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Removal Action Work Plan for the YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

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Removal Action Work Plan for the YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee

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Environmental Management Activities at the
OAK RIDGE Y-12 PLANT
Oak Ridge, Tennessee 37831
managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

PREFACE

This *Removal Action Work Plan for the YS-860 Firing Ranges, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee* (DOE/OR/01-1709&D1) was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to present the technical approach for conducting a non-time critical removal action of bullets and lead-contaminated soils from the former YS-860 Firing Ranges. This work was performed under Work Breakdown Structure 1.10.1.22.30 (Activity Data Sheet 2300, "2334"). This document provides the Environmental Restoration Program with background information about the site, scope, technical objectives of the planned removal action, and reporting and schedule requirements. Health and safety, sampling and analysis, quality assurance, waste management, data management, and best management practices requirements for the project are addressed in separate stand-alone documents. The overall objective of the removal action is to reduce the level of lead present in the firing range berm soils and eliminate this as a potential threat to human health and the environment.

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ABBREVIATIONS

ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	Environmental Protection Agency
ER	Environmental Restoration
LDR	Land Disposal Restrictions
LMES	Lockheed Martin Energy Systems, Inc.
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
RAO	removal action objective
RAR	Removal Action Report
RCRA	Resource Conservation and Recovery Act
RmAWP	removal action work plan
SVOC	semivolatile organic compound
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TOC	total organic compound
UEFPC	Upper East Fork Poplar Creek
VOC	volatile organic compound
WAC	waste acceptance criteria
WMP	waste management plan

EXECUTIVE SUMMARY

The U.S. Department of Energy is conducting environmental restoration activities at the Y-12 Plant in Oak Ridge, Tennessee. As part of these efforts, a removal action is planned for the former YS-860 Firing Ranges as described in the Action Memorandum for the project (DOE/OR/02-1622&D1). This removal action work plan (RmAWP) is focused on the former YS-860 Firing Ranges.

This RmAWP defines the technical approach, procedures, and requirements for the removal of lead-contaminated soil and site restoration of the former YS-860 Firing Ranges at the Oak Ridge Y-12 Plant. This RmAWP describes excavation, verification/confirmatory sampling, and reporting requirements for the project. Lower tier plans associated with the RmAWP, which are submitted as separate stand-alone documents, include a field sampling and analysis plan, a health and safety plan, a quality assurance project plan, a waste management plan, a data management implementation plan, and a best management practices plan.

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act and the Federal Facility Agreement, the objective of this removal action is to minimize the risk to human health and the environment from lead-contaminated soil. This removal action will be completed in an appropriate manner and in the best interest of human health and the environment.

A site evaluation of the YS-860 Firing Ranges conducted in 1996 by Lockheed Martin Energy Systems, Inc., determined that elevated lead levels were present in the Firing Ranges target berm soils. The results of this sampling event form the basis for the removal action recommendation as described in the Action Memorandum for this project.

This RmAWP contains a brief history and description of the Former YS-860 Firing Ranges Project, along with the current project schedule and milestones. This RmAWP also provides an overview of the technical requirements of the project, including a summary of the approach for the removal activities. Finally, the RmAWP identifies the regulatory requirements and the appropriate removal action responses to address applicable or relevant and appropriate requirements to achieve the project goals of substantially reducing the risk to human health and the environment.

1. INTRODUCTION

The former YS-860 Firing Ranges are located at the eastern end of the Oak Ridge Y-12 Plant outside the primary facility fenceline and west of Scarboro Road within the Upper East Fork Poplar Creek (UEFPC) watershed in Oak Ridge, Tennessee (Fig. 1). This portion of the Oak Ridge Reservation (ORR) is within Anderson County, Tennessee, immediately south of the city of Oak Ridge. A decision has been made by the U.S. Department of Energy (DOE) to conduct a removal action of lead-contaminated soils at this site as part of early source actions within the UEFPC watershed. This non-time critical removal action of bullets and lead-contaminated soil from the YS-860 Firing Ranges is being conducted as a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action. These actions are consistent with the ORR Environmental Restoration (ER) Program. The removal action will focus on the excavation of bullets and lead-contaminated soil from the shooting range berms, transportation of the material to a permitted treatment and/or disposal facility, demolition and land filling of a concrete trench and asphalt pathways at the site, and grading and revegetating the entire site.

1.1 PURPOSE

The overall purpose of this project is to reduce the levels of lead present in the firing range berm soils and eliminate this as a potential threat to human health and the environment to accomplish restoration of the site for the purpose of meeting recreational land use requirements following the removal action. This purpose is consistent with ER Program objectives for the UEFPC watershed, as currently defined.

This RmAWP provides the technical requirements for the removal and disposal of bullets, lead-contaminated soil, and a concrete trench and asphalt pathways; performance of verification/confirmatory sampling of the remaining soils; regrading and revegetation of the site; and reporting of the results of the removal action. This work plan will help to ensure that these activities conform with applicable DOE, U.S. Environmental Protection Agency (EPA), Occupational Health and Safety Administration (OSHA), and Lockheed Martin Energy Systems, Inc. (LMES), policies, procedures, and requirements.

1.2 PROJECT OBJECTIVES

The primary objective of this project is to perform the specified project scope in accordance with the requirements of this RmAWP to meet the stated project purpose. Specific project objectives include the following:

- removal of lead bullets and soil contaminated by lead above the action level from both berms located at the site;

- recovery and recycling of lead bullets and shot, if appropriate and feasible;

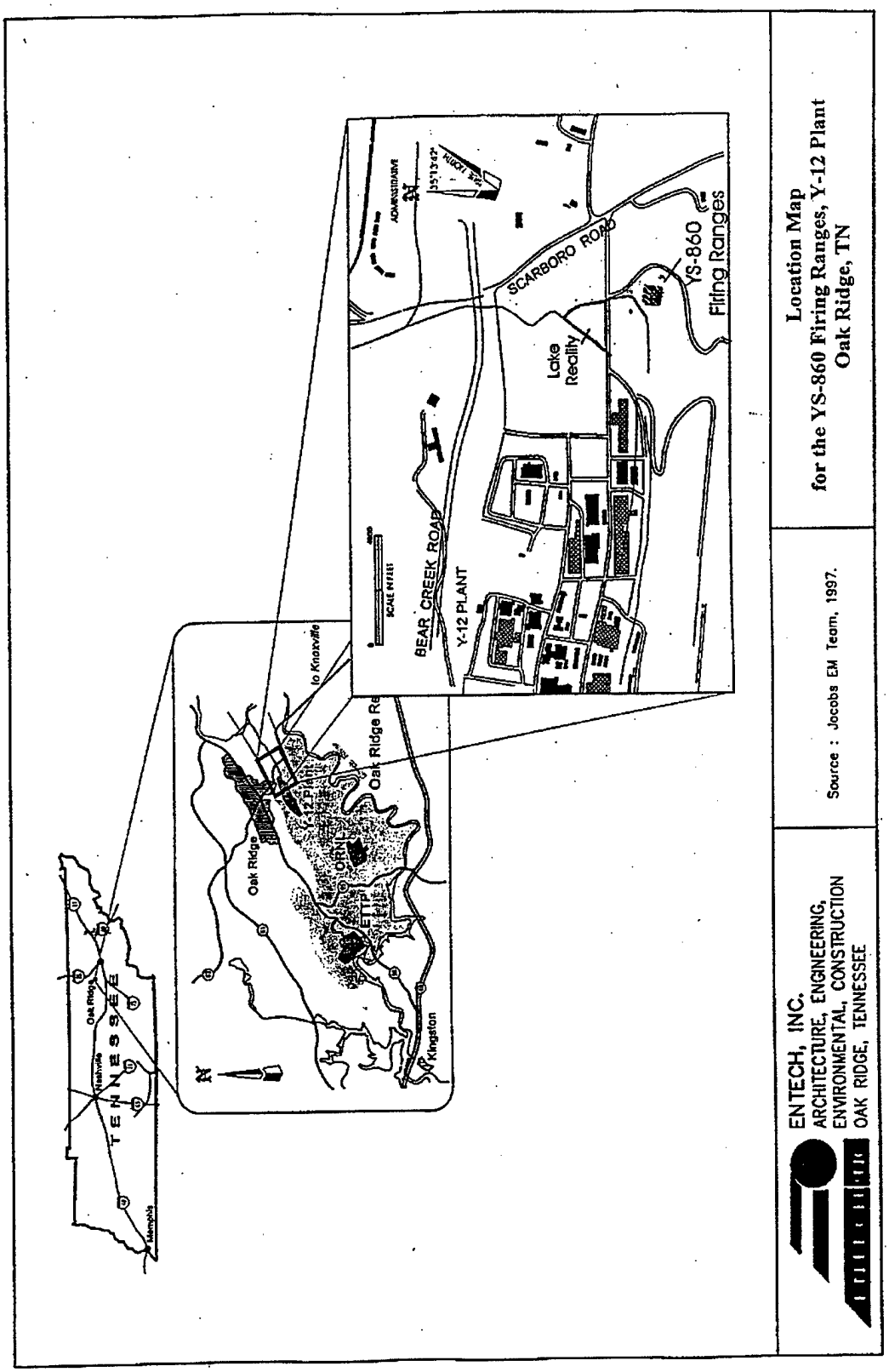

Fig. 1. Location map for the YS-860 Firing Ranges.

- treatment of lead-contaminated soil to meet Resource Conservation and Recovery Act (RCRA) Land Disposal Restrictions (LDR) and disposal in a permitted landfill;
- removal of the concrete trench and asphalt pathways and disposal of the debris in the Y-12 Plant construction/demolition landfill;
- regrading of the site to a final grade consistent with the surrounding topography;
- provision of sufficient sampling results to confirm that the lead levels remaining in the remaining soil are below the action level;
- revegetation of the site with a perennial grass; and
- summary of all project activities in a Removal Action Report (RAR).

1.3 SCOPE

The scope of this project is limited to the removal of lead bullets and lead-contaminated soil from the end berms of the two small arms firing ranges at the YS-860 Firing Ranges site, restoring the site by demolition of an existing concrete trench and asphalt pathways, and then regrading and revegetating the area. To ensure the completeness and effectiveness of the removal action, verification sampling of the remaining berm soil and confirmatory sampling of the site following regrading will be performed. An RAR will be prepared documenting all field activities performed, including the results of verification/confirmatory sampling; the documentation of the transportation, treatment, recycling, and/or disposal of lead and lead-contaminated soil; the removal of asphalt and concrete demolition debris; and the condition of the site at the completion of field activities. Specific activities to be performed as part of the scope of this project include the following:

- mobilization of trained personnel and equipment to the site;
- excavation of lead bullets and shot and potential lead-contaminated soils from the end berms at the two firing ranges to a depth of approximately 15 in., or through the top two layers of soil, which are red and brown to the top of the gray clay layer, or to a depth based on results of verification sampling;
- visual inspection and verification sampling of the excavated soils with quick turnaround analysis for lead;
- excavation of any additional soil having contamination above the established action level (1400 μg/g) based on site analytical results and visual observations;
- transportation of the excavated material to a permitted lead recycling, soil treatment, and/or disposal facility (must be on LMES and DOE Approved Vendor List);
- demolition and excavation of a concrete trench and asphalt pathways (at approximately 6-in. thickness) at the site;
- transportation of the concrete and asphalt debris to the Y-12 Plant construction/demolition landfill for disposal;

- regrading of the entire site (including side berms) with clean fill soils taken from nontarget berms on the east and west of the firing range site and revegetation;
- visual inspection and confirmatory sampling of the final graded surface; and
- preparation of an RAR.

No other contaminants or affected media have been identified or are suspected to be present at the YS-860 Firing Ranges site. Any other environmental contamination at, or adjacent to, the site will be addressed through separate actions under the CERCLA by the ER Program. The location of the site is visible from and accessible to the general public. Community relations at the site are the responsibility of DOE and LMES, but work practices and access control during removal action activities will account for the possibility of general public site visitors.

1.4 OPERATIONAL INFORMATION

The site consists of two former firing ranges, a smaller eastern range and a larger western range. The eastern range is a relatively unimproved area with a low end berm approximately 80 ft long. The western range is an improved firing range with a covered shed, asphalt and gravel pathways, side berms, and a large end berm (approximately 200 ft long) with a concrete trench at the base.

The former firing ranges were used for small arms training by the Y-12 Plant security forces. The eastern firing range was in use from 1943 until the mid-1950s. The western range was in use until the mid-1980s. These ranges were both used primarily as pistol ranges; however, shotgun and rifle use at the ranges cannot be excluded. It is probable that any of the firearms used at the ranges could not penetrate more than 2 ft.

1.5 PREVIOUS INVESTIGATIONS

In 1996, a site evaluation of the YS-860 Firing Ranges was conducted by LMES. The investigation determined that elevated lead levels were present in the firing range target berm soils. The results of the evaluation are documented in the *Y-12 Analytical Services Organization Official Report* (Lockheed Martin Energy Systems, Inc. 1996). The results of this sampling event form the basis for the removal action recommendation presented in the *Action Memorandum for Lead Source Removal at the Former YS-860 Firing Ranges, Y-12 Plant, Oak Ridge, Tennessee* (DOE 1997).

The site evaluation consisted of four shallow surface soil samples (0–6 in.), two deeper surface soil samples (0–12 in.), four soil borings (0–24 in.), and one surface water sample. Two surface soil samples (S-1and S-2) were collected from the face of the end berm in the western range, three surface soil samples (S-4, S-5, and S-10) were collected from near the base of the western range end berm, and one surface soil sample was collected from near the base of the western edge berm of the western range. Three soil borings (SB-6, SB-7, and SB-8) were installed in an east/west line between the western range and a diversion ditch, the nearest topographically downgradient surface water drainage, and one soil boring (SB-9) was installed in the drainage ditch downgradient of the site. The surface water sample (SW-3) was collected from standing water at the base of the western range end berm. Figure 2 illustrates the locations of samples collected during the site evaluation. All of the samples were analyzed for total lead using SW-846 methods, except S-1, which was analyzed using the toxicity characteristic leaching procedure (TCLP).

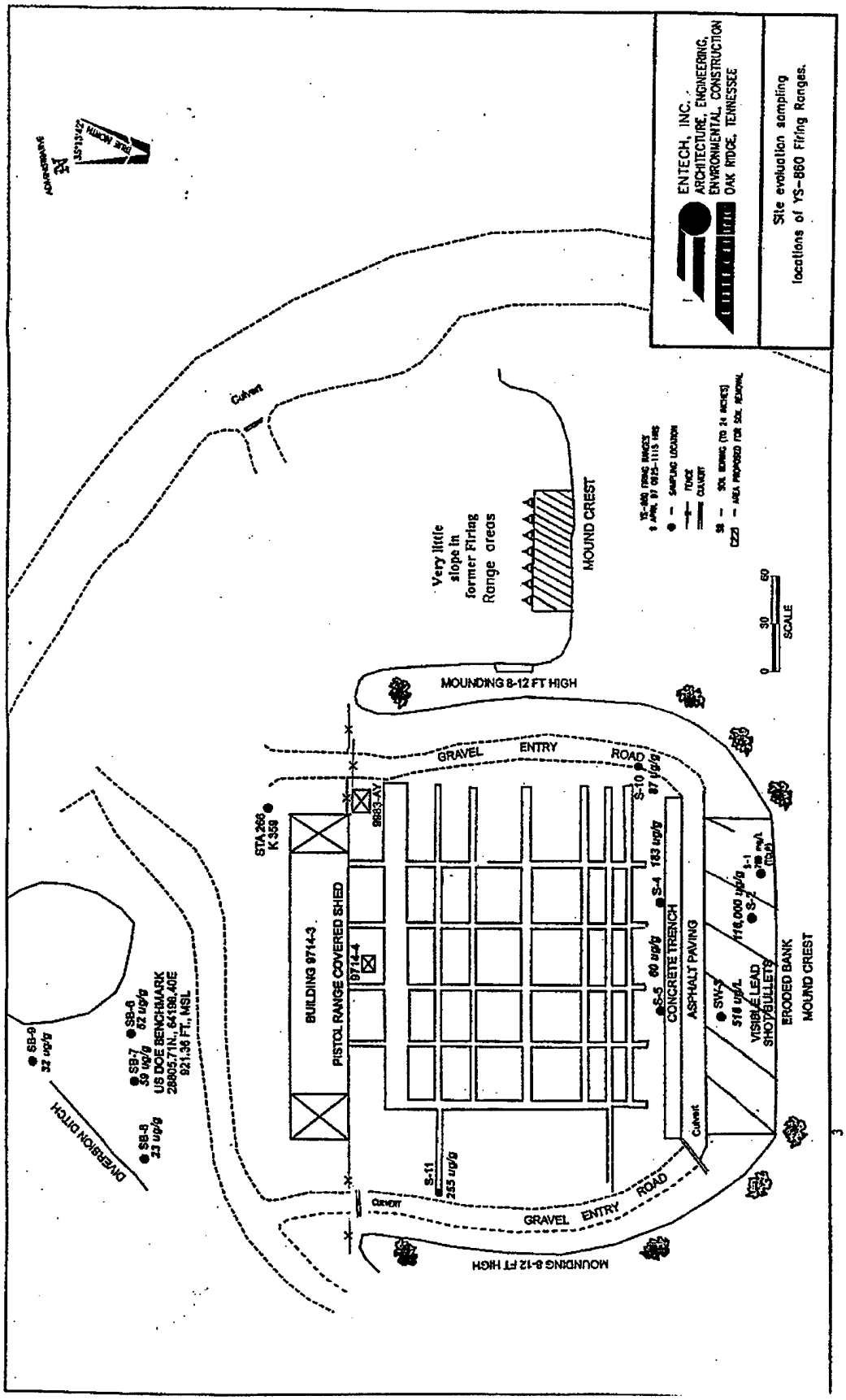

Fig. 2. YS-860 Firing Ranges site evaluation sampling locations.

Samples S-1 and S-2, from the face of the western range end berm, had the highest levels of lead contamination found at the site, 769 mg/L and 116,000 μg/g, respectively. The results from the remaining eight soil samples ranged from 23 to 255 μg/g, all below the most stringent EPA guidance level of 400 μg/g recommended for residential use. The surface water sample, SW-3, from standing water at the base of the western range end berm had a concentration of 0.518 mg/L.

These results demonstrate that most of the lead contamination in soil at the site is restricted to the face of the end berm, as would be expected. Because the transport mechanism for soil and particulate lead is expected to be through erosion of the berm face and fluvial transport along the base of the berms during rain events, these results are consistent with this model. On the basis of these results, removal of the source material from the berm face and soil from the base of the berm (secondary source) should remediate the soil contamination. The presence of lead in surface water at the base of the end berm and the results of the TCLP analysis indicate that lead is leaching into water at the site. However, lead above background levels has not been detected in surface water or groundwater downgradient of the site during routine monitoring by the Y-12 Environmental Management Division (Lockheed Martin Energy Systems, Inc. 1996).

An action level for lead contamination in soil of 1400 μg/g has been defined as the applicable removal action objective (RAO) for this site. EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.4-12 has defined a lead screening level of 400 μg/g in soil for unrestricted use (children in a residential setting) but allows for calculation of a site-specific cleanup level based on actual anticipated lead exposure. The Integrated Exposure Uptake Biokinetic Model, Version 99D, was used to derive a site-specific cleanup level based on being protective of children under a recreational scenario. The modeling results indicated a total lead concentration of 1600 μg/g would protect children. Modeling using default input parameters and allowing for additional sources of lead intake indicates a RAO of 1400 μg/g would be protective of children under a recreational land use scenario; this was selected as the action level for this project (DOE 1997).

2. PROJECT SCHEDULE

Table 1 identifies the project milestones for this removal action.

Table 1. YS-860 Firing Ranges removal action project milestones

Description	Forecast date
Submit work plan to regulators	4/01/98
Start award of subcontract for waste recycling/disposal	5/07/98
Start YS-860 Firing Ranges removal action (contingent on regulators concurrence with this plan)	5/26/98
Complete YS-860 Firing Ranges removal action (as described in this plan—depends on start date)	9/16/98
Submit Removal Action Report to regulators (Federal Facility Agreement milestone for YS-860 Firing Ranges removal action)	10/30/98

3. REMOVAL ACTIVITIES

In August 1997, DOE issued the *Action Memorandum for Lead Source Removal at the Former YS-860 Firing Ranges, Y-12 Plant, Oak Ridge, Tennessee* [YS-860 Action Memo (DOE 1997)]. The YS-860 Action Memo describes the field sampling and analysis of the site, the regulatory requirements, the extent of contamination, and recommended removal actions, which include removal of known contaminated soil, removal of existing asphalt walkways and concrete slab, verification sampling, site regrading, and shipment of contaminated soil to an off-site recycling and/or disposal facility in accordance with RCRA. The Doe Run Company of Boss, Missouri, was recommended as a facility to consider for performing the lead recycling in the YS-860 Action Memo.

Alternatives to the action recommended in the YS-860 Action Memo that were evaluated would involve shipping the lead-contaminated soil to a RCRA waste landfill for disposal. LMES and the Y-12 Plant currently have contracts with several RCRA Subtitle "C" landfill facilities for disposal of RCRA waste (e.g., a Laidlaw landfill in Colorado, a Laidlaw landfill in South Carolina, and a Waste Management landfill in Alabama). Waste sent to a RCRA landfill will be stabilized at the landfill to achieve compliance with EPA LDR for lead. Currently the LDR for lead is 5 mg/L by TCLP analysis, but that value may be changing to 0.75 mg/L in the next few weeks.

Both Laidlaw and Doe Run Company facilities have indicated that a firm price for disposal will not be issued until the facilities run "mini treatability study" tests with the Firing Ranges waste material to determine and refine the process requirements for meeting impending EPA LDR regulations (Phase IV, Part B).

Disposal of the soil lacks the environmental benefits of lead removal and recycling, and disposal appears from initial estimate to be more expensive than recycling; however, disposal was considered as an option because of potential difficulties acquiring the approvals required to use Doe Run or other recycling companies, and the risk of being unable to remove the lead from the clay soil involved in the recycling option that is not present in the disposal option. Doe Run, however, has a RCRA-licensed landfill that may be used if recycling proves infeasible. Lead removal and recycling and/or disposal at an LMES-approved recycling/disposal facility is recommended as the selected remedial alternative for lead-contaminated soil. The recycling/disposal facility will be selected following "mini treatability studies" to be run by the Doe Run Company and Laidlaw and obtaining firm prices from the various facilities.

3.1 MOBILIZATION

3.1.1 Readiness Review

Before mobilization of the contractor's equipment to the site, a readiness review will be performed to ensure that the contractor's personnel have all required training, all required submittals have been approved, and the contractor is prepared to accomplish the intent of the project.

3.1.2 Contractor's Staging and Storage Area

A contractor's staging and storage area will be established adjacent to the site in the gravel area north of the firing range. The area will be established by surrounding it with temporary flagging. The boundaries of the staging area will be selected such that adequate space is provided for the contractor's equipment and access is maintained to the gravel road south of the UEFPC concrete channel.

3.1.3 Contractor's Equipment Monitoring

Upon arrival at the site and before beginning any work, the contractor's equipment will be checked by Health Physics monitoring personnel. At the conclusion of the project, the contractor's equipment will be checked by Health Physics before being released from the site.

3.1.4 Contractor's Equipment Selection

The remediation contractor will be responsible for the selection and mobilization of construction equipment capable of executing the tasks described in this work plan. It is anticipated that the equipment required will include a large track-mounted excavator (trackhoe), trucks to haul uncontaminated materials to the Y-12 Plant construction debris landfill, trucks to haul contaminated material directly to the recycling and/or disposal facility, materials handling equipment, and grading equipment to reshape the site after all of the contaminated soil has been removed. Currently, long haul trucks are proposed to haul directly to the recycling and/or disposal facility.

3.1.5 Silt Fence

A silt fence will be placed around the site to prevent sediment loss to the environment. Prebuilt silt fence consisting of woven polypropylene fabric attached to wood stakes will be installed downhill of all work areas to intercept sediment. The silt fence will be inspected and maintained throughout the project and will be removed at the conclusion of the project when the site has been seeded and mulched.

3.2 EXCAVATION AND DEMOLITION

On the basis of a previous investigation, contaminated soil is limited to the embankments directly behind the targets (Lockheed Martin Energy Systems, Inc. 1996). Negligible contamination is found elsewhere in the area. The depth of penetration of the bullets was determined by the Jacobs EM Team during the Engineering Evaluation/Cost Assessment to be less than 2 ft and typically less than 15 in. Visual inspection of the berms indicates that bullets are present in the top two (red and brown) soil layers but did not penetrate a third (gray) clay layer. Thus, excavation will proceed until the gray layer is uncovered. A strip of soil from each of the two target embankments is considered to be contaminated and will be excavated.

3.2.1 Clearing and Grubbing of Existing Vegetation

The west target berm is partially vegetated with pine trees and shrubs. The east target berm is completely vegetated. The trees and shrubs must be removed before the excavation of contaminated soil. Tree removal will include the stumps and main roots, and it will be accomplished by cutting the

tree above the stumps and pulling out the stumps or pulling up the entire tree with the backhoe. The trees and stumps will be hauled to the burn area in Bear Creek Valley, piled up, and burned. Burning will be coordinated with the LMES Waste Management and Environmental Management staff(s) and will be performed with appropriate notification to the State of Tennessee. Soils will be brushed from stumps and roots before transporting to the burn area.

3.2.2 Excavation of Contaminated Soil

Excavation and demolition will be performed in general accordance with the YS-860 Action Memo. A strip of soil from each of the two target embankments will be excavated. These areas are estimated to be approximately 200 ft × 45 ft × 15 in. and 80 ft × 25 ft × 15 in. in the west and east firing ranges, respectively. Aerial dimensions are based on field measurements taken by ENTECH on February 20, 1998, and depth is based on measurements taken by the Jacobs EM Team during the Engineering Evaluation/Cost Assessment. The total quantity of soil to be excavated in the initial round of contaminated soil removal is approximately 550 yd^3. The soil will be placed directly into lined trucks and covered with tarps for hauling to the recycling/disposal facility. Following the initial excavation of contaminated soil, the soil immediately beneath the excavation will be analyzed to determine if any residual lead contamination is present.

3.2.3 Demolition and Removal of Asphalt and Concrete

After the initial contaminated soil excavation has been completed, the existing asphalt walkways and the concrete trench slab will be removed. The asphalt can be broken up and then excavated with conventional construction equipment. The thickness of concrete and asphalt is approximately 6 in. The concrete slab will have to be cut with a concrete saw or broken up with a jack-hammer, hoe ram, or other percussion tool. The asphalt and concrete will be removed and disposed of at the Y-12 Plant construction/demolition landfill, and the surrounding soils will be left on-site.

3.2.4 Excavation of Residual Contaminated Soil

Contaminated "hot spots" of soil exhibiting lead contamination above the RAO of 1400 µg/g as identified by verification sample analysis of the target embankment following the excavation will be excavated and sent to the off-site recycling and/or disposal facility along with the other soil removed from the site. Testing will consist of quick-turnaround SW-896 Method 7421 analysis with overnight results. It is anticipated that the quantity of soil determined to be lead contaminated by this verification testing will be a very small amount.

3.3 LOADING AND TRANSPORTATION

The Doe Run Company has the capability of removing lead from soil for reuse and cleaning the soil to RCRA nonhazardous levels. Laidlaw and Waste Management facilities have the capability of stabilizing the lead-contaminated soil and lead shot in cement to RCRA nonhazardous levels. The loading and transportation approach described in this work plan has been developed around the material handling capabilities of Doe Run Company, Laidlaw, and Waste Management Corporation. The intent is to reduce cost by minimizing unnecessary handling steps. All non-lead contaminated materials will be disposed of in the Y-12 Plant Construction Debris area of Landfill V.

There are three options for loading and shipping to the LMES-approved recycling and/or disposal facilities:

1. Hauling in lined dump bed trailer trucks.
2. Placing soil in lined containers and shipping containers by rail.
3. Shipping bulk by rail.

3.3.1 Truck Transportation

Doe Run would prefer the first option, hauling in dump bed trailers, because their facility is set up to receive bulk soil dumped directly from a trailer into their receiving hopper. The estimated cost of truck transportation relative to rail transportation is included in Sect. 3.5.

3.3.2 Rail Transportation

A railroad spur runs to the LMES-approved recycling and/or disposal facilities and can receive materials either in containers, bulk, or by rail. If material is shipped by rail in containers, additional cost would be incurred for the purchase of containers and for handling. Acceptable containers include drums or supersacks secured to pallets. If supersacks are selected, a sheet of plywood between the supersack and pallet is required to minimize tears and spills. After containers are unloaded, there would be a disposal or recycling cost associated with the containers. If bulk material is shipped by rail, it would have to be unloaded with a piece of heavy equipment such as a backhoe. An additional cost would be incurred for the equipment and operator to load and unload the bulk soil. Although rail transportation is less expensive than truck transportation, the additional loading and unloading cost and cost of containers would result in rail transportation being comparable in cost to truck transportation.

Truck transportation is the probable recommended hauling method because of greater accessibility and comparable cost to rail transportation, but this decision will be finalized upon receipt of firm bid pricing.

3.4 WASTE RECYCLING/DISPOSAL CONSIDERATIONS

Depending on the characteristics of the soil (grain size, etc.), two different technologies may be required to extract the lead from soil: mechanical separation/soil washing and smelting/thermal treatment. The Doe Run Company or comparable LMES-approved recycling facility would use one or both of those approaches. Stabilization/solidification would be used by a disposal facility, such as Laidlaw, to meet applicable LDR. The following is a list of waste acceptance criteria (WAC) and required soil data submittals, which would apply to both extraction and stabilization methods.

- Waste acceptance criteria
  - Minimal moisture content is acceptable, but no free liquid.
  - Total organic compounds (TOCs) must not exceed 500 ppm.
  - Certification or evidence that the material is free of radioactive constituents.

- Required data submittals
  - Soil analysis for heavy metal content and cyanide (total metals analysis, not TCLP).
  - TCLP for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

- Soil pH.
- Soil particle size distribution.
- Compliance with contaminant limits for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), PCBs, pesticides and herbicides.

Typically, ownership of the contaminated soil would be transferred to the Doe Run Company or a comparable LMES-approved recycling facility upon receipt and acceptance at the facility. In addition, at the completion of the soil separation work, a certificate of recycling or consumption would be issued. If the soil was sent to the landfill for disposal, shipping and acceptance manifests would document the transfer of the material to the landfill.

3.5 ESTIMATED COST OF SHIPPING, TREATMENT, OR DISPOSAL

Approximate costs for lead-contaminated soil disposal at several LMES-approved facilities are provided in Table 2.

Table 2. Approximate costs for lead/soil disposal

Lead/soil disposal option	Treatment and/or disposal cost[a]	Shipping option	Approximate cost of handling, containers, and transportation	Total cost for transportation, treatment, and/or disposal[a]
Recycling, Doe Run Co. Boss, Missouri	$100–150/ton	Rail - In containers	$40/ton	$140–190/ton
		Rail - Bulk	$28/ton	$128–178/ton
		Trucks	$30/ton	$130–180/ton
Disposal, Laidlaw RCRA Landfill, Colorado	$180/ton	Rail - In containers	$35/ton	$215/ton
		Rail - Bulk	$28/ton	$208/ton
		Trucks	$30/ton	$210/ton
Disposal, Waste Management RCRA Landfill, Alabama	$231/ton	Rail-In containers	$60/ton	$291/ton
		Rail-Bulk	$48/ton	$279/ton
		Trucks	$50/ton	$281/ton

[a]For the recycling option, the treatment cost is shown as a range, using Doe Run Company as an example. The actual cost would depend on the soil characteristics and the level of effort required to extract the lead. Characteristics that make lead more difficult to extract, and thus lead to higher costs, are finer particle sizes and the presence of SiO_2, Al_2O_2, and MgO. Because the Y-12 soil is a fine-grained clay soil consisting of the compounds listed, the cost will likely be on the high end of the range. Doe Run Company and Laidlaw have requested to perform a "mini treatability study" before committing to recycling/disposal of the soil. A 5-gal drum of the contaminated soil has been requested by the Doe Run Company, which will serve to demonstrate the feasibility of the separation process and reduce the uncertainty related to the cost of the work. Two quarts of contaminated soil have been requested by Laidlaw to determine the stabilization/solidification process requirements for meeting impending EPA LDR regulations (Phase IV, Part B). Both Laidlaw and the DOE Run Company facilities have indicated that a firm price will not be issued until the facilities run the "mini treatability study" tests; however, Waste Management has given a firm price.

4. PROJECT PLANS

A number of project plans have been prepared for the YS-860 Firing Ranges Project. These plans are summarized in this section.

4.1 HEALTH AND SAFETY PLAN

The health and safety plan (ENTECH, Inc. 1998d) incorporates requirements for field sampling, monitoring for hazardous contaminants, and construction hazards. Also included are training requirements for personnel, levels of personal protective equipment, and site controls. Equipment decontamination will be required. Emergency response and spill containment procedures are described.

4.2 WASTE MANAGEMENT PLAN

The waste management plan (WMP) (ENTECH, Inc. 1998f) incorporates requirements for waste characterization, handling, and transportation. The predominant feature of the WMP is the Environmental Management and Enrichment Facilities WMP Checklist, which contains specific responsibilities for each type of waste and for each organization involved in waste management.

Waste generated by the project activities will be stored, transported, and disposed of in accordance with applicable waste regulations and U.S. Department of Transportation (DOT) regulations, primarily DOT federal motor carrier safety regulations, hazardous materials regulations, and EPA regulations.

4.3 FIELD SAMPLING AND ANALYSIS PLAN

The field sampling and analysis plan (ENTECH, Inc. 1998c) contains a site description and history, sampling methods and characterization, and sampling identification and records. The field sampling and analysis plan shows 512 grid node sample locations resulting in 58 composite samples for verification that the removal effectively reduces lead concentrations below the action levels at the YS-860 Firing Ranges. Following verification, the site will be regraded. Before revegetation, confirmatory sampling will be performed at 187 grid node sample locations, resulting in 25 composite samples, confirming that the RAO for the site has been achieved. If soil lead concentrations are above the action level during confirmatory sampling, the need for additional soil sampling and/or soil removal will be reviewed with the site project manager and DOE. Verification and confirmatory samples will be analyzed for total lead content by EPA SW-846 protocol.

One representative composite sample of the contaminated soil waste stream will be collected before excavation activities. This sample will be analyzed for the WAC and required data submittals for recycling and disposal facilities, respectively. A separate *Sampling Plan for Waste Acceptance Criteria for the YS-860 Firing Ranges* describes WAC sampling and field procedures. The WAC sample will be submitted to a fixed-base laboratory for analysis of inductively coupled plasma metals plus cyanide, VOCs, SVOCs, PCBs, pesticides and herbicides, pH, soil particle size, TOCs, TCLP metals, soil particle size, percent moisture, and gross alpha beta.

4.4 QUALITY ASSURANCE PROJECT PLAN

The quality assurance project plan (ENTECH, Inc. 1998e) incorporates quality assurance measures to ensure that field sampling will be conducted with appropriate procedures in an objective and technically correct manner. The quality assurance project plan supplements the field sampling and analysis plan procedures so that data collected may withstand scientific scrutiny.

4.5 BEST MANAGEMENT PRACTICES

The best management practices plan for this project (ENTECH, Inc. 1998a) is tailored to this project for protection of the environment. It includes requirements of human health and safety, sampling and analysis, waste management, environmental compliance, and erosion and sediment control to minimize any impacts from this project inside and outside the project area.

4.6 DATA MANAGEMENT IMPLEMENTATION PLAN

The primary purpose of the data management implementation plan (ENTECH, Inc. 1998b) is to provide a system for generating and maintaining technically defensible data. To meet current regulatory requirements for the ER Program, complete documentation of the information flow must be established. This document serves to identify data management procedures, show expected data types and flow, and define the roles and responsibilities for all data management activities associated with the YS-860 Firing Ranges Removal Action Project.

5. ARAR CROSSWALK

The *Code of Federal Regulations* (*CFR*) 300.400 (E) (1) states that no federal, state, or local permit shall be required for the portion of any removal action conducted entirely on-site. However, a project that falls under the jurisdiction of CERCLA must meet the substantive requirements of any applicable permits. All substantiative permit requirements must be noted and methods developed for complying with the substantiative requirements. The next several pages list the applicable or relevant and appropriate requirements (ARARs) from the Y-12 Action Memo with responses that identify how the ARARs are to be met.

5.1 REGULATORY INITIATIVE

The non-time critical removal action of bullets and lead-contaminated soil from the YS-860 Firing Ranges is being conducted as a CERCLA action as part of the ORR ER Program. The ORR was placed on the CERCLA National Priorities List in 1989. The YS-860 Firing Ranges site is an operable unit within the UEFPC watershed as part of the Federal Facility Agreement between DOE, EPA, and the Tennessee Department of Environment and Conservation (TDEC) (DOE 1992). Environmental investigation and remedial actions performed at this site are subject to the terms of the Federal Facility Agreement.

ARARs for this project are listed in Table 3. Additional regulatory requirements that will be pertinent to the planned action at the YS-860 Firing Ranges site include hazardous waste, hearing conservation, and construction standards promulgated under OSHA and DOT requirements for shipment of hazardous waste. Other requirements applicable to this project include numerous DOE orders, EPA procedures and protocols, and LMES procedures and policies. These requirements are identified and cited, as applicable, throughout the RmAWP and project plans.

Table 3. Action-specific and chemical-specific ARARs for the YS-860 Firing Ranges at the Oak Ridge Y-12 Plant

Actions	Response	Citation
Institutional controls	Institutional controls as required will be provided during the entire sampling and excavation/restoration period	DOE Order 5400.5(IV)(6)(c)
Remediation of lead-contaminated soils	A screening level of 400 ppm lead in soil is recommended to protect children in a residential setting; a site-specific cleanup level for lead of 1400 ppm has been calculated based on actual lead exposure scenarios	OSWER Directive 9355.4-12, (August 1994)
Control of fugitive dust emissions	Reasonable precautions will be taken to prevent particulate matter from becoming airborne; no visible emissions are permitted beyond property boundary line for more than 5 min/hour or 20 min/day	Rules of the TDEC 1200
Surface water control during construction activities	Implement good site planning and best management practices to control run off from sampling/removal activities	40 *CFR* 122 Rules of the TDEC 1200-4-10-.05
Disposal of Construction debris	Disposal of non-hazardous construction debris waste will be permitted to the Y-12 construction debris landfill	40 *CFR* 258 Rules of the TDEC 1200-1-7-.01 et seq.
Removal of bullets	A used or fired military munition[a] must be managed as solid waste when transported off range for the purposes of storage, reclamation, treatment, disposal, or treatment before disposal.	40 *CFR* 266.202 (c)
	Hazardous wastes recycled as scrap are not subject to the requirements of 40 CFR 262-266, 268, 270, or 124	40 *CFR* 261.6(a)(3)(iii) Rules of the TDEC 1200-1-11-.02(1)(f)
Consolidation within area of contamination	Movement of environmental media within an area of contamination does not constitute treatment, storage, or land disposal as defined in 40 *CFR* 262.11	OSWER Directive 9347.3-05FS (July 1989)

[a]Military munitions are defined as all ammunition products used by or for national defense and security, including military munitions under the control of the U.S. Department of Defense, the U.S. Coast Guard, the U.S. Department of Energy, and National Guard personnel (40 *CFR* 260.10).

6. GOALS ATTAINMENT

When this removal action is completed, the current and potential future risk to human health and the environment will be reduced through the removal of sources of contamination from bullets and lead-contaminated soil currently located in the YS-860 Firing Ranges.

Attainment of goals for this project will be ensured when all the requirements identified in Chap. 3 are met and the project plans in Chap. 4 are following during removal activities. Oversight and documentation will be provided to ensure that removal activities are conducted in accordance with this RmAWP and the referenced project plans. In addition, the responses to the action identified in Chap. 5 outline the measures to be taken to ensure compliance with all regulatory requirements.

7. REFERENCES

DOE (U.S. Department of Energy) 1992. *Federal Facility Agreement for the Oak Ridge Reservation,* DOE/OR-1014, U.S. Environmental Protection Agency Region IV, Atlanta, GA; U.S. Department of Energy, Oak Ridge Operations, Oak Ridge, Tenn; and Tennessee Department of Environmental Protection, Nashville, Tenn.

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ENTECH, Inc. 1998f. *Waste Management Plan for the YS-860 Firing Range Removal Action, Oak Ridge, Tennessee*, Y/ER-315, Lockheed Martin Energy Systems, Inc., Oak Ridge, Tenn.

Lockheed Martin Energy Systems, Inc. 1996. *Y-12 Analytical Services Organization Official Report, Oak Ridge, Tennessee.*

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