

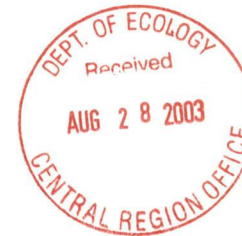
# Closure Certification Report for the Unserviceable Munitions Treatment Unit

Yakima Training Center  
Washington

August 2003



Prepared for:  
Fort Lewis  
Environmental and Natural Resources Division  
Fort Lewis, Washington



CLOSURE CERTIFICATION REPORT  
FOR THE UNSERVICEABLE MUNITIONS  
TREATMENT UNIT

YAKIMA TRAINING CENTER  
WASHINGTON

Prepared for  
Fort Lewis  
Environmental and Natural Resources Division  
Fort Lewis, Washington

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## ACRONYMS

COPC	Chemical of Potential Concern
DQI	Data Quality Indicator
EOD	Explosive Ordnance Disposal
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MTCA	Model Toxics Control Act
QC	Quality Control
RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
STL	Severn Trent Laboratories
UMTU	Unserviceable Munitions Treatment Unit
UXO	Unexploded Ordnance
WAC	Washington Administrative Code
WDOE	Washington Department of Ecology
YTC	Yakima Training Center

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Fort Lewis, the largest Army base in the Pacific Northwest, is part of the Forces Command and serves primarily as an Army training base. Fort Lewis is the owner of Yakima Training Center (YTC), a 324,000-acre training facility that has multiple maneuver areas and live firing ranges. Currently, training activities at YTC involve movement of troops, firing of artillery into "impact zones," range operations, drills for all branches of the military, and testing of military equipment. YTC is located in the south-central part of Washington in Yakima and Kittitas Counties, approximately 100 miles east-southeast of Fort Lewis. The primary users of YTC are the various units stationed at Fort Lewis, together with other U.S. Department of Defense installations and National Guard and Reserve units from Washington and Oregon.

The Unserviceable Munitions Treatment Unit (UMTU), located on Range 14 of YTC, has been used to thermally treat various propellant, explosive, and pyrotechnic items that have exceeded their shelf life or life cycle utilization, as well as off-specification versions of these same materials. The UMTU, which contains both open burning and open detonation areas, has been in operation since 1970 under the management of YTC. The U.S. Army decided to discontinue treatment operations at YTC and prepared a Resource Conservation and Recovery Act closure plan in accordance with the requirements set forth in Washington Administrative Code (WAC) 173-303-610. The closure plan was approved by the Washington Department of Ecology (WDOE) on 15 May 2003. The Closure Plan is included in Appendix A.

Past site investigation activities at the UMTU were completed from August 1993 to September 2000 in order to characterize the extent of contamination as a result of thermal treatment operations being carried out at the UMTU. The clean closure performance standards used to evaluate the analytical results from these site investigations were either the Model Toxics Control Act (MTCA) concentrations provided in WAC 173-340-900 (Table 740-1) or the risk-based concentrations calculated using the equations provided in 173-340-740 (unrestricted land use soil cleanup standards) assuming a child resident exposure. A review of the analytical data indicated that all chemicals of potential concern (COPCs) were within the risk-based clean closure performance standards with the exception of nitroglycerin, which exceeded the clean



closure standard (71 mg/kg) in a single sampling location (hot spot) from the September 2000 sampling event.

As part of the closure activities, grab surface soil samples were collected from the suspected hot spot on 30 June 2003 using a random start systematic sampling strategy. The analytical results were then compared to the risk-based cleanup level of 71 mg/kg to determine whether the existing nitroglycerin concentration represents a potential exposure hazard to human and/or environmental receptors via the direct exposure pathways. The results indicate that all the samples were below the cleanup level; therefore, the site could be clean closed without any soil removal/treatment. The Work Plan used for the closure sampling activities is provided in Appendix B.

## 2.0

### SUMMARY OF CLOSURE ACTIVITIES

Multiple site investigations were completed between August 1993 and September 2000 in order to characterize the extent of contamination as a result of thermal treatment operations being carried out at the UMTU. These site activities included surface and subsurface soil sampling, sediment sampling, as well as groundwater sampling from the monitoring well network located near the UMTU.

The closure performance standards listed in WAC 173-303-610 require Fort Lewis/YTC to close the UMTU in a manner that minimizes the need for further maintenance; controls, minimizes, or eliminates the post-closure escape or hazardous waste and/or hazardous waste constituents to the ground, surface water, groundwater, and atmosphere to the extent necessary to protect human health and the environment; and returns the land to the appearance and use of surrounding land areas to the degree possible. The regulations also require that the levels of hazardous waste and/or hazardous waste constituents remaining on-site do not exceed the numeric cleanup levels calculated using residential exposure assumptions according to the MTCA Regulations (WAC 173-340). Primarily, these will be published numeric cleanup levels (MTCA Method A) or cleanup levels calculated according to MTCA Method B.

In order to determine whether the site was in compliance with the closure performance standards, the analytical results from all previous sampling events were evaluated against the MTCA concentrations. A review of the analytical data indicated that all COPCs were within the clean closure performance standards with the exception of nitroglycerin, which exceeded the soil clean closure standard (71 mg/kg) in a single sampling location (hot spot) from the September 2000 sampling event. Therefore, YTC proposed pre-closure sampling of the hot spot to determine whether the current concentration of nitroglycerin was less than the clean closure standard. If the analytical results of the pre-closure sampling indicated that current concentrations exceed the clean closure standard, soil would be removed from the area down to the point of compliance. The results of closure sampling conducted at the UMTU on 30 June 2003 indicate that all the samples were below the cleanup level; therefore, the site was clean closed as is.

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### **3.0 SAMPLING DATA AND ANALYSES**

As discussed above, only one soil sample exceeded the appropriate closure performance standard – nitroglycerin collected from the surface soil. Therefore, a set of surface soil samples was collected from the suspected hot spot. The soil samples were analyzed using Method 8332 (nitroglycerin by high performance liquid chromatography).

#### **3.1 Sample Locations**

The sample locations were based on a systematic soil sampling strategy that could be used to statistically analyze the sample results. Using maps from previous sampling events and field markers located adjacent to the UMTU, the sampling team members triangulated the location of the hot spot. A 15 × 15-ft sampling grid was marked off and the first sampling location chosen randomly. All subsequent sampling locations were identified using the sampling grid presented in Figure 3-1. A copy of the field notes, which discuss the triangulation to identify the hot spot, is provided in Appendix C.

#### **3.2 Sampling Methods**

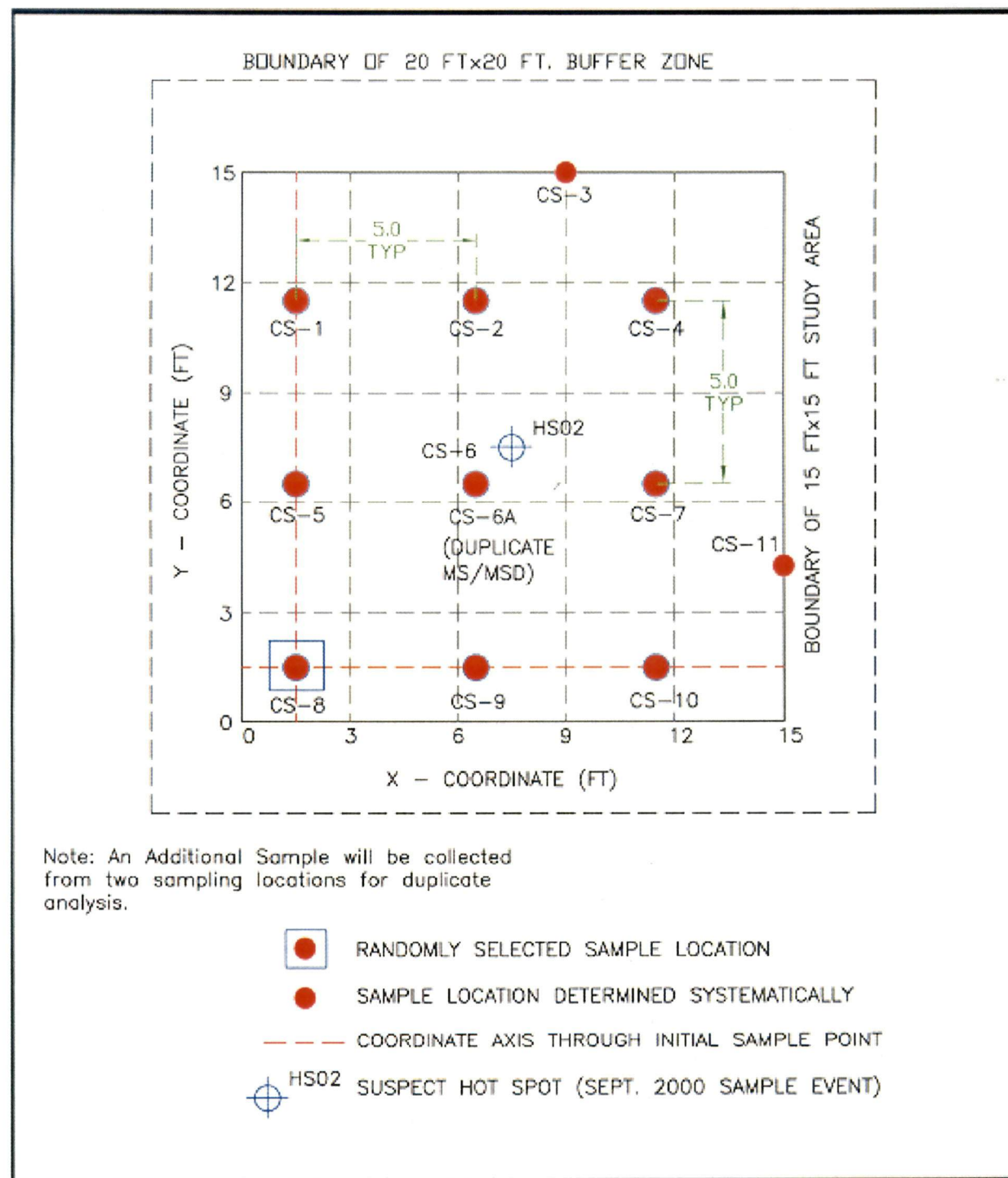
The soil samples were collected from the top 6 in. of soil using disposable spoons. A total of 11 primary soil samples were collected from within the designated sampling grid; 3 additional soil samples were collected and identified as a duplicate, a matrix spike (MS), and a matrix spike duplicate (MSD). A liquid equipment blank was also collected by collecting distilled water that had been rinsed over the decontaminated sampling equipment. Each sample was placed directly into the labeled sample bottle shipped to the site from the analytical laboratory and then into the shipping cooler, along with the necessary chain-of-custody forms.

#### **3.3 Analytical Procedures**

The soil samples were analyzed by Severn Trent Laboratories (STL), located in Knoxville, Tennessee, which has certification in the state of Washington (DOE Lab #C120). The samples were analyzed using SW-846 Method 8332 for nitroglycerin. The extraction procedures



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**Figure 3-1. Investigation Area and Sample Locations**



for this method allowed a rapid turnaround of preliminary results, which were required in order to minimize the down time of the field team. The reporting limit (2.5 mg/kg) for Method 8332 was well below the required action level (71 mg/kg) concentration.

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#### **4.0 DISCUSSION OF ANALYTICAL RESULTS**

Nitroglycerin was not detected in any of the soil samples collected from the site. Likewise, nitroglycerin was not detected in the equipment blank. The samples were received at 7°C, slightly above the recommended temperature of 4°C. However, due to the low volatility of nitroglycerin, the non-detect levels reported by the laboratory should be indicative of actual sample concentrations. All holding times and quality control (QC) criteria were met and the test results were in compliance with all applicable National Environmental Laboratory Accreditation Conference requirements.

The data were evaluated against six criteria in order to determine whether they meet the project-specific data quality objectives and contract requirements.

##### **4.1 Review of Reports**

The data and documentation associated with the project were reviewed and compared to the Sampling and Analysis Plan (SAP). The sampling methods and sample locations were confirmed, based on the notes received from the field team. The data package provided by the laboratory was reviewed and the analytical results, reporting limits, and narrative explanation of the data review used by the laboratory were confirmed.

##### **4.2 Documentation**

The chain-of-custody records were reviewed to ensure that the sample numbers and sampling dates had been recorded. The sample numbers were also compared to the hand-drawn sample map provided in the field notes to ensure sample results could be related to a specific sampling location.

#### **4.3        Data Sources**

The minimum analytical data requirement for closure sampling is the use of an approved analytical technique for obtaining soil sample results. All samples were analyzed using SW-846 Method 8332 for nitroglycerin. No field samples were collected for this effort.

#### **4.4        Analytical Method and Detection Limit**

All the sample results were reported as non-detected; therefore, the reported quantitation limits were verified to ensure that they were lower than the concentration of concern. The level of concern for this evaluation is 71 mg/kg, well above the laboratory reporting limit of 2.5 mg/kg.

#### **4.5        Data Review**

The sample results were reviewed by the laboratory in accordance with the items listed in the STL Knoxville High-Pressure Liquid Chromatography Data Review/Narrative Checklist. During the review, STL Knoxville noted the following:

- All project requirements were met;
- All sample identifications, preparation factors, and dilution factors were verified;
- All sample analyses were completed within preparation and analytical holding times;
- All surrogates were within QC limits;
- All peaks were checked for saturation;
- The lab control sample was performed and all analytes were within laboratory established QC limits;
- The method blank was run, all surrogate recoveries were met, and all analytes present in the method blank were less than the reporting limit; and
- An MS/MSD run was completed and all recoveries and relative percent differences (RPDs) were within laboratory generated control limits.



#### 4.6

#### Data Quality Indicators

Data quality indicators (DQIs) were used to confirm the usability of the analytical results for clean closure verification. The following DQIs were assessed:

- **Completeness:** The minimum number of samples required to determine compliance with the clean closure was determined assuming a statistical evaluation of the analytical results. This statistical analysis indicated that a minimum of 10 samples would be necessary; therefore, the SAP discusses the collection and analysis of 11 primary samples. The field team was able to collect eleven samples and the laboratory successfully analyzed (i.e., the data generated were determined to be acceptable measurements) for all samples.
- **Comparability:** Only the data from the pre-closure sampling event were considered for evaluating compliance with clean closure standards. The previous data were only used to determine the pre-closure sampling strategy, which was approved by WDOE.
- **Representativeness:** The field sampling plan, field notes, and data packages were reviewed to ensure that the data meet the performance standards of the method. Holding times, sample preservation, extraction procedures, and the results from analysis of the blanks indicate that the data are representative of the conditions at the site.
- **Precision:** Precision was calculated using the results from the duplicate field laboratory sample analyses and is expressed as RPD. Since all samples were non-detect, there are no numerical values that can be used to calculate the RPD. However, precision refers to the distribution of a set of reported values about the mean (the closeness of agreement between individual test results). Therefore, assuming the concentration of nitroglycerin in both samples is equivalent to the reporting limit of 2.5 mg/kg, the precision would be acceptable.
- **Accuracy:** Accuracy was determined from spiked samples and is expressed as percent recovery. The percent recovery for the soil and water spiked samples was 93% and 85%, respectively. These values fall within the 50% to 140% measurement quality objective stated in the SAP.
- **Data Qualifiers:** None of the sample results have qualifiers indicating that the precision and accuracy are acceptable or due to performance requirements in the sample.

#### 4.7

#### Data Summary

Table 4-1 summarizes the sample results. Raw data are provided in Appendix D.

Table 4-1

Analytical Results for Pre-Closure Sampling at the UMTU

Item	Sample Number	Media	Results	Reporting Limit
Primary Samples				
1	CS-1	Soil	ND	2.5 mg/kg
2	CS-2	Soil	ND	2.5 mg/kg
3	CS-3	Soil	ND	2.5 mg/kg
4	CS-4	Soil	ND	2.5 mg/kg
5	CS-5	Soil	ND	2.5 mg/kg
6	CS-6	Soil	ND	2.5 mg/kg
7	CS-7	Soil	ND	2.5 mg/kg
8	CS-8	Soil	ND	2.5 mg/kg
9	CS-9	Soil	ND	2.5 mg/kg
10	CS-10	Soil	ND	2.5 mg/kg
11	CS-11	Soil	ND	2.5 mg/kg
QC Samples				
12	CS-6A (Field Duplicate)	Soil	ND	2.5 mg/kg
13	MS/MSD (1)	Soil	Percent recovery (NG) = 87	
14	MS/MSD (2)	Soil	Percent recovery (NG) = 74; RPD = 15	
15	Equipment Blank	Water	ND	500 ug/L



## **5.0 DEVIATIONS FROM APPROVED CLOSURE PLAN**

The closure activities were conducted in accordance with the Closure Plan (Appendix A) as it was approved by WDOE, with the exceptions discussed below.

### **5.1 Field Team Personnel**

The sampling team discussed in the closure plan consisted of one geologist in the role of field task leader/chemical QC representative, an Explosive Ordnance Disposal (EOD) technician in the role of the safety officer, and YTC personnel providing any unexploded ordnance (UXO) support if it became necessary (e.g., excavation of the soil). However, due to the deployment of YTC EOD personnel after the closure plan was approved, URS was asked by Fort Lewis to assume the UXO support role. In order to meet this requirement, an additional UXO technician was selected for the field team in place of the geologist. However, prior to mobilization of the field team, the geologist developed a field work plan/checklist that UXO technicians were able to use to ensure all proper sampling procedures were followed.

### **5.2 Hot-Spot Identification**

Subsequent to the development and approval of the closure plan it became apparent that the sampling coordinates recorded during the September 2000 sampling event were no longer available. However, the field team was able to triangulate the sampling location (HS02) using a map of the 2000 sampling locations, the marker for monitoring well 1, and the sampling stake for HS01.

### **5.3 Field Split Sample Collection**

The sample matrix presented in the closure plan indicated the collection of a field split sample in the event that WDOE decided to collect an additional sample and send it to a quality assurance laboratory of their choice. However, WDOE opted not to participate in the sampling event. In lieu of the field split, an additional MS/MSD was collected and sent to STL for QC analysis. In addition, Table 4-1 did not list an equipment blank as part of the sample

matrix. However, one equipment blank was collected and submitted to STL to assess incidental contamination that may have occurred during sampling. No de-ionized water was available at the site; therefore, the equipment blank was collected using distilled water.

#### **5.4        Soil Survey**

The closure plan states that the approximate location of all sampling points will be documented and that the exact locations will be surveyed. The sample locations were recorded in the field logbook in order to match the analytical results to each sampling location. However, a soil survey was not completed since the basis for the survey is typically to define data gaps and identify future data needs, issues that are not relevant to closure of the UMTU.

#### **5.5        Sample Receipt Temperature**

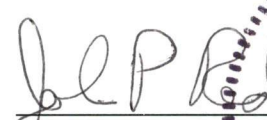
The sample cooler temperature specified in the SAP is 4°C. However, due to shipping errors on behalf of the overnight carrier, the temperature of the samples upon arrival at the laboratory was 7°C. The laboratory notified URS of the discrepancy and, upon URS' approval, continued with the analysis as scheduled. Due to the low vapor pressure of nitroglycerin (1.2 E-04 mm at 20°C) and the volatility by weight percent (negligible at 20°C), the concentration in the soil at 4°C (39°F) is not expected to be considerably different at 7°C (45°F). Therefore, the non-detect concentrations reported by STL are considered acceptable and within Method 8332 analytical test procedures. The corrective action report is included in Appendix C.

Due to the short duration of the sampling effort (all samples were collected within one day), the notes recorded in the field logbook will serve as the daily chemical QC report discussed in Section 9 of the Field Sampling Plan. A copy of the field notes is also provided in Appendix C.

## CERTIFICATION

In accordance with the requirements of WAC 173-303-610(6), I hereby certify that the Unserviceable Munitions Treatment Unit at Yakima Training Center has been closed in accordance with the closure plan approved by the Washington Department of Ecology in May 2003. This certification also applies to the information provided in the closure report submitted herewith.

*I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who managed the closure, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

  
John P. Reddy, E.E.  
Senior Project Engineer  
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