floor slabs and foundations will be removed to a depth of one foot below grade by breaking up the concrete with a hardened excavator fitted with a hammer/tooth attachment. Hardened track loaders and dump trucks will be utilized for moving the debris to pre-designated grade depressions within the corresponding LL boundaries. Any noticeable crack in the concrete floor (1/8" wide or greater) will require that the crack be flooded with water prior to the concrete flooring being demolished within three feet on either side of the cracked area. Upon removal of the slab/foundation, the excavation area will be rough-graded using soils from onsite borrow sites within the LL being demolished.

The concrete debris will be used as clean hard fill in the grade depressions within corresponding LL boundaries.

Task 14 - Sub-slab Soil Sampling and Remediation

Soil sampling and remediation will be conducted under the remedial investigation (RI) phase of the RVAAP CERCLA program. Sub-slab soil sampling in not included in this MKM scope of work.

Task 15- Verification and 5X Certification

EXPRAY will be used as the primary field screening method for 5X certification. Due to the ease of use and sensitivity of the test, it provides the best real-time method for 5X certification. Should an item test positive for the presence of explosives, it will be additionally washed or thermally treated, and retested.

The final certification submission will include a combination of:

- Documented visual inspection or survey report for buildings or structures of concern;
- Photo documentation of field screening activities and/or analytical testing results;
- Written and signed certification statement for each building and/or load line.

Task 16 - Disposal

All explosives disposal operations will be conducted on-site within each load line. No ordnance or explosive items will be removed from the site for disposal.

Several regulated/hazardous items will be encountered during site operations that will require special handling, storage, transportation, and disposal. These items include asbestos and lead containing material, mercury-containing switches and gauges, mercury-containing fluorescent lights, light ballast potentially containing PCBs, and other electrical equipment potentially containing PCBs. Environmental management of these items will be conducted in accordance with applicable state/federal regulations and MKM Standard Operating Procedures (SOPs). Project generated debris - metal, concrete, water, sludge, wood and brick - will be properly handled as described in **Table 3** of the proposal.

Task 17 - Site Restoration

MKM shall remove all temporary facilities such as work areas, structures, temporary fencing, or any other signs of construction within the work, staging, and access areas. The areas shall be restored to near natural conditions. Seed will be applied at the appropriate rate using the approved RVAAP mix.

Task 18 - Final Report

On completion of the decontamination and demolition activities, a Final Report will be compiled to include an executive summary, photo-documentation of site activities, weekly reports, demolition and/or burn logs and videos, field screening and analytical results, waste manifests, and other necessary documents.