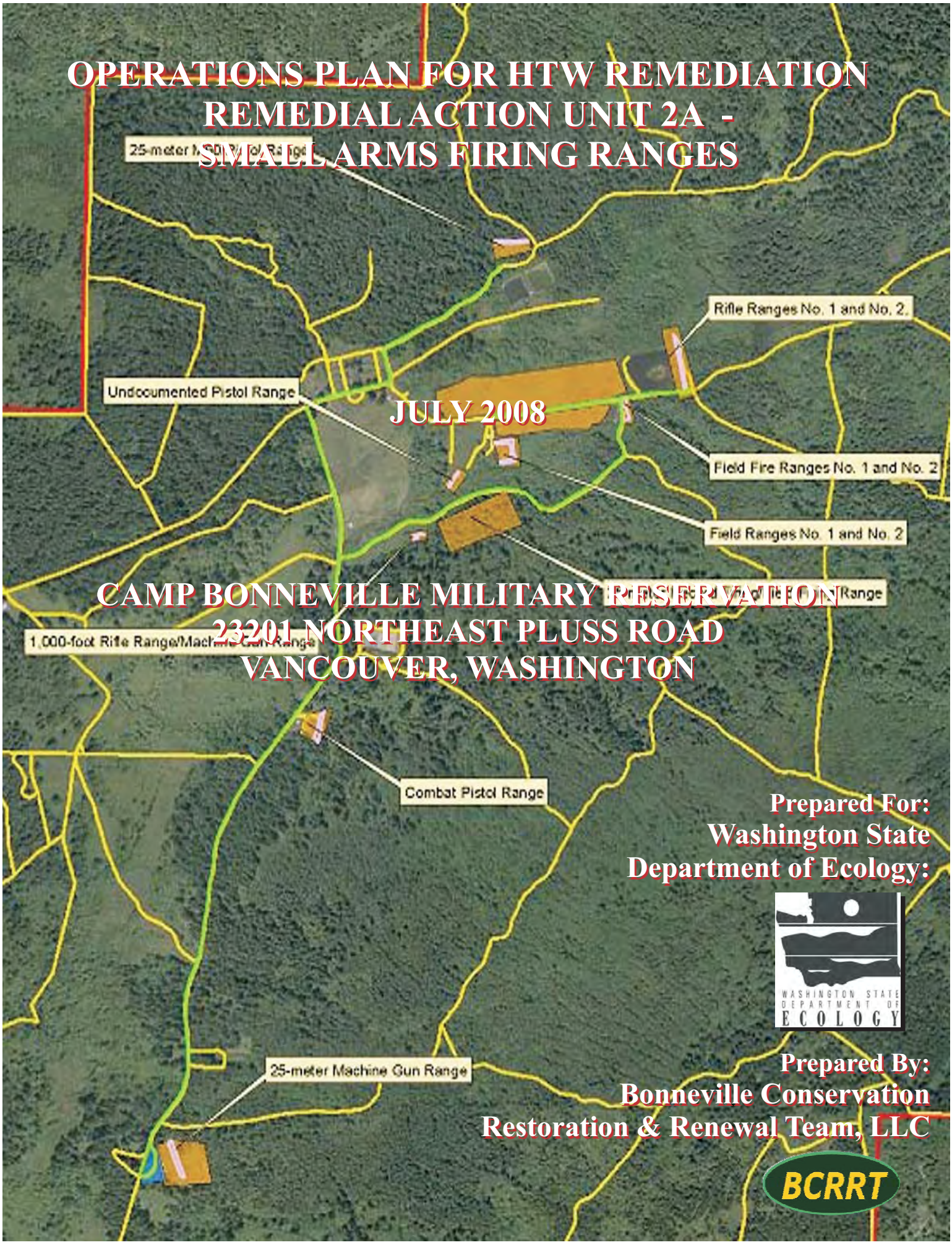
OPERATIONS PLAN FOR HTW REMEDIATION
REMEDIAL ACTION UNIT 2A -
SMALL ARMS FIRING RANGES



JULY 2008

CAMP BONNEVILLE MILITARY RESERVATION
23201 NORTHEAST PLUSS ROAD
VANCOUVER, WASHINGTON

Prepared For:
Washington State Department of Ecology:

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BCRRT

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ACRONYM LIST

AEM	Atlanta Environmental Management, Inc.
ASTM	American Society for Testing and Materials
BCRRT	Bonneville Conservation Restoration and Renewal Team
Bgs	below ground surface
BRAC	Base Realignment and Closure
CAP	Cleanup Action Plan
CBMR	Camp Bonneville Military Reservation
CM	Construction Site Manager
DNR	Department of Natural Resources
FTL	Field Team Leader
GPS	Global Positioning System
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MTCA	Model Toxics Cleanup Act
OP	Operation Plan
PE	Project Engineer
PM	Project Manager
PPCD	Prospective Purchase Consent Decree
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
RAU	Remedial Action Unit
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation Feasibility Study
SAR	Small Arms Range
SC	Special Condition
SUXOS	Senior Unexploded Ordnance Supervisor
TAT	Turnaround time
TCLP	Toxicity Characteristic Leaching Procedure
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
WDOE	Washington State Department of Ecology

1.0 EXECUTIVE SUMMARY

This operation plan (OP) has been prepared to outline the proposed cleanup actions at firing ranges located within Camp Bonneville Military Reservation (CBMR). CBMR comprises approximately 3,840 acres and is located in southwestern Washington, approximately 10 miles northeast of Vancouver, Washington. The Department of the Army used Camp Bonneville for live fire of small arms, assault weapons, artillery, and field and air defense artillery between 1910 and 1995. Since 1947, Camp Bonneville has also provided training for a variety of military and nonmilitary units from the National Guard, Reserves, and U.S. Air Force to federal, state, and local law enforcement agencies. Camp Bonneville includes approximately 820 acres of land leased from the state of Washington Department of Natural Resources (DNR).

In July of 1995, Camp Bonneville was selected for closure under the 1995 Base Realignment and Closure (BRAC) process. In October 2006 the Army transferred ownership of the property to the County which subsequently transferred the land to the Bonneville Conservation Restoration and Renewal Team. LLC (BCRRT). The BCRRT will hold the deed of the property during investigation and clean-up activities at the site. The Washington State Department of Ecology (WDOE) is the lead regulatory agency with primary responsibility to oversee the cleanup actions performed by BCRRT.

The site is being cleaned up under the Washington State cleanup law, the Model Toxics Cleanup Act (MTCA). Per MTCA the cleanup standards for lead in soil, the only contaminant of concern for this cleanup action, is 50 mg/Kg (total lead) and 5 ppm (leachable lead). For cleanup purposes, Camp Bonneville has been divided into five remedial action units (RAUs). These units are primarily grouped by the nature of the particular release, not by physical boundaries. The cleanup action discussed in this plan is proposed for the sub-unit RAU2A. The RAU2A consisted of 21 small arms ranges (SAR) areas out of which 9 firing ranges were slated for this cleanup action. These nine areas are shown on Figure 1 (**Appendix A**).

From February 2003 to October 2006, the Army conducted investigations and cleanup actions at Camp Bonneville under an Enforcement Order issued by WDOE. During these investigations, the extent of lead contamination on the range floors of these ranges was identified and delineated. The general objective of the cleanup action for sub-unit RAU-2A (described as consisting of 21 small arms range [SAR] areas) is the “excavation and removal of lead contaminated soil” from nine small arms ranges. These ranges have been identified in the Prospective Purchase Consent Decree (PPCD) entered on October 13, 2006, the Final Remedial Investigation Feasibility Study (RI/FS) Report for RAU 2A (Baker, 2007) and the Final Cleanup Action Plan (CAP) Small Arms Ranges (RAU2A) (Baker, 2008).

These documents also identify lead as the only contaminant of concern for the nine small arms ranges listed below:

1. Combat Pistol Range (RAU-2A-4);
2. Undocumented Pistol Range (RAU-2A-15);
3. 1,000-inch Rifle Range and Machine Gun Range (RAU-2A-16);
4. 25-meter M60 and Pistol Range (RAU-2A-17);
5. 25-meter Machine Gun Range ((RAU-2A-18);
6. 25-meter Record Firing Range and Field Firing Range (RAU-2A-19);
7. Field Firing Ranges ((RAU-2A-20);
8. Rifle Ranges No.1 and No.2 (RAU-2A-21); and
9. Field Fire Ranges No.1 and No.2 (RAU-2A-22).

Analysis of results from previous investigative studies has identified areas with localized elevated lead concentrations (exceeding MTCA standards) associated with the range floors as requiring remediation. In addition the berms associated with 8 of the 9 ranges have also been identified as requiring cleanup. This cleanup action involves a combination of excavation, screening, stabilization, sampling and disposal (in accordance with RCRA and MTCA standards and guidelines) either on or off-site. In addition alternate actions are proposed within certain areas (referred to as special conditions) where cleanup actions cannot be implemented.

2.0 STATEMENT OF REMEDIAL ACTION OBJECTIVES (RAOs)

The objectives of the cleanup actions planned for each of the nine SARs are summarized below. As outlined in the final CAP for RAU2A the technical approach for the remediation of the firing ranges includes a combination of excavation, screening, stabilization, sampling, re-grading activities, and disposal of potentially MTCA contaminated soil.

The locations of these nine SARs within Camp Bonneville are mapped on Figure 1 (**Appendix A**). The technical approach for the remediation of all range floors, berms, and pop up targets within these nine SARs is presented below and is per the final CAP for RAU2A. Cleanup actions for all areas selected for remediation are as follows:

- For all locations on the range floor, the average concentration of total lead will be used to determine the size of a square grid pattern which will be remediated to a depth of 6-inches bgs. The grid sizes will be :
    - For all grids where average lead concentration is higher than 50 mg/Kg but is equal to or less than 118 mg/Kg, the grid size will be 29 square feet;
    - For all grids where average lead concentration is higher than 118 mg/Kg but less than 250 mg/Kg, the grid size will be 58-square feet;
    - For all grids where average lead concentration is higher than 250 mg/Kg, the grid size will be 130 square feet;
- Accordingly, the lead concentration in the individual samples will be used to determine the sequence of excavation within each grid. The presumably RCRA soils (which are the soils that are directly impacted by the firing activity) will be excavated and managed first, followed by the MTCA soils (total lead concentrations greater than 50 mg/Kg).
- Following excavation, samples will be collected to confirm the concentration of lead. If the concentration of lead in the confirmation samples exceeds 50 mg/Kg, additional excavation will be performed in the form of step outs. These step-outs will be performed in 6-inch lifts and the size of the excavation will be based on guidelines used to determine size of the initial excavation areas. Step-outs will be continued until the contamination has been delineated and removed.
- It is assumed that the face of the berm (top 6-18 inches), which is directly impacted by the firing activity has the greatest potential to have high lead concentrations (presumably categorized as RCRA soils). The face of the berm is also typically laden with lead bullets/shots/fragments, which are all indicative of potential lead contamination. As such, it is assumed that visual observation can aid in determining the degree of contamination.
- All excavation will be performed along the face of the berm (upper layer of presumably RCRA and MTCA soils). After the first 24-inches (first 12-inches of RCRA and next 12-

inches of MTCA) are removed; additional soil will be removed in 6-inch lifts until visual observations (i.e. lead bullets or bullet fragments seen on the surface of the excavation) rule out the need for further excavation. This will further be validated by the confirmatory sampling that will follow the excavation of the contaminated material.

- The 12-inch layer of soil immediately beneath the "presumably RCRA soils" that does not show presence of significant quantities of lead bullets/shots/fragments is assumed to be the MTCA regulated soils (that have lead concentrations greater than 50 mg/Kg). Previous investigative assumptions may not have identified potential areas of contamination because of the vegetation barrier on the surface.
- A 30 square foot area around pop-up target bases will be excavated to a depth of 6-inches bgs.

The areas selected for cleanup actions on the range floor, berms, and pop-up targets for each range are shown on Figures 2 through 9 in **Appendix B**.

2.1 RAU2A-4 - Combat Pistol Range

The common name for the range RAU2A-4 is the "Combat Pistol Range". The scope of work at this range requires the excavation of approximately 1,015 cubic yards of soil from sections of the berm, around concrete pop up target bases and the range floor. These excavation areas are shown on Figure 2 and summarized as follows:

- Berm removal – Soil will be excavated along the natural slopes of the berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed following the requirements included in **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Concrete pop targets – Excavation of soil around 42 concrete pop up target bases. The concrete bases will be dismantled, cleaned of native soils, and disposed as construction debris. The pop up target bases for this range are arranged in an irregular pattern within close proximity of each other. Based on the density of the pop ups, the outer boundaries of all pop ups that lie along the periphery of the range floor are used as the outline for excavation. This polygonal outline is shown as a red line on Figure 2. After removal of target pop up bases, the entire polygonal shaped boundary will be excavated to a depth of 6-inches.
- Range Floor – Three 29-foot x 29-foot square areas on the range floor will be excavated to a depth of 6-inches bgs. However, these areas fall outside the boundary of the range. As documented in previous investigative studies (AEM, 2005), the lead concentration in these areas is less than the MTCA residential level (less than 250 mg/Kg). Additionally,

the extent of the contamination is confined to a 29-foot by 29-foot square area. Since these areas fall outside the boundary of the range, are south of the firing line, and within the area of cultural concern (Area F), these will be re-sampled and analyzed to confirm and document the concentration of total lead (Please refer to **Appendix C** for details of sampling activities in areas with special conditions)..

2.2 RAU2A-15 - Undocumented Pistol Range

The common name for the range RAU2A-15 is the "Undocumented Pistol Range". The scope of work in this range requires the excavation of approximately 50 cubic yards of soil from sections of the berm and the range floor. These excavations are shown on Figure 3 (**Appendix A**) and summarized as follows:

- Berm Removal – Soil (with identified lead concentrations exceeding RCRA and MTCA limits) will be excavated from the free-standing earthen berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed following the requirements included in **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Range Floor – Two areas within the range floor will be excavated in a 29-foot x 29-foot square pattern to 6-inches bgs. Soil exceeding total lead concentration of 50 mg/Kg will be managed following the requirements included in **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. However both these areas fall outside the boundary of the range floor, north-east of the firing line. These areas qualify as special conditions and will be re-sampled and analyzed to confirm and document the concentration of total lead (Please refer to **Appendix C** for details of sampling activities in areas with special conditions).

2.3 RAU2A-16 - 1,000-inch Rifle Range/Machine Gun Range

The common name for the range RAU2A-16 is the "1,000-inch Rifle Range/ Machine Gun Range". The scope of work requires excavation of approximately 850 cubic yards of soil from sections of the berm and the range floor. These excavations are shown on Figure 4 (**Appendix A**) and summarized as follows:

- Berm Removal - Soil will be excavated along the natural slopes of the berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed following the requirements included in **Appendix B** of the Final CAP and the Waste Submission

(**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.

- Range Floor - Excavation of soil around 21 areas within the range floor. Five of the 21 areas will be excavated in a 29-foot x 29-foot square pattern to a depth of 6-inches bgs. The remaining 16 locations will be excavated in a 58-foot x 58-foot square pattern to a depth of 6-inches bgs. Most of these 16 locations are within close proximity of each other and overlap. The overlapping areas will be consolidated into one excavation. The overlapping areas form an irregular shaped polygon shown in Figure 4 (**Appendix A**). Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP.
- Five of the 16 areas (58-square foot each), fall outside the boundary of the range floor, west of the firing line. These areas qualify as special conditions and will be re-sampled and analyzed to confirm and document the concentration of total lead (Please refer to **Appendix C** for details of sampling activities in areas with special conditions).
- One area (RAU-2A-16-28-S) falls within the footprint of the berm. In this case, the berm will be remediated first (RCRA and MTCA layers along the natural slope). After this excavation is complete, the remaining portion of the range floor that falls within the boundary of the 58-square foot area will be remediated to a depth of 6-inches.

2.4 RAU2A-17 - 25-meter M60/Pistol Range

The common name for the range RAU2A-17 is the "25-meter M60/ Pistol Range". The scope of work within the range involves excavation of approximately 800 cubic yards of soil from sections of the berm and the range floor. These excavations are shown on Figure 5 and summarized as follows:

- Berm Removal - Soil will be excavated along the natural slopes of the berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Range Floor- A 29-foot x 29-foot square pattern around one area in the range floor will be excavated to a depth of 6-inches bgs. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP.

There are no special conditions associated with this range

2.5 RAU2A-18 - 25-meter Machine Gun Range

The common name for the range RAU2A-18 is the "25-meter Machine Gun Range". The scope of work within the range involves excavation of approximately 4,968 cubic yards of soil from sections of the berm and the range floor. These excavations are shown on Figure 6 and summarized as follows:

- Berm Removal - Soil will be excavated along the natural slopes of the berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Range Floor- Soil around 15 areas on the range floor will be excavated. Eleven of the 15 areas will be excavated in a 29-foot x 29-foot square pattern to a depth of 6-inches bgs. Three of the 15 areas will be excavated in a 58-foot x 58-foot square pattern to a depth of 6-inches bgs. One of the 15 areas will be excavated in a 130-foot x 130-foot square pattern to a depth of 6-inches bgs.
- The three 58-square foot areas are within close proximity of each other and overlap forming an irregular shaped polygon. These areas are shown on Figure 6 (**Appendix A**).
- One 130-square foot area falls within the footprint of the berm. In this case, the berm will be remediated first (soil with lead concentrations exceeding RCRA and MTCA limits will be removed in layers). After the berm is excavated, the remaining portion of the range floor that falls within the boundary of the 130-square foot area will be excavated to a depth of 6-inches bgs.

There are no special conditions associated with this range.

2.6 RAU2A-19 - 25 meter Record Firing Range

The common name for the range RAU2A-19 is the "25-meter Record Firing Ranges". The scope of work for this range requires excavation of approximately 553 cubic yards of soil from sections of the range floor. These excavations are shown on Figure 7 and summarized as follows:

- Berm Removal – No berms are associated with this firing range
- Range Floor- Excavation of soil in five areas. Three of the five areas will be excavated in a 29-foot x 29-foot square pattern to a depth of 6-inches bgs and two of the five areas will be excavated in a 130-foot x 130-foot square pattern to a depth of 6-inches bgs.

- Two 130-square foot areas are within close proximity of each other and overlap forming a rectangular shaped polygon shown on Figure 7 (**Appendix A**). Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP.

There are no special conditions associated with this range.

2.7 RAU2A-20 - Field Firing Range

The common name for the range RAU2A-20 is the "Field Firing Ranges". The scope of work for this range requires excavation of approximately 550 cubic yards of soil from sections of the berm and the range floor. These excavations are shown on Figure 8 and summarized as follows:

- Berm Removal - Removal of soil from this free-standing earthen berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Range Floor- Soil in five areas of the range floor will be excavated. One of the five areas will be excavated in a 29-foot x 29-foot square pattern to a depth of 6-inches bgs, three of the five areas will be excavated in a 58-foot x 58-foot square pattern to a depth of 6-inches bgs, and one of the five areas will be excavated in a 130-foot x 130-foot square pattern to a depth of 6-inches bgs.

- The three 58-square foot areas are within close proximity of each other and overlap forming an irregular shaped polygon as shown on Figure 8 (**Appendix A**).

- One 130-square foot area falls within the footprint of the berm. In this case, the berm will be remediated first (RCRA and MTCA layers), after which the remaining portion of the range floor that falls within the boundary of the 130 square foot area will be excavated to a depth of 6-inches bgs.

All areas associated with this range qualify as special conditions since the range floor is under standing water and excavation in this area would cause significant negative impacts on wetlands or riparian areas. Therefore, this area will not be excavated. These areas are further discussed in **Appendix C** and will be re-sampled and analyzed to confirm and document the concentration of total lead (Please refer to **Appendix C** for details of sampling activities in areas with special conditions).

2.8 RAU2A-21 - Rifle Ranges No. 1 & No. 2

"The common name for the range RAU2A-21 is the "Rifle Ranges No.1 & No.2". The scope of work requires the excavation of approximately 1,850 cubic yards of soil from sections of the berm, around concrete pop up target bases, and the range floor. These excavations are shown on Figure 9 and summarized as follows:

- Berm Removal - Removal of soil from the free standing earthen berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Concrete pop targets – Soil around 14 concrete pop up target bases will be excavated. Soil exceeding total lead concentration of 50 mg/Kg will be managed per Appendix B of the Final CAP and the Waste Submission (**Appendix D**) of this OP.
- Range Floor- Soil will be excavated from 19 areas on the range floor. Nine of the 19 areas will be excavated in a 29-foot x 29-foot square pattern to a depth of 6-inches bgs, six of the 19 areas will be excavated in a 58-foot x 58-foot square pattern to a depth of 6-inches bgs, and four of the 19 areas will be excavated in a 130-foot x 130-foot square pattern to a depth of 6-inches bgs.
- Two of the four 130-square foot areas are located in areas of the range floor that are under standing water (greater than 2-feet deep). The presence of standing water in these two areas prevents the excavation and remediation of impacted soil. These areas are further discussed in **Appendix C** and will be re-sampled and analyzed to confirm and document the concentration of total lead (Please refer to **Appendix C** for details of sampling activities in areas with special conditions).
- One of the six 58-square foot areas lies in an area of the range floor that exhibits marsh-like conditions and excavation in this area would cause significant negative impacts on wetlands or riparian areas. Therefore, this area will not be excavated. This area is further discussed in **Appendix C** and will be re-sampled and analyzed to confirm and document the concentration of total lead (Please refer to **Appendix C** for details of sampling activities in areas with special conditions).

2.9 RAU2A-22 - Field Fire Ranges No. 1 & No. 2

"The common name for the range RAU2A-22 is the "Field Fire Ranges No.1 & No.2". The scope of work within the range involves excavation of approximately 276 cubic yards of soil

from sections of the berm, around concrete pop up target bases and the range floor. These excavations are shown on Figure 9 and summarized as follows:

- Berm Removal - Excavate soil from the free-standing earthen berm. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP. First 12-inches of presumably RCRA soil will be segregated separately from the second 12-inches and possibly subsequent 6-inch lifts of MTCA soil.
- Excavate soil around 28 concrete pop up target bases. Soil exceeding total lead concentration of 50 mg/Kg will be managed per **Appendix B** of the Final CAP and the Waste Submission (**Appendix D**) of this OP.
- Range Floor- Excavate soil around three (3) areas on the range floor. Two of the three areas will be excavated in a 29-foot x 29-foot square pattern to a depth of 6-inches bgs and one of the three areas will be excavated in a 130-foot x 130-foot square pattern to a depth of 6-inches bgs .

There are no special conditions associated with this range.

3.0 INITIAL SETUP

3.1 Mobilization

- The equipment required for this cleanup action includes a screening and/or stabilization plant, front end loaders, excavators, dump trucks, air/ dust samplers, and a water truck. The required equipment will be mobilized to Camp Bonneville and staged.
- Key Field Personnel required to complete this cleanup action are heavy equipment operators, sampling technicians, a documentation specialist, and a screening/stabilization technician. All personnel will be given site and task specific training. The training will include the following topics:
    - General site orientation (facilities, access, security etc.);
    - General health, safety, and accident prevention procedures;
    - Site and task specific safety procedures;
    - Personnel protective equipment and air monitoring procedures;
    - MEC avoidance rules and procedures;
    - Erosion and sedimentation control procedures;
    - Wetlands and riparian habitat protocols;
    - Cultural resources –protocols for identification and protection of resources;
    - On-site vehicle operation protocols.
- Materials and supplies required for this cleanup action include liners/tarps (for staging piles), sampling containers, sampling equipment (scoops, bowls), packaging materials (tape, shrink wrap), sample labels, shipping seals, shipping coolers, and icepacks.

3.2 Delineation

- Global Positioning System (GPS) data for each SAR will be used to demarcate the boundary of excavation zones.
- All sensitive areas (riparian/ wetland/ cultural) will be marked. All access to the potential cultural zone in the vicinity of the combat pistol range will be restricted and monitored

3.3 Zoning

- Staging pile zones will be identified within each SAR.

- The screening/stabilization process area within the 25-meter Machine Gun Range will be established and the processing and exclusion zones will be clearly marked.

3.4 Access Routes

- Access routes from each SAR leading to the screening and stabilization process area are identified on the operations map (Figure 1).
- Access routes leading from the screening/stabilization process area to the exit gate (south gate) are identified on Figure 1.

3.5 Transportation Plan

- Pre-designated access routes will be used for all equipment and material movement during the remedial action.
- Adequate measures to ensure compliance including signage, tail-gate briefings, and monitoring. These measures will be implemented in accordance with the safety and health plan for CBMR to ensure safety of site personnel and the safe operation and movement of equipment.

3.6 Munitions and Explosives of Concern (MEC) Anomaly Avoidance

- Anomaly avoidance for MEC will be completed at nine SARs in areas that will be accessed by personnel and equipment
- Anomaly avoidance for MEC will be completed along the length of each berm being excavated
- Anomaly avoidance for MEC will be competed within each of the areas on the range floor that will be excavated as part of the cleanup.

3.6 Brush Clearance

- Undergrowth (including tress less than six inches in diameter) will be cleared using a combination of mechanical brush cutting equipment (unless these trees are located in riparian/ wetland zones) and brush clearing teams.
- Several trees (greater than six -inches in diameter) have been identified along sections of berm designated for cleanup. In order to ensure safety of personnel and equipment during operations, these trees will be removed before the start of excavation operations in these areas.

3.7 Runoff Control

Appropriate measures will be taken to minimize runoff water as specified in the Grading Permit Application and the Erosion and Sedimentation Control Plan by PBS Engineering (**Appendix B** of the Final CAP). Silt fencing will be strategically located along down gradient contours leading from the excavation areas to trap sediment runoff in to the adjoining creek or seasonal stream.

3.8 Baseline Air Monitoring

Based on the concentration of lead in soil samples in a given range established during previous investigations by AEM in 2005, air monitoring will be conducted to analyze the quality of ambient air. These baseline monitoring results at each range will be compared to background air samples captured within different areas of Camp Bonneville.

3.9 Personal Protective Equipment (PPE)

Task specific PPE will include hard hats, safety glasses, dust masks, and gloves. All personnel working within the excavation and soil handling areas will be required to wear PPE appropriate for the task they are performing. Use of PPE will be enforced at all times.

3.10 Documentation and Forms

Each aspect of the field work for this cleanup action including anomaly avoidance, brush clearance, excavation delineation operations, excavation, hauling, sampling, analysis, and disposal will be documented by assigned documentation specialists. Tracking sheets, appropriate forms, and chain of custodies will be maintained to ensure adequate documentation of tasks at various stages of the project. Blank copies of these forms are provided in Appendix B of this document. Photocopies of these records will be provided to the overseeing contractors and agencies upon request. These records will be archived at Camp Bonneville pending transfer with other project documents and records.

3.10.1 Tracking sheets

Volumes of soil processed and other pertinent parameters of progress for various tasks related to this cleanup action including brush clearance, excavation, hauling, and disposal activities will be recorded on field logs. To ensure accurate representation of progress during the course of the cleanup action, the data recorded on these logs will be transferred to excel spreadsheets on a daily basis. The following tracking logs will be used

- Field technical changes log will describe any deviations or modifications made to the technical approach due to field conditions will be recorded in a master log. The log will document details such as range name, location, reason for deviation, approving authority signature, date (identified, approved, and completed)
- Brush clearance progress logs will track brush cutting progress (mechanical & manual).
- Excavation logs will track volume of soil excavated at each SAR.
- Soil processing logs will track volume of RCRA soil that are screened and stabilized on-site.
- Disposal logs will track volume of RCRA/stabilized soil sent to landfill from each firing range. Additional tracking of MTCA soil staged for on-site disposal/ recycling at each firing range.
- Finding logs will report quantity, type, and weight/volume of any finding (MD Trash/ Cultural Resource) if encountered operations.
- Sample collection logs will report information pertaining to all waste characterization, confirmatory, and air monitoring samples collected.

3.10.2 Reporting Forms

Reporting forms will include the following (examples are provided in Appendix B):

- Sample Collection and Chain of Custody Forms – Waste characterization samples (solids), Confirmatory samples per the Baker SAP (solids), Ambient samples (air).
- Weight tickets – Weight tickets will be generated for each truckload sent to the disposal facility.
- Finding Reports – Finding reports to record details of Archeological or Cultural Resources encountered.
- Field Technical Change Memorandum – Any technical deviations or modification from this operations plan will be recorded on a technical memorandum and archived with project documents.

3.10.3 Chain- of-Custody

A chain-of-custody form will be completed for each soil sample collected to provide and record pertinent details of sample number, sample type, analysis type, collection date, collection time, sample technician name(s) and other relevant information (**See Appendix B**).

3.11 Dry Run

A practice exercise will be conducted before beginning cleanup operations to test and rehearse protocols, processes, and personnel responsibilities identified earlier to support the execution of this cleanup action in a safe and efficient manner. The practice exercise will help identify any tasks/ processes, or procedures that might need to be modified or enhanced to improve safety, environmental protection, productivity, or efficiency.

Following operations will be evaluated during the practice exercise:

- Operation of the sifter unit;
- Screen size and ability to capture brush and other debris;
- Lead bullet fragments (for both RCRA and MTCA layers).

Any observations prompting modification in screen size to increase the efficiency of the sifting procedure will be documented.

4.0 FIELD OPERATIONS

4.1 Excavation

Excavation of the berms will be conducted before excavation of the range floor. The RCRA soils will be staged in each range in a designated area for further processing. Excavated soil will be sifted at each excavation location to remove brush, debris, and lead bullet fragments before being subject to any treatment/ recycling.

The MTCA soils will be staged on site. After the final confirmation sampling results are received (as required by the WDOE) the soils will be transported to a pre-determined location (sewage lagoon ponds) within the site for disposal. The excavation of soils will be conducted as described in Section 2.0.

The excavation of several areas (identified in **Appendix C**) would cause significant negative impacts on wetlands or riparian areas. With the agreement and approval of WDOE and Clark County, soils in these areas will be re-sampled and analyzed to confirm and document the level of lead contamination.

4.2 Staging

Excavated soil will be staged within the range floor in areas approved by and in accordance with the wetlands restoration plan. Liners (polyethylene tarpaulins) will be used under the staging piles to minimize the cross contamination from excavated soils to undisturbed soils. In addition the run-off, erosion, and sedimentation controls described in Section 3.7 of this operations plan will be implemented.

4.3 Screening/ Sifting

All Category I and II excavated soil will be processed using a vibrating multi-stage screening system. The mesh size interval on the screens will be varied with a larger spacing at the top and the smallest at the bottom level per the following:

- Primary screen will have a spacing of 5-inches (to capture vegetation debris, large rocks etc);
- Secondary level will have a spacing of 3-inches (to capture smaller rocks, brush debris etc); and
- Tertiary level will have a spacing of 0.5-inches (to capture bullet fragments and other smaller media).

In addition a 0.25-inch screen will be on standby for use if visual observations indicate that lead pellets are not being successfully trapped by the 0.5-inch screen. Material trapped at each level will be removed, inspected (for Archeological and/or cultural findings) and staged in separate piles. The product captured on the 5-inch screen will be shipped off-site as vegetation debris. The product captured by the 3-inch screen, which will comprise of small rocks and bullet fragments will be staged for disposal. The product from the 0.5-inch (or the 0.25-inch) screen will be staged for stabilization treatment prior to disposal.

Removed bullets and bullet fragments will be staged securely in a designated location and recycled if economically feasible. If not economically feasible, the resulting materials containing bullet fragments may require treatment and disposition for transport and disposal. The treated soil piles will be sampled and analyzed for TCLP levels at the rate of 1 composite sample every 500 cubic yards for soil being disposal off-site and 1 composite sample every 50 cubic yards for soil being disposed/recycled on-site.

The staged soil and debris piles from each screen level will be inspected for archaeological objects and human remains. The inspections will be conducted by a Professional Archeologist (as defined by the Secretary of the Interior), or an Archeologist working under the supervision of a Professional Archeologist, accompanied by a trained UXO technician. The procedures and guidance for the inspection have been provided in the Archaeological Monitoring Plan of Lead Contaminated Small Arms Firing Ranges included as **Appendix F**.

4.4 Sampling

Confirmation of MTCA Soils (EPA Method 6010 (ICP))

Excavated soils originating from each firing range, which are categorized as suitable for on-site reuse under MTCA will be screened to capture any lead bullet fragments. One composite sample will be collected for every 50 cubic yards of soil excavated. Each composite sample will comprise of up to six soil aliquots collected at regular intervals from the tertiary level of the screening unit prior to being staged in a pile. The excavated soil will be then staged awaiting confirmation of sampling results for on-site disposal. These composite samples will be analyzed for total lead using USEPA and WDOE approved methods.

Waste Characterization of RCRA Soils (EPA Method 1310 (TCLP))

The soils originating from each range which are categorized as requiring offsite disposal will be screened and stabilized as appropriate and staged for transportation and disposal. Prior to transport for disposal at the designated off-site facility, one composite sample will be collected for every 500 cubic yards of soil. Each composite sample will consist of six soil aliquots

collected at regular intervals at the output end of the sifting and/ or stabilization process. These composite samples will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) extractable lead using USEPA and WDOE approved method.

Confirmatory Sampling

All confirmatory sampling for determination of removal action completion on range floors and berm areas will be performed by Michael Baker Jr., Inc. The protocol for all confirmatory sampling is provided as a separate document and is presented in **Appendix E**.

5.0 TRANSPORTATION

- Soil excavated and staged at each firing range for treatment and off-site disposal or on-site disposal/recycling to the sewage lagoon ponds or another area as a fill material after confirmatory sampling.
- Clean soil resulting from berm grading operations will be transported within the nine small arms ranges to be used as backfill material as needed.
- Treated RCRA soil resulting from the stabilization process will be transported offsite after confirmatory sampling under an approved waste manifest under Oregon Department of Transportation regulations to the approved disposal facility.
- Transportation routes within the different ranges and those leading to the designated off-site disposal facility (WASCO County Landfill) are shown in Figure 1 (**Appendix A**)

6.0 RCRA SOIL TREATMENT

- Staging - The excavated RCRA soils will be placed in discrete piles (within each range) segregated by excavation areas and depth zones (with possible further pile divisions as appropriate based on observations of visible particulate lead during excavation and initial handling). Each pile will be identified with a unique tracking number and its source excavation area and depth zone will be recorded on the soil tracking log. Additional field observations related to soils types and any visible lead bullets also will be recorded on this log. The pile identities and segregation will be rigorously maintained during subsequent handling for screening, testing, or disposition.

- Screening - Soils from staged piles where visible particulate lead has been observed during field work preparation, excavation, or handling or where earlier documentation (the Camp Bonneville Archive Search Report and the RI/FS for RAU2A) suggests the possible presence of lead, will be screened, separated in to staging piles, and sampled for leachable lead.

- Stabilization –All RCRA (leachable lead concentration greater than 5 mg/L) designated screened soils will be treated utilizing a proprietary reagent. Results from a treatability study (**Appendix F**) conducted on soil samples originating from one or more of the firing ranges will be used as guidance to establish rates at which the reagent will be added to the soil piles.

  During mixing of the reagent (ECOBOND®) pellets with the soil, water may be added to assist with dust control and initial dissolution of reagent. The reagent forms a chemical chain that binds with metal ions forming insoluble metal complexes. It produces a reaction that proceeds at ambient temperatures and does not produce secondary waste streams or gases. ECOBOND® can be applied in wet or dry form, in-situ or ex-situ, and increases the volume of the waste by only 1% to 5%.

  Following a 12–24 hour post-treatment curing period, a five-point composite sample from treated soil piles will be collected. Samples will be sent to a certified laboratory for lead TCLP analysis. Should sample results indicate a failure to achieve RCRA 5.0 mg/L standard based on composite sample results, the soil will be re-treated until desirable results are achieved. Standard construction equipment will be used to apply the reagent to the soils. As needed, the mixing will be accomplished using rakes or other similar hand held tools.

  Soil Sampling – One composite sample (per every 500 cubic yards) will be collected from the soil pile originated from each screen level. Each composite sample will consist

of at least five (5) soil aliquots from different stages of the screened soil pile. Sample collection, handling, analysis, and documentation procedures will be in accordance with the Section 3.0 of **Appendix C** of this OP.

- Sample Analysis: Each composite soil sample will be analyzed for Toxicity Characteristic Leaching Procedure (TCLP) extractable lead using USEPA and WDOE approved methods. Applicable protocols for QA/QC, data validation, sample holding times, and documentation will be followed (**Appendix G**).

7.0 DISPOSAL

All materials from the berms and range floors that are presumable RCRA hazardous based on the operational history of the range will be treated on-site and disposed of **Appendix B** of the Final CAP and the 'Waste Submission' (**Appendix D**) of this OP. The Waste Submission addressed to the authorized representative at the landfill facility will be prepared for those treated soils being sent for disposal to the landfill.

The waste submission will be approved by the Environmental Manager at the designated landfill facility prior to transporting soil to the landfill. Weight tickets for each truck shipment and a letter of completion (after last soil shipment) will be obtained from the landfill and archived with the project files.

All approved MTCA soils (total lead less than 250 mg/Kg and TCLP less than 5 ppm) will be transported via end dump trucks for disposal to the sewage lagoon ponds. The total maximum volume of soil based on field measurements and calculation estimates for the RAU2A cleanup is expected to be 5,000 cubic yards. Since the measured total capacity of each lagoon pond is in the vicinity of 20,000 cubic yards, the cleanup process will not generate enough dirt to completely fill either one of the two lagoon ponds.

In order to maintain the natural gradient of the areas surrounding the sewage lagoon ponds, the soil will be placed within a disposal area along the northern edge of the pond starting with the eastern corner and proceeding west. The slope of the soil placed in the pond will be engineered to ensure that it is does not contradict the natural gradient of the surrounding area promotes drainage to the south.

A 6 mL reinforced liner will be placed at the bottom and along the northern walls of the lagoon pond prior to adding soil in the disposal area. It is estimated that the MTCA soil being disposed in the lagoon pond will take up approximately one-third of the pond volume (northern portion - approximately 40 feet from the northern face). After MTCA soil has been placed, a 1-foot layer of clean soil (native soil with total lead less than 50 mg/Kg) will be placed on top of the MTCA soil.

The top layer will be compacted to at least 90 percent of the Modified Proctor Density (ASTM D1577). In addition to reduce the leaching potential due to percolation surface grading and drainage features that promote runoff of surface water from the disposal area will be implemented.

This layer provided for reducing the leaching potential will comprise of the following:

- A 1-foot thick layer comprising of granular material with reduced permeability;
- A 1-foot thick layer, overlying the low permeability layer, comprising of gravel with perforated pipes or similar water collection and discharge system;
- Filter fabric and top-soil suitable for landscaping operations to enhance and promote surface runoff.

The exposed eastern, western and southern ends of the lagoon ponds are proposed to be collapsed around the disposal area during an independent closure process to be conducted by Michael Baker Jr. Inc. Presently there is no estimated schedule for the completion of this task. However, care will be taken to ensure that the finished grade of soil after construction activity for closure of sewage ponds will synchronize with the drainage and runoff features designed to reduce leaching potential of the disposal area within the lagoon pond.

During the disposal operations, a 3 mL visqueen sheet will be placed over the soil placed in the lagoons at the end of each work day to mitigate the potential of overnight airborne transport of the MTCA soil. In addition all concrete debris originating from pop-up target bases and backstop concrete berm walls during the cleanup process will be disposed off-site.

8.0 GRADING AND SITE RESTORATION

A site restoration and grading plan has been prepared by PBS Engineering (**Appendix B** of the Final CAP). After completion of excavation and backfilling of excavated areas along the range floor and berm footprint areas, re-grading operations will be completed in accordance with the approved plan.

After re-grading operations have been approved by WDOE, appropriate site restoration (approved seed mix spread over affected areas) to minimize erosion and weed control per provisions in the grading plan will be implemented.

9.0 REFRENCES

Atlanta Environmental Management, Inc. September 2005. Final Site Investigation Report, Small Arms Ranges and Demolition Areas 2 and 3, Camp Bonneville, Vancouver, WA.

Michael Baker Jr. Inc. November 2006. Camp Bonneville Cultural and Historical Resources Protection Plan, Camp Bonneville, Vancouver, WA.

Michael Baker Jr. Inc. August 2007. Final Remedial Investigation Feasibility Study Report for RAU-2A, Camp Bonneville, Vancouver, WA.

Michael Baker Jr. Inc. January 2008. Final Cleanup Action Plan for RAU-2A, Camp Bonneville, Vancouver, WA,

Model Toxics Control Act Statute and Regulation. November 2007. MTCA Cleanup Regulation Chapter 173-340 WAC.

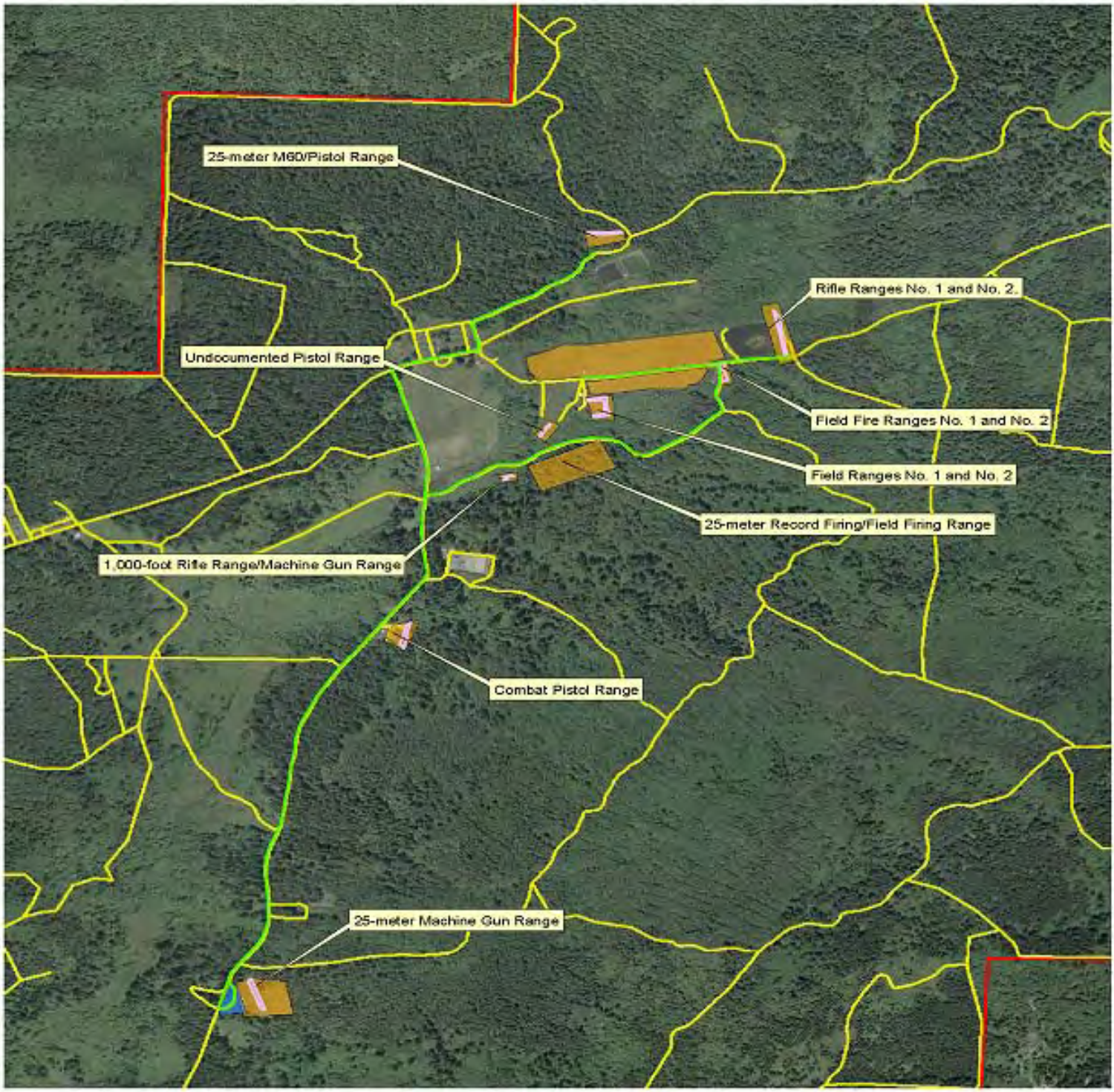
Sediment Management Standards (Chapter 173-204 WAC). Ecology Publication No.03-09-043.

WDOE and Clark County, State of Washington. October 2006. Prospective Purchase Consent Decree.

WDOE. February 2008. Sediment Sampling and Analysis Plan Appendix. Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the

APPENDIX A

MAPS AND FIGURES



Legend

- Camp Bonneville Property Perimeter
- Central Impact Target Area Perimeter
- Roads and Trails
- Access Route
- Firing Ranges Boundary
- Processing Area 1
- Berm

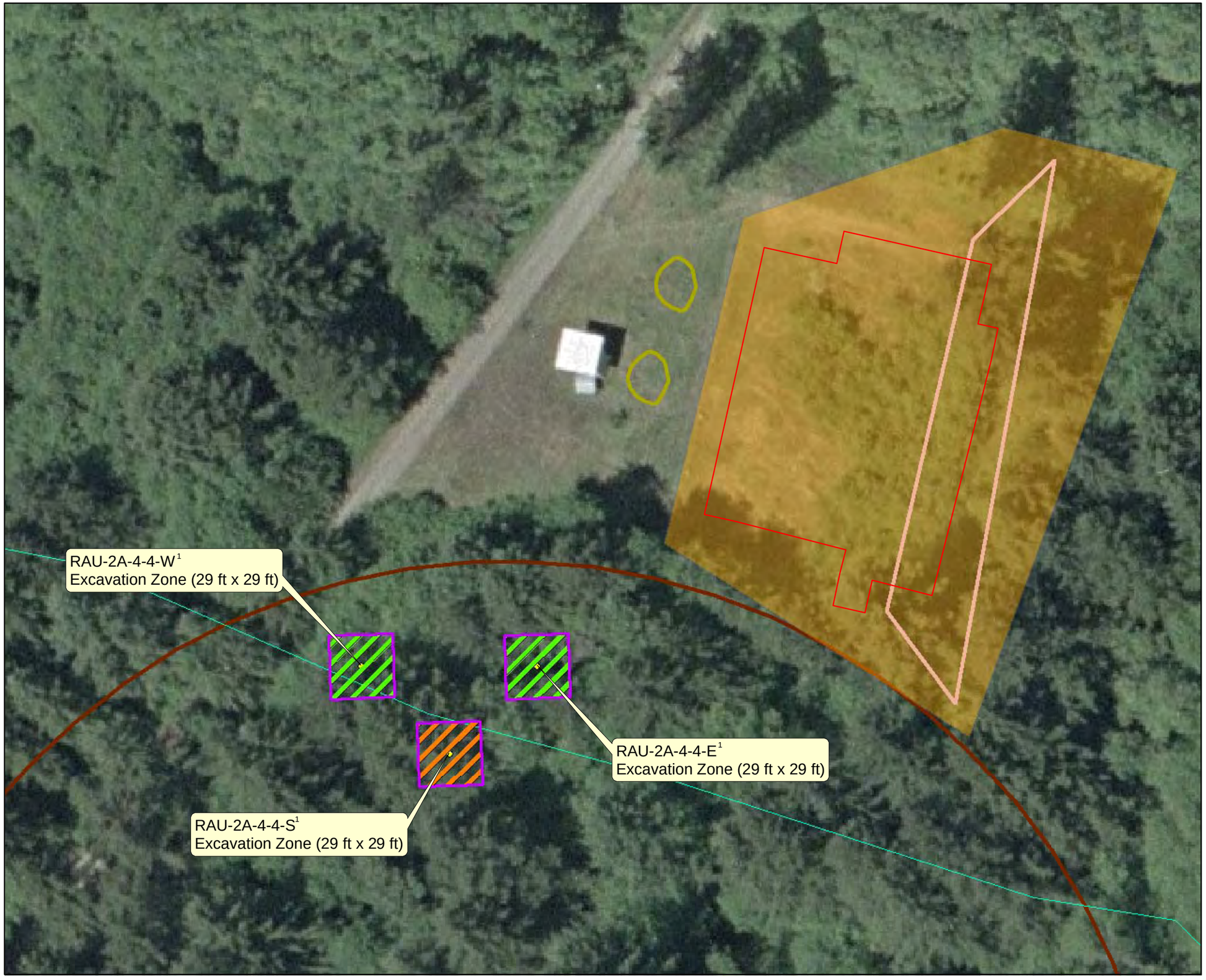
N
W E
S

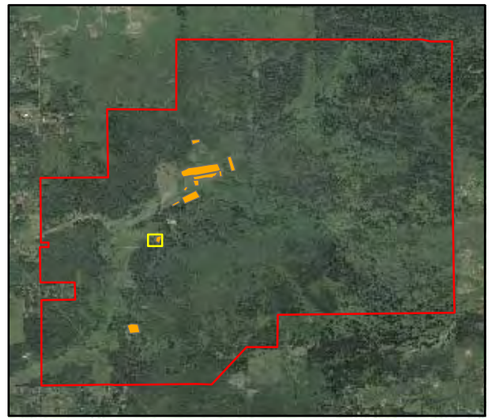
0 305 610 1,220 1,830 2,440 Feet

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

HTW SITES

Drawn On: 4/18/2007 Drawn By: QX Reviewed By: SS





Legend

- Concrete Popup Excavation Area
- Camp Bonneville Property Perimeter
- Firing Ranges
- Staging Piles
- Special Condition

Excavation Categories

- MTCA 1
- MTCA 2
- Excavation Hot Spot
- Stream
- Zone F 300 ft Buffer
- Berm Footprint (Scenario 3)

Note:

1. All excavation are 6 inches unless noted otherwise

N
W E
S

0 1,900 3,800 7,600 11,400 15,200
Feet

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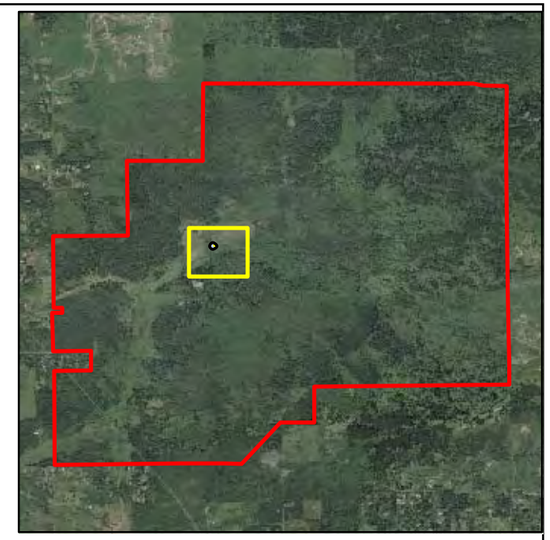
Stafford, TX 77477

Figure 2
Removal Actions at Combat Pistol Range (RAU2A-4)

Drawn On: 5/28/2008 Drawn By: QX Reviewed By: SS



Legend

- Camp Bonneville Property Perimeter
- StockPiles
- Berm

RAU2A_15_Excavation_Point_Area

Category

- MTCA 1
- MTCA 2
- RCRA
- Firing Ranges
- Excavation Hot Spot

N
W E
S

0 10 20 40 60 80
Feet

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PIKA INTERNATIONAL, INC.

Figure 3
Removal Actions at Undocumented
Pistol Range (RAU-2A-15)

Drawn On: 5/28/2008 Drawn By: QX Reviewed By: SS

RAU-2A-16-30-N
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-30-W
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-27-E
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-27-N
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-27-C
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-26-N[1]
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-26-W[1]
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-30-C
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-30-E
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-30-S
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-28-N
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-29-W
Excavation Zone (29 ft x 29 ft)

RAU-2A-16-29-C
Excavation Zone (29 ft x 29 ft)

RAU-2A-16-29-S
Excavation Zone (29 ft x 29 ft)

RAU-2A-16-28-E
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-28-C
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-28-S
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-24-N
Excavation Zone (29 ft x 29 ft)

RAU-2A-16-24-C
Excavation Zone (29 ft x 29 ft)

RAU-2A-16-26-C
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-26-S
Excavation Zone (58 ft x 58 ft)

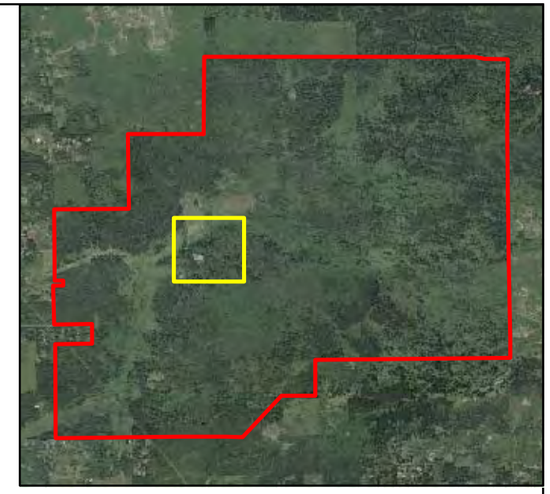
RAU-2A-16-26-E
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-27-W
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-27-S
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-28-W
Excavation Zone (58 ft x 58 ft)

RAU-2A-16-24-W
Excavation Zone (29 ft x 29 ft)



Legend

- Camp Bonneville Property Perimeter
- Firing Ranges
- Berm
- Excavation Hot Spot
- Special Condition

Excavation Categories

- MTCA 1 - 50-118 ppm lead
- MTCA 2 - 119 to 250 ppm lead
- RCRA - >250 ppm lead
- Stream

Note:

All excavation are 6 inches unless noted otherwise

N
W E
S

0 25 50 100 150 200
Feet

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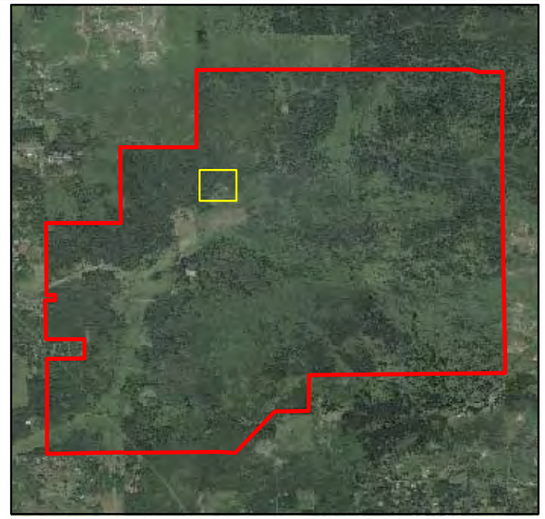
Stafford, TX 77477

PIKA INTERNATIONAL, INC.

Figure 1
Removal Actions at 1,000-ft Rifle Range/Machine Gun Range (RAU-2A-16)

(This may be the 1,000 inch range)

Drawn On: 6/16/2008 Drawn By: QX Reviewed By: ES



Legend

- Camp Bonneville Property Perimeter
- Firing Ranges
- Staging Piles
- Berm
- Excavation Hot Spot

Excavation Categories

Category

- MTCA 1 - 50-118 ppm lead
- MTCA 2 - 119 to 250 ppm lead
- RCRA - >250 ppm lead

Note:

1. Special Condition

N W E S

0 10 20 40 60 80 Feet

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Stafford, TX 77477

PIKA INTERNATIONAL, INC.

Figure 5
Removal Actions at 25-meter M60/Pistol Range (RAU-2A-17)

Drawn On: 6/16/2008 Drawn By: QX Reviewed By: SS

RAU2A-18-9-N
Excavation Zone (29 ft x 29 ft)

RAU2A-18-9-E
Excavation Zone (29 ft x 29 ft)

RAU2A-18-9-C
Excavation Zone (29 ft x 29 ft)

RAU2A-18-8-C[1]
Excavation Zone (130 ft x 130 ft)

RAU2A-18-5-N
Excavation Zone (29 ft x 29 ft)

RAU2A-18-5-W
Excavation Zone (29 ft x 29 ft)

RAU2A-18-5-S
Excavation Zone (29 ft x 29 ft)

RAU2A-18-11-N
Excavation Zone (58 ft x 58 ft)

RAU2A-18-11-W
Excavation Zone (58 ft x 58 ft)

RAU2A-18-11-C
Excavation Zone (58 ft x 58 ft)

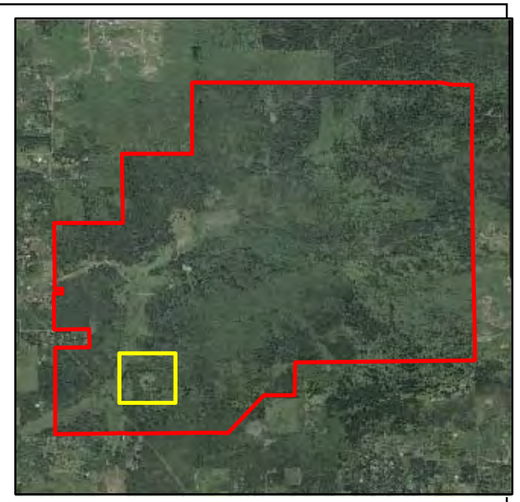
RAU2A-18-10-N
Excavation Zone (29 ft x 29 ft)

RAU2A-18-10-C
Excavation Zone (29 ft x 29 ft)

RAU2A-18-10-W
Excavation Zone (29 ft x 29 ft)

RAU2A-18-10-S
Excavation Zone (29 ft x 29 ft)

RAU2A-18-5-C
Excavation Zone (29 ft x 29 ft)



Legend

- Camp Bonneville Property Perimeter
- Firing Ranges
- Berm
- Staging Piles
- Stream
- Excavation Hot Spot
- Special Condition

Excavation Categories

- MTCA 1 - 50-118 ppm lead
- MTCA 2 - 119 to 250 ppm lead
- RCRA - >250 ppm lead

Note:

All excavation are 6 inches unless noted otherwise

N
W E
S

0 45 90 180 270 360
Feet

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PIKA INTERNATIONAL, INC.

Figure 6
Removal Actions at 25 meter Machine Gun Range (RAU-2A-18)

Drawn On: 5/28/2008 Drawn By: QX Reviewed By: SS

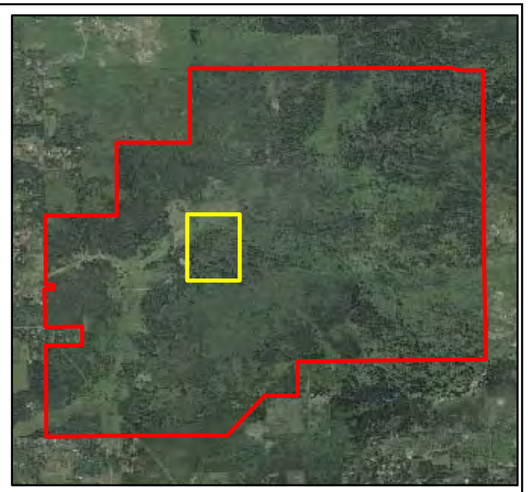
RAU2A-19-33-C
Excavation Zone (130 ft x 130 ft)

RAU2A-19-34-C
Excavation Zone (130 ft x 130 ft)

RAU2A-19-19-N
Excavation Zone (29 ft x 29 ft)

RAU2A-19-19-E
Excavation Zone (29 ft x 29 ft)

RAU2A-19-19-W
Excavation Zone (29 ft x 29 ft)



Legend

- Camp Bonneville Property Perimeter
- Firing Ranges
- Staging Piles
- Excavation Hot Spot

Excavation Categories

- MTCA 1 - 50-118 ppm lead
- MTCA 2 - 119 to 250 ppm lead
- RCRA - >250 ppm lead
- Stream

N
W E
S

0 30 60 120 180 240 Feet

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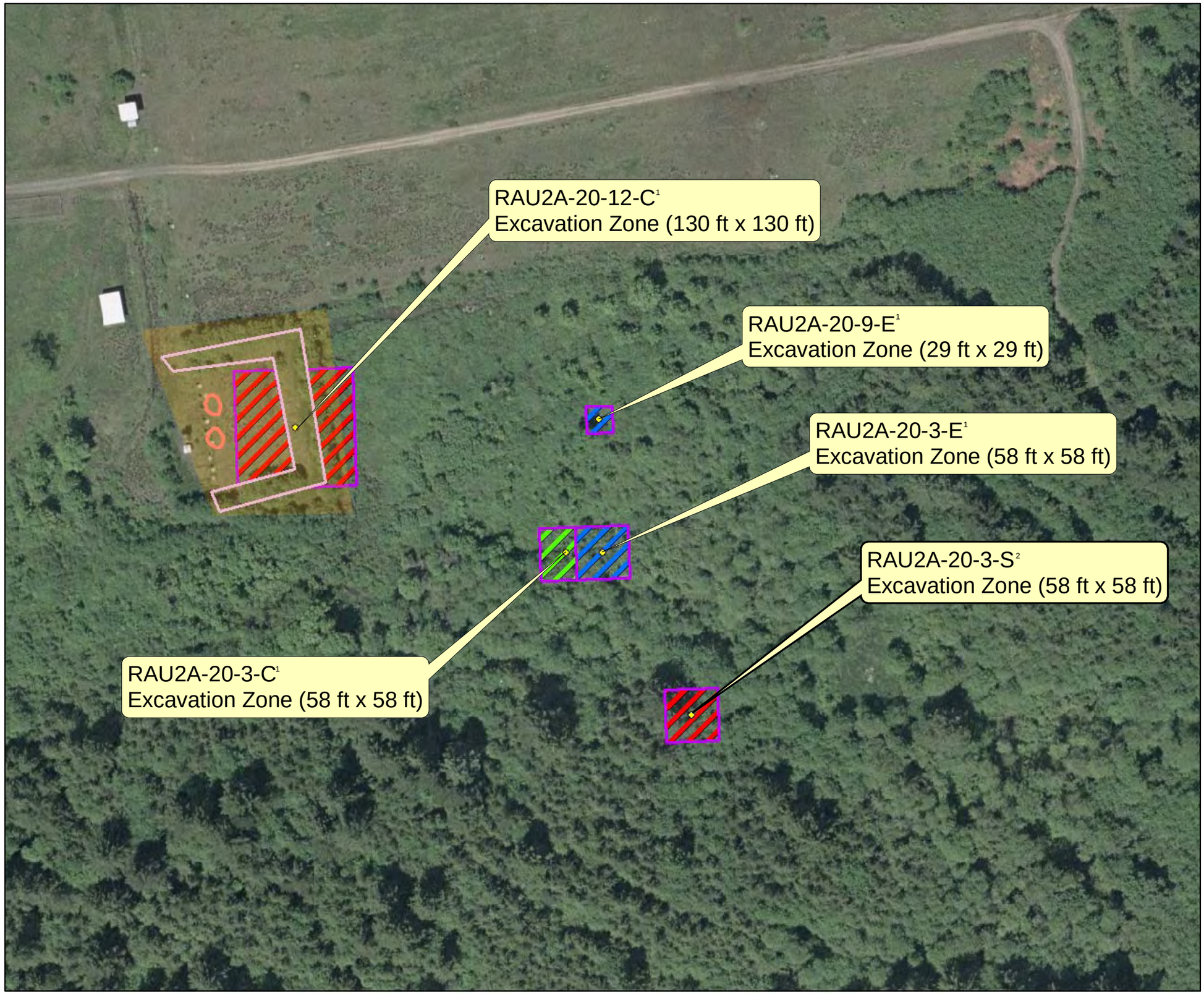
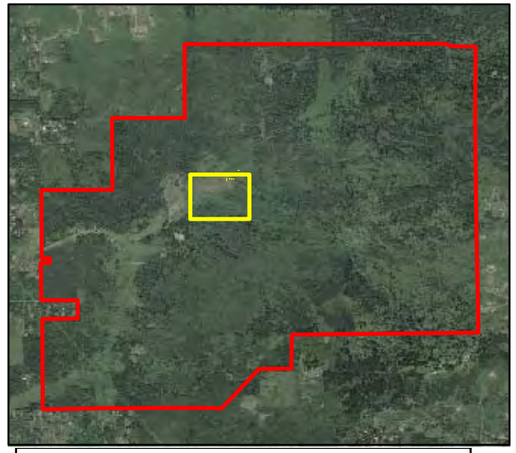
Stafford, TX 77477

Figure 7
Removal Actions at 25-meter Record Firing/Field Firing Range (RAU 2A-19)

Drawn On: 5/28/2008 Drawn By: QX Reviewed By: SS





Legend

- Camp Bonneville Property Perimeter
- Firing Ranges
- Staging Piles
- Berm
- Excavation Hot Spot
- Special Condition

Excavation Categories

- MTCA 1 - 50-118 ppm lead
- MTCA 2 - 119 to 250 ppm lead
- RCRA - >250 ppm lead

Note:

1. All excavation are 6 inches unless noted otherwise
2. Location was moved by AEM 195 feet southeast of original location

N
W E
S

0 35 70 140 210 280
Feet

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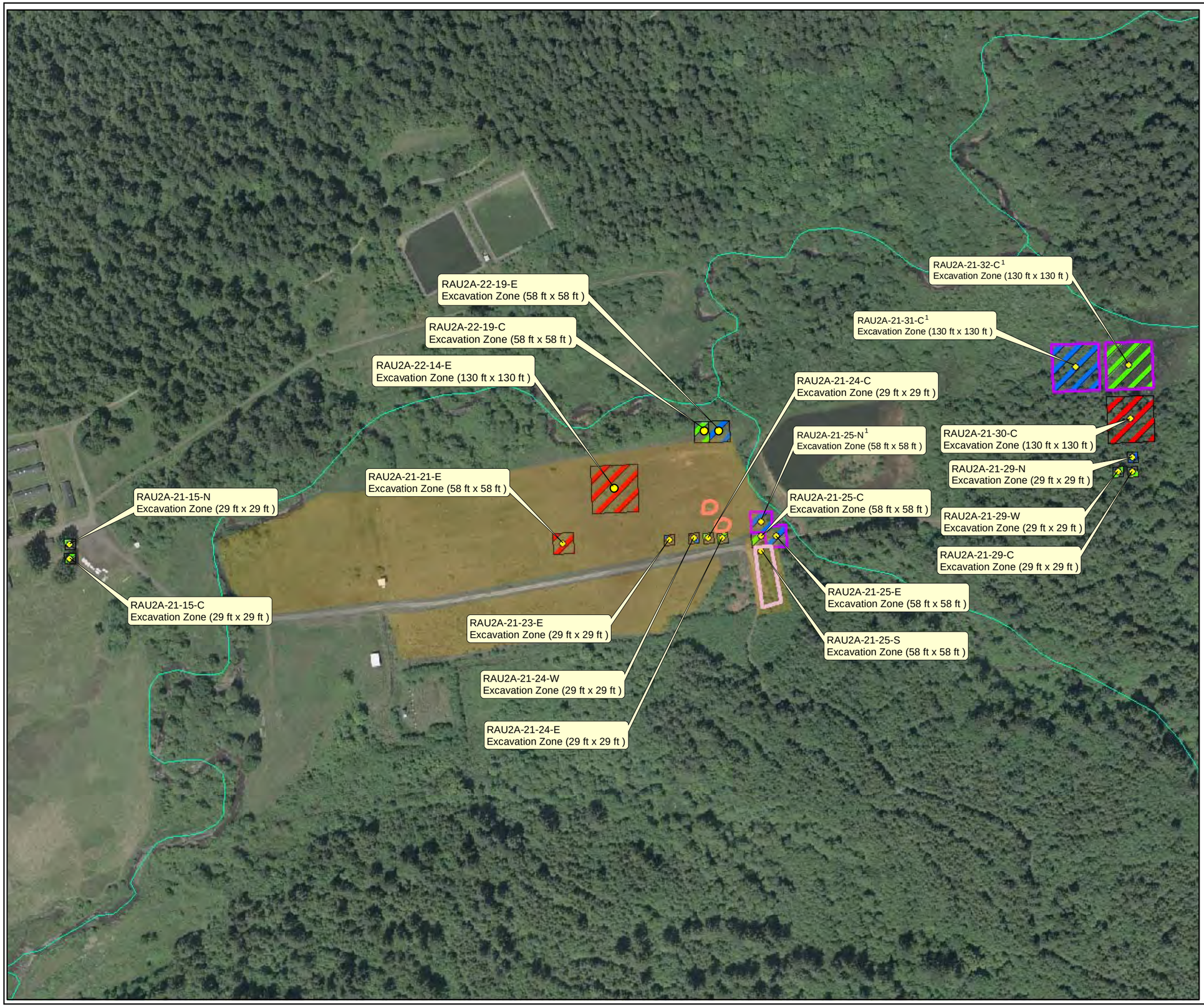
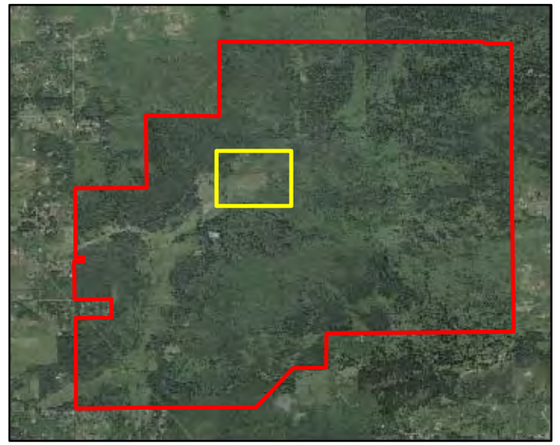
Stafford, TX 77477

PIKA INTERNATIONAL, INC.

Figure 8
Removal Actions at Field Firing Ranges No.1 & 2 (RAU-2A-20)

Drawn On: 5/28/2008 Drawn By: QX Reviewed By: ES





Legend

- Camp Bonneville Property Perimeter
- Firing Ranges
- Staging Piles
- Berm
- Excavation Hot Spot
- Stream
- Special Condition

Excavation Categories

- MTCA 1 - 50-118 ppm lead
- MTCA 2 - 119 to 250 ppm lead
- RCRA - >250 ppm lead

Note:

1. All excavation are 6 inches unless noted otherwise

N
W E
S

0 100 200 400 600 800
Feet

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Stafford, TX 77477

PIKA INTERNATIONAL, INC.

Figure 9
Removal Actions at Field Fire Ranges No. 1 and No. 2
(RAU 2A-21 and RAU 2A -22)

Drawn On: 6/16/2008 Drawn By: QX Reviewed By: ES

APPENDIX B

FORMS

MKM

Master Tracking Sheet for Range Floor Remediation
(Excavation, Staging Piles, Sampling, Volumes)

Remedial Unit No.	Phase 1			Samples			Staging Piles			No. of samples									Findings	MTCA Volume	
	Depth (ft)	Grid Size (sq.ft)	Screened	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1			Level 1			Level 1				Off-site	On-site
2A-4										**S**	**C**	**D**	**S**	**C**	**D**	**S**	**C**	**D**			
RAU2A-4-4-W	0.5																				
RAU2A-4-4-E	0.5																				
RAU2A-4-4-S	0.5																				
2A-15																					
RAU2A-15-1-N	0.5																				
RAU2A-15-1-E	0.5																				
2A-16																					
RAU2A-16-24-N	0.5																				
RAU2A-16-24-S	0.5																				
RAU2A-16-24-W	0.5																				
RAU2A-16-26-N	0.5																				
RAU2A-16-26-S	0.5																				
RAU2A-16-26-E	0.5																				
RAU2A-16-26-W	0.5																				
RAU2A-16-26-C	0.5																				
RAU2A-16-27-N	0.5																				
RAU2A-16-27-S	0.5																				
RAU2A-16-27-E	0.5																				
RAU2A-16-27-W	0.5																				
RAU2A-16-27-C	0.5																				
RAU2A-16-28-N	0.5																				
RAU2A-16-28-S	0.5																				
RAU2A-16-28-E	0.5																				
RAU2A-16-28-W	0.5																				
RAU2A-16-28-C	0.5																				
RAU2A-16-29-C	0.5																				
RAU2A-16-29-S	0.5																				
RAU2A-16-30-N	0.5																				
RAU2A-16-30-S	0.5																				
RAU2A-16-30-E	0.5																				

MKM

Master Tracking Sheet for Range Floor Remediation
(Excavation, Staging Piles, Sampling, Volumes)

Remedial Unit No.	Phase 1			Samples			Staging Piles			No. of samples									Findings	MTCA Volume	
	Depth (ft)	Grid Size (sq.ft)	Screened	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1			Level 1			Level 1				Off-site	On-site
RAU2A-16-30-W	0.5																				
RAU2A-16-30-C	0.5																				
2A-17																					
RAU2A-17-3-N	0.5																				
2A-18																					
RAU2A-18-5-N	0.5																				
RAU2A-18-5-S	0.5																				
RAU2A-18-5-W	0.5																				
RAU2A-18-5-C	0.5																				
RAU2A-18-8-C	0.5																				
RAU2A-18-9-N	0.5																				
RAU2A-18-9-E	0.5																				
RAU2A-18-9-C	0.5																				
RAU2A-18-10-N	0.5																				
RAU2A-18-10-S	0.5																				
RAU2A-18-10-W	0.5																				
RAU2A-18-10-C	0.5																				
RAU2A-18-11-N	0.5																				
RAU2A-18-11-C	0.5																				
RAU2A-18-11-W	0.5																				

MKM

Master Tracking Sheet for Berm Remediation
(Excavation, Staging Piles, Sampling, Volumes)

Remedial Unit No.	Phase 1			Samples			Staging Piles			No. of samples									Findings	MTCA Volume	
	Depth (ft)	Panel Size (sq.ft)	Screened	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1			Level 1			Level 1				Off-site	On-site
2A-4										**S**	**C**	**D**	**S**	**C**	**D**	**S**	**C**	**D**			
RAU2A-4-B1	0.5																				
RAU2A-4-B2	0.5																				
RAU2A-4-B3	0.5																				
RAU2A-4-B4	0.5																				
RAU2A-4-B5	0.5																				
RAU2A-4-B6	0.5																				
RAU2A-4-B7	0.5																				
RAU2A-4-B8	0.5																				
RAU2A-4-B9	0.5																				
RAU2A-4-B10	0.5																				
2A-15																					
RAU2A-15-B1	0.5																				
RAU2A-15-B2	0.5																				
RAU2A-15-B3	0.5																				
2A-16																					
RAU2A-16-B1	0.5																				
RAU2A-16-B2	0.5																				
RAU2A-16-B3	0.5																				
RAU2A-16-B4	0.5																				
RAU2A-16-B5	0.5																				
RAU2A-16-B6	0.5																				
RAU2A-16-B7	0.5																				
RAU2A-16-B8	0.5																				
RAU2A-16-B9	0.5																				
RAU2A-16-B10	0.5																				
2A-17																					
RAU2A-17-B1	0.5																				
RAU2A-17-B2	0.5																				
RAU2A-17-B3	0.5																				
RAU2A-17-B4	0.5																				
RAU2A-17-B5	0.5																				
RAU2A-17-B6	0.5																				
RAU2A-17-B7	0.5																				
RAU2A-17-B8	0.5																				

MKM

Master Tracking Sheet for Berm Remediation
(Excavation, Staging Piles, Sampling, Volumes)

Remedial Unit No.	Phase 1			Samples			Staging Piles			No. of samples									Findings	MTCA Volume	
	Depth (ft)	Panel Size (sq.ft)	Screened	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1			Level 1			Level 1				Off-site	On-site
RAU2A-17-B9	0.5																				
RAU2A-17-B10	0.5																				
2A-18																					
RAU2A-18-B1	0.5																				
RAU2A-18-B2	0.5																				
RAU2A-18-B3	0.5																				
RAU2A-18-B4	0.5																				
RAU2A-18-B5	0.5																				
RAU2A-18-B6	0.5																				
RAU2A-18-B7	0.5																				
RAU2A-18-B8	0.5																				
RAU2A-18-B9	0.5																				
RAU2A-18-B10	0.5																				
RAU2A-18-B11	0.5																				
RAU2A-18-B12	0.5																				
RAU2A-18-B13	0.5																				
RAU2A-18-B14	0.5																				
RAU2A-18-B15	0.5																				
RAU2A-18-B16	0.5																				
RAU2A-18-B17	0.5																				
RAU2A-18-B18	0.5																				
RAU2A-18-B19	0.5																				
RAU2A-18-B20	0.5																				
RAU2A-18-B21	0.5																				
RAU2A-18-B22	0.5																				
RAU2A-18-B23	0.5																				
RAU2A-18-B24	0.5																				
RAU2A-18-B25	0.5																				

SAMPLE COLLECTION LOG

DATE		**PROJECT NO.**	05-55-0050	**PREPARED BY**	
TIME		**RAU2A NUMBER**		**SIGNATURE**	
PAGE					

PROJECT NAME	Hazardous Toxics Waste Remediation (HTRW) for RAU2A												
SAMPLE I.D.	**RAU2A-4-BS-001**								COC NO.	**MKM-RAU2A-001**			
SAMPLE LOCATION	**BERM**		**RANGE FLOOR**		**AMBIENT**		**OTHER**						
SAMPLE TYPE	SOIL		GRAVEL		DEBRIS		WATER		**OTHER**				
COMPOSITE	YES		NO				**CONTAINERS USED**		**AMOUNT COLLECTED**				**mL**
COLOR			**ODOR**						**CONSISTENCY**				
GPS POSITION COLLECTED	YES		NO										
COMMENTS/NOTES:													

Page: _____ of _____
Project #:
GEL Quote #: _____
COC Number [1]: _____
PO Number:

GEL Chain of Custody and Analytical Request

See www.gel.com for GEL's Sample Acceptance SOP

GEL Work Order Number:

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Phone #:

Project/Site Name: Fax #:

Address:

Collected by: Send Results

Sample Analysis Requested [5] (Fill in the number of containers for each test)

Sample ID ** For composites - indicate start and stop date/time*	*Date Collected **(mm-dd-yy)**	*Time Collected **(Military) (hhmm)**	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	**Should this sample be considered:** Radioactive	**Should this sample be considered:** TSCA Regulated	**Total number of containers**										<-- Preservative Type (6)	**Comments** Note: extra sample is required for sample specific QC

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge)

Fax Results: Yes / No

Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Sample Collection Time Zone
Eastern Pacific
Central Other _____
Mountain

Chain of Custody Signatures

Relinquished By (Signed) Date Time	Received by (signed) Date Time
1	1
2	2
3	3

Sample Shipping and Delivery Details

GEL PM:

Method of Shipment: Date Shipped:

Airbill #:

Airbill #:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: **N** = Normal Sample, **TB** = Trip Blank, **FD** = Field Duplicate, **EB** = Equipment Blank, **MS** = Matrix Spike Sample, **MSD** = Matrix Spike Duplicate Sample, **G** = Grab, **C** = Composite

3.) Field Filtered: For liquid matrices, indicate with a **- Y -** for yes the sample was field filtered or **- N -** for sample was not field filtered.

4.) Matrix Codes: **DW**=Drinking Water, **GW**=Groundwater, **SW**=Surface Water, **WW**=Waste Water, **W**=Water, ML=Misc Liquid, **SO**=Soil, **SD**=Sediment, **SL**=Sludge, **SS**=Solid Waste, **O**=Oil, **F**=Filter, **P**=Wipe, **U**=Urine, **F**=Fecal, **N**=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. **8260B**, **6010B/7470A**) and number of containers provided for each (i.e. *8260B* **- 3**, *6010B/7470A* **- 1**).

6.) Preservative Type: **HA** = Hydrochloric Acid, **NI** = Nitric Acid, **SH** = Sodium Hydroxide, **SA** = Sulfuric Acid, **AA** = Ascorbic Acid, **HX** = Hexane, **ST** = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only

Custody Seal Intact?
YES NO

Cooler Temp:
_____ *C*

WHITE = LABORATORY **YELLOW = FILE** **PINK = CLIENT**

General Location:	Camp Bonneville, Vancouver, Washington
Company:	MKM Engineers, Inc, 4153 Bluebonnet Drive, Stafford, TX 77477
Finding:	***Description of item***
Date of Finding:	02 July 2008
Time of Finding:	0850
Team Leader:	Glenn Haupt
Senior Unexploded Ordnance Supervisor:	Randy Schneider
Coordinate System:	NAD 83 UTM 10T
Northing	
Easting	
General Location:	RAU2A and excavation grid details
Activity Being Performed At Time of Finding:	Remediation activities within RAU2A
Planned Disposition:	Per approved Monitoring and Archeological Plan
Map:	*Image showing location of finding on a AUTOCAD map*
Photo:	*Photo of finding*

Wasco County Landfill
WASCO COUNTY LANDFILL
The Dalles, OR 97058

Acct #
name
address

Site 40
Ticket 009497
Date In 07/07/08
Time In 08:50
Date Out 07/07/08
Time Out 09:16

Weighmaster NANCY
Origin MULT
Ref. CEL21 — tekor P.O. #
Grid

DESCRIPTION

Scale 1 Gross Wt. 103960 LB Vehicle TRAIL
Scale 1 Tare Wt. 40640 LB Roll-Off
Net Wt. 63320 LB TON 31.66

type of waste

PO #
NOTE
DRIVER

BY SIGNING THIS, I CERTIFY THAT THIS DIPOSAL MATERIAL ORIGINATED IN THE COUNTY/STATE AS STATED ABOVE. I ALSO CERTIFY THAT TO THE BEST OF MY KNOWLEDGE THIS LOAD CONTAINS NO HAZARDOUS OR SPECIAL WASTE.

Signature _____

APPENDIX C

SPECIAL CONDITIONS TECHNICAL APPROACH

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

The remedial action proposed for the cleanup of nine small arms ranges (SARs) at CBMR is localized excavation and confirmatory sampling for berms and range floor areas. Investigation studies conducted in the past have shown elevated concentration of lead in soil samples collected at several locations spread across the range floor within each range. Five samples were collected within a 130-foot grid, with several 130-foot grids being sampled for each range floor.

Based on the average concentration of lead in the five samples collected within each grid, the grid was selected for remediation. The values of the average concentration and that of the individual samples were used to determine the area of the grid as being either 29 square feet, 58 square feet, or 130 square feet. Excavation depth for all grids was 6-inches bgs. The technical approach and rationale towards selection of the grids is presented in Section 5.0 of the Final CAP for RAU2A (Baker 2008).

The objective of this paper is to present the technical approach to pursue alternate actions in certain areas, referred to as a 'Special Condition' (SC), where remedial actions (comprising excavation, sifting, stabilization, confirmatory sampling, and disposal) are presently not viable due to one or several of the following four conditions listed below:

- Standing water, presence of a creek, stream, or similar water body running through the range;
- Within to an area of potential cultural significance; and
- Location outside of firing line and/ or the historical boundary of the range.

These special conditions were identified after the final CAP for RAU2A was finalized and are hence not included in that document. The alternative action to remedial actions for the SCs being proposed is sampling and analysis of soil samples to determine the actual concentration of particulate lead within the SCs. Samples will be collected and analyzed to obtain information pertaining to the concentration of lead in the soils within the nine SARs. The information regarding the concentration of lead in the soil will enable further actions towards remediation of the nine small arms ranges

This technical approach presents the problem statement, data needs and uses, data quality objectives, sampling rationale, analyses to be performed, procedures for documentation of alternative actions, and data validation.

2.0 FIELD DEVIATIONS AND REPORTING

This work assignment has a Project Manager (PM) who works under guidance provided by the Washington State Department of Ecology (WDOE) PM to accomplish the remedial actions. The PM manages the schedule and technical status of the work assignment. The key people involved in interfacing with the PM are the Project Engineer (PE), Quality Assurance Officer (QAO), Senior Unexploded Ordnance Supervisor (SUXOS), and the Field Team Leader (FTL).

In the event field deviations (i.e. areas where remedial actions are not feasible) are observed, these will be documented and communicated to the WDOE PM and other stakeholders involved in the remedial actions at the nine SARs. The following actions will be conducted when a field deviation is observed:

1. Notification – PM will notify Michael Baker Jr. Inc on-site Construction Manager (CM) and WDOE PM of the scope of field deviations. The CSM will subsequently notify other stakeholders of the field deviations.
2. Field Deviation Memorandum – Conditions and details of the field deviation will be recorded on a formal memorandum addressed to the WDOE PM and other stakeholders.
3. All stakeholders will discuss the field deviations and arrive at a decision for the alternative action for remediation of those areas where field deviations are observed.

Presently there are several areas where field deviations necessitate alternative remedial actions due to special conditions within one or more of the grids that are presently scheduled for remediation. These are presented in Table C.1 and in the photo log at the end of this technical approach.

Table C.1: Field Deviations for Remedial Actions in Small Arms Ranges at CBMR.

Range	Grid	Size (feet)	Category	Condition
Combat Pistol Range (2A-4)	2A-4-4 E	29 x 29	MTCA 1	within buffer zone of potential cultural area (Area F)
	2A-4-4 S	29 x 29	MTCA 2	within buffer zone of potential cultural area (Area F)
	2A-4-4 W	29 x 29	MTCA 1	within buffer zone of potential cultural area (Area F)
Undocumented Pistol (2A-15)	2A-15-1 N	29 x 29	MTCA 1	Location falls outside of the firing range boundary
	2A-15-1 E	29 x 29	MTCA 2	

1,000" Rifle Range/Machine Gun Range (2A-16)	2A-16-26 N	58 x 58	MTCA 1	Location falls outside of the firing range boundary
	2A-16-26 E	58 x 58	MTCA 1	
	2A-16-26 C	58 x 58	MTCA 1	
	2A-16-26 S	58 x 58	MTCA 2	
	2A-16-26 W	58 x 58	RCRA	
	2A-16-26 W	58 x 58	RCRA	
	2A-16-30 N	58 x 58	MTCA 1	location in stream bed
25-m M60 Pistol Range (2A-17)	no special conditions			
25-m Machine Gun Range (2A-18)	no special conditions			
25-m Record Firing Ranges (2A-19)	no special conditions			
Field Firing Ranges (2A-20)	2A-20-3 C	58 x 58	MTCA 1	standing water
	2A-20-3 S	58 x 58	RCRA	standing water
	2A-20-3 E	58 x 58	MTCA 2	standing water
	2A-20-9 E	29 x 29	MTCA 2	standing water
	2A-20-12 C	130 X 130	RCRA	standing water
Rifle Ranges No1 and 2 (2A-21)	no special conditions			
Field Firing Ranges No1 and 2 (2A-22)	2A-22-25 N	58 X 58	MTCA 2	standing water
	2A-22-31 C	130 X 130	MTCA 2	standing water
	2A-22-32 C	130 X 130	MTCA 1	standing water

3.0 ALTERNATIVE REMEDIAL ACTIONS

3.1 Schedule

Alternative remedial actions (i.e. sampling and analysis of soil samples) are planned for summer 2008 with an expected start date of second week of July. The start date is based on:

- The submission and acceptance of the SAP and Operations Plan (OP) by WDOE;
- The United States Army Corp of Engineers (USACE) permit approval; and
- Favorable weather conditions (drier summer months with low possibility of rainfall)

Sampling activities will be completed in conjunction with field activities. It is anticipated that preliminary laboratory analysis and results will be available within one business week of the last sample being collected. The quickest allowable turnaround times (TAT) will be used (24 HR for Totals and 3-day for TCLP as applicable).

Data validation will be completed within four to six weeks of delivery of the completed electronic data packages from the laboratory.

3.2 Characterization of Special Conditions

In general all proposed samples will be collected at a depth of 0 to 6 inches below ground surface (bgs) for the general areas described in Section 2.0 or in the future when field deviations might occur at other grids where remedial actions are presently planned as follows:

- Per Section 2.0 of this document and 5.2 of the final CAP, in grids (square) on the range floor where special conditions prevent removal actions.

All special condition grid locations for each range have been identified in figures 2 through 9 (Appendix B of the Operations Plan). Sample locations will be recorded using a global positioning system (GPS) with an accuracy of +/- 1 meter. All sampling locations will be confirmed clear of MEC by UXO technicians before sampling begins. If vegetation or other surface material is present at the surface at the sampling location, the material will be removed to expose native soil.

There is a likelihood that some of the sample locations will not be at the grid locations because of the presence of obstructions such as roads, streams, standing water, rocks, and trees. When a sample cannot be collected at a pre-designated location, a sample will be collected at the nearest point in a pre-specified direction from the original point where a sample can be obtained, provided that the location is within less than half the grid spacing of the original point.

If the sampling location is submerged under water, then sediment samples will be conducted. The guidelines presented in WDOE Publication No.03-09-043: Sediment Sampling and Analysis Plan Appendix will be followed during collection of all sediment samples. Care will be taken to ensure that there is enough sample volume for analysis.

3.3 Sampling Devices

The following equipment may be used during the collection of surface soil samples: Personnel protective equipment (PPE) (Nitrile gloves, hard hat, steel-toe boots, and if necessary, a respirator with appropriate cartridges). Sampling devices include hand trowel (disposable or stainless steel) shovel and digging bar, digital camera, glass jars (laboratory-certified sterile), aluminum foil, plastic re-sealable storage bags, distilled water Alconox (or equivalent), clean 5-gallon buckets (minimum of three), scrub brushes, self-adhesive labels, permanent markers (Sharpie®* or equivalent), paper towels, field notebook, custody seals, chain-of-custody forms, field sampling forms, Ice chests/coolers, wet ice etc.

Surface soil samples will be collected using a decontaminated stainless steel or clean disposable polyethylene hand trowel or drive sampler. If necessary, a decontaminated shovel will be used to loosen the soil or remove vegetative materials before sampling. Each discrete soil sample will be homogenized in a decontaminated stainless steel, plastic, or dedicated disposable collection container, using a dedicated or decontaminated sampling spoon or trowel. The containers and sampling utensils selected for this project will be made from materials that will not interfere with the requested analyses.

Sediment samples will be collected using hand held surface sediment sampling devices (i.e. either a box with a set of jaws or a rotating bucket that will enable collection of a wedge shaped sample of the surface sediment or soil.

3.4 Sample Collection and Handling

After homogenizing, the discrete sample will be immediately placed into the appropriate laboratory-certified clean glass jar, capped, and labeled. The sample jars will be placed in a cooler on wet ice and the cooler will be sealed prior to being shipped.

3.5 Sample Identification and Labeling

Each sample name will be preceded by its associated range name (RAU2A number) , followed by its sample type abbreviation and numeric designation, followed by the depth collected below

grade. The dates and times of each sample collected will also be noted on the sample form (Appendix A of the Operations Plan) and the label on container.

Each sample will have an adhesive plastic or waterproof paper label affixed to the container and will be labeled at the time of collection. The following information will be recorded on the container with a permanent marker at the time of collection:

- Project name;
- Sample ID number;
- Preservative (if applicable);
- Date and time of collection;
- Initials of collector; and
- Laboratory analysis requested

3.6 Sample Chain of Custody

A chain-of-custody record will accompany all samples en route to the laboratory. The chain-of-custody record will contain the following information:

- Project name;
- Sample number;
- Sample collection point;
- Sampling date;
- Time sample collection (this time must match the time recorded on the sample label and field log book;
- Sample matrix description;
- Analyses requested for each sample;
- Preservation method;
- Number and type of container used;
- Any special handing or analysis requirements
- Signature of person collecting the samples; and
- Signature of persons involved in the chain of possession

In addition information pertinent to the sampling will be recorded on the sampling form (Appendix A) and in the field logbook by the on-site field person. The sampling documentation will contain information on each sample collected, and may include project name, GPS location/file, field observations (e.g., sample descriptions), photographs, sample name and number, sample matrix, and location (RAU2A number), date, time sample collected, sampling method and description of activities

3.7 Sample Preservation and Holding Times

Sample containers will be inspected by field sampling personnel before daily field work begins to ensure the number, type, and preservation methods for the provided containers are accurate. The container type, sample volume, preservation and holding time requirements for the analyses are:

Name	Analytical Methods	Matrix	Container	Preservation	Minimum Sample Volume	Maximum Holding Time
Metals	SW6010B	Soil	polyethylene or glass	Cool 4 °C	125 grams	Metals 180 days
Metals	SW6010B	Decon Water	polyethylene	Cool 4 °C HNO_3 to pH<2	2- 1 liter	Metals 180 days

3.8 Decontamination Procedures

To avoid cross-contamination between sampling intervals and locations, decontamination of equipment and non-disposable sampling devices will be conducted as needed. All soil sampling equipment will be decontaminated using a three-bucket wash and rinse methodology as follows:

- Spray, rinse, wash, and scrub equipment using a solution of Alconox (or equivalent) and potable water contained in one 5-gallon bucket.
- Rinse with potable water in one 5-gallon bucket.
- Rinse with distilled water contained in one 5-gallon bucket.
- Air-dry the equipment.

3.9 Investigation Derived Waste

The types of waste anticipated in this program consist of solid waste (soil/sediment from decontamination procedures, disposable sampling equipment, and personal protective equipment [PPE])) generated from excavation and soil sampling activities and liquid waste generated from equipment decontamination.

Based on results of previous investigations at CBMR, no RCRA hazardous wastes are expected to be generated during the completion of the project. However, MTCA regulated wastes are expected to be generated. MKM will manage all types of waste and recyclable materials, regardless of classification.

All liquid decontamination rinsate resulting from decontamination of sampling devices and equipment will be collected and stored on a daily basis in properly labeled 55-gallon drums or portable tanks located at a designated staging area pending laboratory analysis.

Equipment and tools used for excavation will be decontaminated by dry-brushing heavy soils off the bucket and machine, then washing the bucket in a field containment area; the fluids will be put into 55-gallon drums. All liquid decontamination rinsate will be collected and stored on a daily basis in properly labeled 55-gallon drums or portable tanks at a designated staging area pending laboratory analysis.

Solid waste generated in connection with the completion of soil excavation/characterization and sampling activities or decontamination will include materials that can be characterized as incidental wastes. These materials could include PPE, plastic sheeting, wood, and sacks or containers for construction material (e.g., cardboard and expended sampling supplies). Most of these materials are considered non-regulated wastes and will not require characterization by laboratory analyses for disposal. Materials that have been used for pollution prevention or that have come into contact with significant amounts of contaminated media may require characterization before disposal

The liquid waste will be disposed of in accordance with policies and regulations outlined in the MTCA and those specified by the facility designated to receive the waste.

All vegetation debris resulting from screening operations will be reduced to mulch and dispersed on surface during re-grading and seeding operations after excavation and backfill operations are completed.

3.10 Quality Assurance and Quality Control Samples

QC samples are essential for continual assessment of analytical procedures. QC analyses include the use of blanks, internal standards, check standards, matrix spikes, duplicates or matrix spike duplicates, check samples (spiked blank samples), and proficiency testing samples. Proper use of these data helps to ensure the production of legally valid analytical results. In addition, they provide constant, documented evaluation of acceptable analytical method performance.

Field QC samples will be collected at the following frequencies. One field blank per week will be collected for all ranges. Laboratory QC samples will be collected at a frequency of 5% of total samples from all ranges.

3.11 Duplicate Samples

Duplicate samples will be collected to assess laboratory precision, and will be collected at a frequency of 1 per 10 field samples collected. To collect a duplicate sample, a sufficient volume of sample material will be placed into a clean stainless steel bowl. The sample will be stirred thoroughly with a decontaminated stainless steel trowel or spatula to homogenize the sample. The sample volume will be then be divided in half with the trowel for the sample and duplicate. If less than 10 samples are collected during a single day, one blind duplicate will be collected per day of fieldwork

4.0 ANALYSIS AND REPORTING

4.1 Detection Reporting Procedures

These are presented in Appendix F of the Operations Plan.

4.2 Data Verification and Validation Procedures

All data will undergo a data verification and validation process. For all data from the soil sampling of the grids with special conditions, 100% verification and a 10% validation will be performed by an independent agency.

5.0 SPECIAL CONDITION GRID DETERMINATION

The alternative actions for cleanup in those areas where special conditions or other field deviations prevent implementation of the cleanup actions are:

1. For areas which fall within a creek/ stream, streambed, standing water or the area of cultural significance the alternative cleanup action will involve collection of soil samples (discrete samples: five samples per 29-foot x 29-foot area in a square pattern) to determine if they exceed the regulatory limit (total lead not to exceed 50 mg/Kg). If the area fails, further remedial actions will be discussed with WDOE and other stakeholders.
2. For areas that fall outside the boundary of the range/ firing line soil samples (discrete samples: five samples per 29-foot x 29-foot area in a square pattern) will be collected to establish the concentration of total lead. The samples will be analyzed to determine if they exceed the regulatory limit (total lead not to exceed 50 mg/Kg). If the area fails, the area will be excavated and sampled until confirmation of removal of lead is obtained.

2A-16-26-N

2A-16-26-w

2A-16-30-N

2A-20-3-C

2A-20-3-S

2A-20-3-E

2A-20-9-E

2A-20-12-C

2A-22-25-N

2A-22-31-C

2A-22-32-C

APPENDIX D

WASTE SUBMISSION

WASTE CONNECTIONS INC.

Connect with the Future®

SPECIAL WASTE PERMIT AND INSTRUCTIONS

- The generator must determine if the waste is hazardous or dangerous before completing a permit application.
- The special waste permit application must be in the name of the generator of the waste and signed by an authorized representative who is responsible for the accuracy of all information submitted.
- Recertification is required for on-going special waste streams prior to the expiration date.
- A copy of the approved special waste permit must be shown to the gatehouse attendant upon delivery at the facility.

DISPOSAL SITE: **CRC** _____ **FINLEY BUTTES** _____ **WASCO** _____**X**_____

- To be completed by disposal company -

Generator:	US Army Camp Bonneville (Camp Bonneville Military Reservation, Vancouver, WA)
Customer:	PIKA International, Inc./Dietrich Trucking, LLC
Waste:	Non-Hazardous Soil Containing Lead generated from remedial actions at 9 small arms firing ranges. Waste to consist of soils stabilized with a proprietary reagent (ECOBOND®).
Instructions:	Generator to collect a five-point composite sample from each treated soil pile and analyze for TCLP lead. Generator to provide results of the TCLP lead analysis documenting the composite sample passed the TCLP analysis before shipment of load(s) represented by said sample. Generator may fax (360-695-5091) or email (pamelap@wcnx.org) results.
Date:	July 17, 2008
Permit No:	2042-08-071
Expiration date:	July 17, 2009
New/Recert:	New
Previous No:	N/A
Landfill report:	Yes
Environmental approval:	Pamela S Pawelek

SPECIAL WASTE PERMIT APPLICATION

Disposal Site: **CRC _____** **Finley Buttes _____** **Wasco X**

Generator name and address:
US Army Camp Bonneville
23201 NE Pluss Road
Vancouver, WA 98682-9735

Billing name & address:
PIKA International Inc
12723 Capricorn Drive, Suite #500
Stafford, TX – 77477

Waste description: Non hazardous soil containing lead (< 10% organic matter and construction debris)

Quantity: Approximately 4,000 cubic yards Frequency of disposal: ☒ One-time
Process generating waste:
Remedial actions (excavation, screening, and leachable lead stabilization) at small arms firing ranges within Camp Bonneville.

Waste address ***(include county & zip code)***:
23201 NE Pluss Road
Vancouver, WA 98682-9735
Clark County, WA State
Contact:

Srini Neralla	Phone: 281/295 0555	Fax: 281/340 5533
Clifton Gray	Phone: 360/566 6985	Fax: 360/566 6986

Transporter:

Dietrich Trucking LLC	Phone: 360/892 3881	Fax: 360/883 1898

PHYSICAL CHARACTERISTICS AND DOCUMENTATION

Physical state: ☒ Solid ❒ Semi-solid ❒ Dusty ❒ Sludge ☒ Color: brownish red

Analytical results: ❒ TPH (PCS) ❒ Volatiles ❒ pH ☒ TCLP-Metals (TCLP 8)
❒ BTEX ❒ Pesticides ❒ PCB ❒ Other: Total Metals (PP13)

Sample source: ☒ Pile ❒ In-ground ❒ Pit bottom ☒ Other: Stablization process pile

Additional information: ❒ MSDS ☒ Process knowledge
☒ Other: Sampling and Treatability Studies

NON-HAZARDOUS DETERMINATION

Under 40 CFR Part 261, is this a Listed or Characteristic waste? ❒ Yes ☒ No
Is waste classified as a state-only or provincial hazardous waste? ❒ Yes ☒ No
Is waste covered or restricted from landfilling by any permit? ❒ Yes ☒ No
Basis for non-hazardous determination: Historical investigation data and treatability studies.

WASTE CERTIFICATION STATEMENT

I hereby certify that all information contained herein is true and correct, and the material described is properly identified, classified, packaged, labeled, and prepared as indicated. I certify this waste is not hazardous or dangerous as defined by the U.S. EPA, the State of Oregon, or the state or province of origin. I certify this waste does not contain any regulated radioactive materials. I certify that all samples used for this analysis are representative of the materials described herein. I will notify the company if there is a change in the composition of, or process generating this waste stream.

Clifton Gray *for* Srini Neralla
Name (print)

Authorized representative's signature

Vice President (Technical Services)
Title

15 July 2008
Date

REPRESENTATIVE SAMPLE CERTIFICATION

INSTRUCTIONS: This form must be completed in order to determine the acceptability of the waste described in the Special Waste Permit Application for disposal at a municipal solid waste landfill. Analytical data for certain wastes is required for an adequate assessment of waste composition and regulatory status. This form is used to certify that the analytical data presented was derived from testing a *representative* sample, which reflects the physical characteristics and chemical components in the same proportion as the *total* waste stream. A representative sample may be obtained using methods specified in federal (40 CFR Part 261, Appendix I) or state regulations.

SECTION A: DESCRIBE SAMPLING POINT OR LOCATION

☒ Pile ❒ In-ground ❒ Pit bottom ❒ Drum ☒ Other: Stablization process pile

SECTION B: SAMPLING METHOD

❒ I have obtained a representative sample of the waste material described in the attached special waste permit application according to the sampling methods specified in 40 CFR Part 261.

☒ I will obtain a representative sample of the waste material described in the attached special waste permit application by an equivalent method.

SECTION C: REPRESENTATIVE DATA CERTIFICATION

Generators' name:	US Army Camp Bonneville.
Waste type:	Non-hazardous soil containing lead.
Date sample collected:	Chain of custody and sampling forms will be generated.
Samplers' name:	Chain of custody and sampling forms will be generated.
Samplers' employer:	PIKA International, Inc.

SECTION D: REPRESENTATIVE SAMPLE CERTIFICATION

I hereby certify that the analytical data presented was derived from testing a representative sample taken in accordance with one of the methods listed in Section A of this form.

Sachin Saldanha
Name

Authorized representative's signature

Project Engineer
Title

11 July 2008
Date

APPENDIX E

MICHAEL BAKER JR. INC, CONFIRMATORY SAMPLING INSERT

APPENDIX E - CONFIRMATORY SAMPLING METHODOLOGY AND ANALYSIS

E.1 PURPOSE OF CONFIRMATORY SAMPLING

This proposed confirmatory sampling program is designed to insure that the objectives of the cleanup actions at the nine Small Arms Ranges at CBMR have been met. The objectives of this cleanup action are to reduce the potential exposure of human and ecological receptors to lead contamination in site soils at concentrations greater than cleanup standards and to support the proposed re-use and/or redevelopment of portions of the CBMR as a public park. Potential human receptors at the Small Arms Ranges include on-site construction workers during cleanup and future park development activities, visitors to the CBMR in the future when it has been developed as a regional park, and adjacent residents. Potential ecological receptors at the Small Arms Ranges include plants and wildlife that may inhabit or use affected areas.

E.2 CONFIRMATORY SAMPLING LOCATIONS

E.2.1 Small Arms Range grids

Confirmatory samples will be collected at the Small Arms Range grids with Category Ranks of 3, 4, or 5

Based on the lead concentrations of each of the five samples within each individual grid, the grids can be categorized for remediation as follows:

Table E-1

Summary of Categorization of Grids for Remediation

Category	Description	Action Required
1	Average and Individual Sample Concentrations < 50 mg/Kg.	No action needed
2	Average Concentration is < 50 mg/Kg and no individual sample concentration is >118 mg/Kg.	No action needed
3	Average Concentration is > 50 mg/Kg but < 118 mg/Kg and no individual sample concentration is > 250 mg/Kg.	Excavate* "hot spot"
4	Average Concentration is > 118 mg/Kg but < 250 mg/Kg.	Excavate* "hot spot"
5	Average Concentration is > 250 mg/Kg	Excavate* "hot spot"

For all hot spots that fall within grids under Category 3, a 29 ft x 29 ft area will be excavated. For hot spots that fall within grids under Category 4, a 58 ft x 58 ft area will be excavated. For hot spots within grids under Category 5, the entire grid (130 ft x 130 ft) will be excavated.

The level of effort for the confirmatory sampling varies with the Category rank as follows:

- In each Category Rank 3 grid, six (6) confirmatory samples will be collected after excavating the initial hotspot. A surface sample will be collected from the approximate center of each of the four excavation sidewalls and two bottom samples (approximately 10 feet apart) will be collected from the excavation floor.

- In each Category Rank 4 grid, twelve (12) confirmatory samples will be collected after excavating the initial hotspot. A surface sample will be collected from the approximate center of each of the four excavation sidewalls, four bottom samples (approximately 10 feet apart) will be collected from the excavation floor, and four samples will be collected from the cardinal compass directions approximately 20 feet from the center of the excavation.

- In each Category Rank 5 grid, seventeen (17) confirmatory samples will be collected after the initial excavation. Three samples will be collected from the each of the excavation sidewalls from locations about 30 feet apart on each sidewall; one bottom sample will be collected at the center of the excavation floor; and four samples will be collected from the cardinal compass directions approximately 40 feet from the center of the excavation

In the event that any sidewall confirmatory sample is reported to have a lead concentration greater than 118 mg/kg, a step-out excavation will be conducted at that sidewall location. The step-out excavation will extend over the entire length of the affected sidewall, going outward from the existing excavation one-half of the width of the grid and downward to a depth of 6 inches bgs. Confirmatory sampling of the step-out excavation will be conducted in accordance with the appropriate grid category rank as detailed above.

In the event that any excavation bottom confirmatory sample is reported to have a lead concentration greater than 118 mg/kg, an additional 6-inch step-down excavation will be conducted across the entire excavation floor. Confirmatory sampling of the step-out excavation will be conducted in accordance with the appropriate grid category rank as detailed above.

This iterative process of confirmatory sampling, step-out excavation, and resampling will be repeated until all of the confirmatory sample lead analysis results for the final excavation sidewalls and floors are less than 118 mg/kg.

E.2.2 Berm Face Excavations

Confirmatory samples will be collected at the Impact Zones (Rifle Range 1 & 2), Earthen Berms, (Rifle Ranges 1&2, Field Fire Ranges 1&2, Field Ranges 1&2,

25-meter Machine Gun Range, Undocumented Pistol Range) Hillside Berms (25-meter M60/Pistol Range, 25-meter Record Firing/Field Firing Range, Combat Pistol Range, 1000-inch Rifle Range/Machine Gun Range) and Pop-Up Target Berms (Combat Pistol Range, Rifle Ranges 1&2, Field Fire Ranges 1&2).

E.2.2.1 Impact Zones, Earthen Berms and Hillside Berms

A 2-foot soil lift will be excavated from each berm/impact zone. The excavated impact zone, each earthen berm or hillside berm will be divided into 15-foot linear sections (or panels). These panels will have the 15-foot width of the panel oriented along the toe of the berm and will extend to the top the berm. Adjacent panels will be demarked along the along the entire length of the excavated berm face... After required soil excavation, the remaining surface and near-surface soils in each panel will be visually inspected for bullets. If no bullets are observed two (2) soil samples will be collected for laboratory analysis from each section. One soil sample will be collected near the center of each section at a depth of 0 to 6 inches. The second soil sample will be collected at the base of the berm within the 15-foot wide panel at a depth of 0 to 6 inches. The approximate locations of each sample will be noted in the field notebook and a photograph placed in the photo log.

E.2.2.2 Pop-Up Target Berms

The pop-up target berms will be completely removed. In addition, a 6-inch soil lift will be removed from an approximate 15-foot radius from the center of the concrete target. The area within the 15-foot radius will be surface cleared using Schonstedt's hand held magnetometers. If no bullets are observed, two (2) soil samples will be collected for laboratory analysis from each section. The surface soil samples will be collected at representative locations within the 15-foot radius at a depth of 0 to 6 inches. The approximate locations of each sample will be noted in the field notebook and a photograph placed in the photo log.

E.3 Confirmatory Sampling Methodology

E.3.1 Pre-Field Activities

A permanent record will be compiled for each sample consisting of sample labels, chain-of-custody forms (COCs), and sample collection location photographs. Preparation of the sample labels and COCs will be initiated prior to the start of excavation and sample collection. The general site and sample information will be entered on a supply of labels and COCs before going into the field for this task. The partially completed labels and COCs will be assembled into a binder for convenient access and use in the field. Sample collection dates, times, exact locations, and pertinent comments (if any) will be added to the labels and COCs at the time of individual sample collection.

Photo sheets with the Excavation Identification and a blank for the date will be also included in the binders. While sampling, these sheets will be held by a field team member within the view of the camera so that each excavation can be easily identified in a photograph.

In addition to the required items for the permanent record, the field binders will include spreadsheets to ensure that the appropriate numbers of samples and quality control (QC) samples will be taken for each excavation. This will assist field sample collection workers with sample tracking and will help to confirm that the appropriate QC samples have been collected and that other required quality assurance steps have been completed.

The field sample collection personnel will assemble sampling packs for each Small Arms Range. These packs will include the above mentioned binders, sample containers, shipping cases/coolers, disposable plastic scoops, and disposable latex gloves.

E.3.2 Sample Collection Containers

Sample containers will be provided by Test America Laboratories. These containers will be new and will be certified clean prior to shipment to the sampling site. Certificates of cleanliness will be maintained by the laboratory. A copy of this certificate will be included with each shipment of sample containers to the site.

E.3.3 Sampling Collection Procedures for Small Arms Range Excavations

The following procedures will be applied to the collection of confirmatory soil samples in the excavation areas in the Small Arms ranges

- A photograph will be taken at each Small Arms Range excavation prior to sampling. The completed photo sheet showing the excavation identification and the sample collection date will be visible in the photograph.

- The partially completed sample label will be removed from the binder, and the field information will be entered.

- The sample label will be affixed to a clean laboratory-provided glass jar, which will be opened and prepared to receive the soil sample.
.
- The sample collector will don a new pair of sampling gloves and use a new disposable plastic scoop at each sample location to minimize potential cross contamination.

- Using the new disposable plastic scoop, the sample collector will remove approximately 8 ounces of soil from the 0 to 6-inch depth interval.

- Where a particular sample collection location has been selected for a field QC sample, the sample collector will increase the volume of soil collected to allow for a duplicate sample.

- Excess soil and any vegetation accidentally included in the sample in the scoop will be removed from the collected soil sample and returned to the sample collection site.

- The sample gloves and the plastic scoop will be disposed of as appropriate.

E.3.4 Sampling Equipment Decontamination (If Needed)

Single-use disposable sample collection equipment will be employed whenever practical and appropriate. Non-single-use field equipment and any required instrumentation will be decontaminated before and after each sample is collected. In the event that non-disposable equipment is required, decontamination will be performed in the field as follows:

- The sampling personnel will physically remove visible contaminants from sampling equipment by first scraping with a disposable wooden spatula and rinsing with clean potable water.

- If visible contaminants remain, they will be removed with a scrub brush, and clean potable water.

- After any visible contamination has been removed, the sampling equipment will be washed with non-phosphate detergent solution (Alconox©).

- Finally, the sampling equipment will be rinsed with deionized (DI), contaminant-free water.

E.3.5 Sample Numbering System

Each sample will be assigned a unique sample identification (ID) number by the sampler. These sample identification numbers will provide a tracking system for retrieval of data on each sample. Sample numbers and sample labels will not indicate if a sample is a duplicate or field blank. The QC field duplicate samples and field/rinsate blank samples will be identified with fictitious site numbers. Field blanks and other QA/QC samples will be identified in the field note book. Samples for matrix spike and matrix spike duplicates (MS/MSD) will be designated on the COCs and on the sample label.

Each sample will have a unique 10-character sample number. These sample numbers will be generated in the following format:

(Range ID) – (Sample ID) – (Sample Date) – (Sample Matrix)

The sample information will be defined as follows:

- Range ID – two characters identifying the Small Arms Range location.
- Sample ID – two characters identifying the individual, predetermined sample location in the form of a sequential number.
- Sampling Date – five characters identifying the sample collection date information in the YMMDD format;
- Sampling Matrix – one character identifying the sampling matrix using “S” for soil.

E.3.6 Chain-of-Custody Procedures

Proper COC documentation for these samples will be maintained by the field personnel from the time of sample collection until the samples are shipped to the laboratory. COCs will accompany all of the sample shipments and will contain the following information: project number, sample numbers, number of containers, method(s) of preservation of samples, date and time of sample collection, analysis(es) requested, date and time of transportation to the laboratory, method of transportation, and any other information pertinent to the samples.

E.3.7 Preservation Methods and Maximum Holding Times

All of the samples will be preserved with ice to a temperature of 4° Celsius prior to and during transportation to the analytical laboratory. The following table presents specifications for sample containers and holding times for this event.

Table E-2

Summary of Analysis Required, Sample Volume, Container, Preservation, and Holding Time

Analyses	Sample Volume	Container	Preservation	Laboratory Holding Time
Lead by US EPA Method SW846 6010	10 grams	8 oz Clear Wide Mouth Glass Jars	Cool to 4° C ± 2° C	6 months

E.3.8 Sample Storage

Samples will be stored in coolers with ice and maintained in secured field vehicles or field barracks prior to daily shipment to the laboratory. Samples will be maintained at 4° C during all phases of sample storage and transportation prior to analytical testing at the laboratory.

E.3.9 Sample Handling

Samples will be placed in appropriate shipping containers (i.e., coolers) and properly packaged to prevent damage to the samples during handling and transportation. All of the samples will be re-counted, the sample container labels checked against the field daily logbook and the COCs before each cooler is sealed. The completed COCs will be sealed in plastic bags and placed in each cooler. One copy of each completed COC will be retained in the field so that sample delivery to the laboratory can be confirmed.

E.3.10 Sample Shipping and Delivery

Samples will be shipped to the analytical laboratory in coolers by overnight express-delivery (i.e., Federal Express). Upon receipt at the laboratory, the Sample Custodian (or representative) will collect the relevant shipping

documents and verify enter the appropriate sample data into the laboratory sample custody records. The Sample Custodian will unpack the shipping containers, verify the contents with the COC, and sign and date the COC. The Sample Custodian (or designee) will be responsible for the following:

- Inspecting the condition of the shipping containers and sample bottles
- Documenting the as-received temperature (if appropriate)
- Confirming the consistency of the information on the individual sample labels and on the COCs for each sample in the shipment and noting any discrepancies on the appropriate COC
- Recording the sequential laboratory sample I.D. number, the job number, the client name, the requested turnaround time or analytical due date, the holding time, the date and time collected, the specified analytical method, the sample matrix, and refrigerator storage location in the laboratory's sample log-in book and in the laboratory's database
- Placing the samples in the appropriate secured refrigerator location
- Alerting the appropriate Laboratory Section Leader of receipt of any samples with short holding times and/or rush turnaround times

In addition, during the laboratory analytical procedures, the Sample Custodian will continue to be responsible for confirming that the laboratory analysts have returned all sample containers to the environmental chamber in the appropriate area after each analytical procedure.

E.3.11 Sample Analysis

The confirmatory soil samples from the Small Arms Range excavations are being collected to test for the presence or absence of lead. These samples will be analyzed for lead using United States EPA Method SW846 6010.

APPENDIX F

TREATABLITY STUDIES

ATTACHMENT 1 – TREATABILITY REPORT

Camp Bonneville, Washington

Mark Peters, Ph.D., MT2 (Metals Treatment Technologies), LLC
June 5, 2008

1.0 OBJECTIVE

The objective of this report is to present the findings of a laboratory treatability study conducted on the Camp Bonneville Washington soil samples by MT2 designed to determine RCRA leachable lead (Pb) concentrations from Pb contaminated samples and to develop a chemical formulation that ensures the Pb remain below the TCLP Pb criteria.

2.0 SAMPLE DESCRIPTION and CHARACTERIZATION

Two samples of Pb contaminated material were delivered to MT2 Sample Receiving. The samples were received in plastic bags. Before analysis, the samples were transferred to plastic bags and blended to ensure homogeneous sub-sampling. A description of the samples is presented in Table 1.

Table 1 Sample Description and Characterization

MT2 Sample #	Client I.D. #	Description
297-1	Combat Pistol Lane 3 0-2"	Clumps of medium brown loamy soil with some roots.
297-2	Machine Gun 0-6"	Brown sandy soil with some rocks.

The materials were then tested for hazardous Pb by using EPA's SW-846 Method No. 1311 "Toxicity Characteristic Leaching Procedure" (TCLP). The TCLP extraction fluids were then filtered and analyzed by ICP or AAS. The results of the subsequent analysis are presented in Table

Table 2 Pre-Treatment TCLP Results

MT2 Sample #	Client ID #	Total Pb mg/Kg (via XRF)	MT2 Test #	Natural pH of Material	TCLP Pb (mg/l)
297-1	Combat Pistol Lane 3 0-2"	2360	17-40-1	7.62	29.4
297-2	Machine Gun 0-6"	13300	17-40-4	7.97	226.
				RCRA Criteria	5.0 mg/l
				UTS Limit	0.75 mg/l

The untreated TCLP Pb extraction value of the samples indicates that the materials are well above the RCRA criteria for leachable Pb.

3.0 TREATMENT STUDIES

ECOBOND® Pb formula was applied and mixed with the samples at the 1.0%, 2.0%, 3.0%, and 4.0% weight % levels. Some water was added to the sample (~5 weight %). After weighing measurements and complete mixing with the treatment materials, the samples and treatment materials were allowed to cure and stabilize at least overnight. The following day, sub-samples were taken and extracted for Pb implementing EPA's SW-846 Method No. 1311 "Toxicity Characteristic Leaching Procedure" (TCLP). The TCLP extraction fluids were then filtered and analyzed by ICP. The results of the ECOBOND® Pb treatment tests are presented in Table 3.

Table 3 ECOBOND® Pb TCLP Treatment Data

MT2 Test #	MT2 I.D. #	Client I.D. #	Sample Weight, grams	ECOBOND® Pb Formulation (Weight %)	TCLP Pb mg/l UNTREATED	TCLP Pb mg/l TREATED
17-40-2	297-1	Combat Pistol Lane 3 0-2"	100	1.0	29.4	4.7
17-40-3	297-1	Combat Pistol Lane 3 0-2"	100	3.0	29.4	2.6
17-40-5	297-2	Machine Gun 0-6"	100	2.0	226.	2.9
17-40-6	297-2	Machine Gun 0-6"	100	4.0	226.	2.3
RCRA Criteria						5.0 mg/l
UTS Limit						0.75 mg/l

4.0 CONCLUSIONS

The addition of 1.0%, 2.0%, 3.0%, and 4.0% ECOBOND® Pb did significantly lower the TCLP Pb in the samples to below the RCRA limit of 5.0 mg/L.

5.0 RECOMMENDATION

MT2 recommends the addition of 2.0 % to 3.0% weight % of ECOBOND® Pb to the Camp Bonneville soil samples to effectively lower the TCLP Pb to well below the RCRA TCLP criteria to ensure all contaminated materials meet the RCRA limits. These samples, chosen as a worst case scenario for their high concentration of Pb, were readily treatable with ECOBOND® Pb. Actual range soils will likely require less ECOBOND® Pb treatment.

APPENDIX G

LABORATORY DOCUMENTATION

The State of Washington
Department of Ecology

This is to certify that

GEL Laboratories, LLC
Charleston, SC

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective October 26, 2007, and shall expire October 25, 2008.

Witnessed under my hand on October 25, 2007.

Stewart M. Lombard
Lab Accreditation Unit Supervisor

Laboratory ID
C1641

Scope of Accreditation

GEL Laboratories, LLC

Charleston, SC

is accredited by the State of Washington Department of Ecology to perform analyses for the parameters listed below using the analytical methods indicated. This Scope of Accreditation may apply to any of the following matrix types: non-potable water, drinking water, solid and chemical materials, and air and emissions. Accreditation for all parameters is final unless indicated otherwise in a note. Accreditation is for the latest version of a method unless otherwise specified in a note. EPA refers to the U.S. Environmental Protection Agency. SM refers to American Public Health Association's publication, Standard Methods for the Examination of Water and Wastewater, 18th, 19th or 20th Edition, unless otherwise noted. ASTM stands for the American Society for Testing and Materials. PSEP stands for Puget Sound Estuary Program. Other references are detailed in the notes section.

Matrix Type/Parameter Name	Reference	Method Number	Notes
Drinking Water			
Alpha, Gross	EPA	00-02	1
Alpha, Gross	EPA	900.0	1
Beta, Gross	EPA	900.0	1
Cesium	DOE	4.5.2.3	1
Gamma Emitters	DOE	4.5.2.3	1
Gamma Emitting Isotopes	EPA	901.1	1
Iodine 131	EPA	901.1	1
Iodine 131	EPA	902.0	1
Iodine-131	DOE	4.5.2.3	1
Radium 226	EPA	903.1	1
Radium 228	EPA	904.0	1
Strontium 89	EPA	905.0	1
Strontium 90	EPA	905.0	1
Tritium	EPA	906.0	1
Uranium	DOE	U-02	1
Uranium, Total	ASTM	D5174-91	1
Non-potable Water			
Cyanide, Total	EPA	335.3	1
Total Petroleum Hydrocarbons	EPA	1664	1

Matrix Type/Parameter Name	Reference	Method Number	Notes
Alpha, Gross	EPA	900.0	1
Beta, Gross	EPA	900.0	1
Radium 226	EPA	903.1	1
Solid and Chemical Materials			
Bromide	EPA	9056	1
Chloride	EPA	9056	1
Chromium, Hexavalent	EPA	7196	1
Cyanide, Total	EPA	9012	1
Cyanides, Amenable to Chlorination	EPA	9012	1
Extractable Organic Halides	EPA	9023	1
Fluoride	EPA	9056	1
Nitrate	EPA	9056	1
Nitrate + Nitrite	EPA	9056	1
Nitrite	EPA	9056	1
Oil & Grease	EPA	9070 A	1,2
Oil & Grease	EPA	9071 A	1,2
Orthophosphate	EPA	9056	1
pH	EPA	9040	1
pH (non-aqueous)	EPA	9045	1
Phenolics, Total Recoverable	EPA	9066	1
Specific Conductance	EPA	9050	1
Sulfate	EPA	9056	1
Sulfide	EPA	9030	1
Sulfide	EPA	9034	1
Total Organic Carbon	EPA	9060	1
Aluminum	EPA	6010	1
Aluminum	EPA	6020	1
Antimony	EPA	6020	1
Antimony	EPA	6010	1
Arsenic	EPA	6010	1

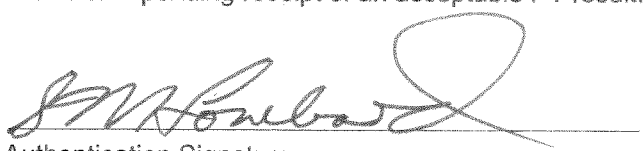
Matrix Type/Parameter Name	Reference	Method Number	Notes
Arsenic	EPA	6020	1
Barium	EPA	6010	1
Barium	EPA	6020	1
Beryllium	EPA	6010	1
Beryllium	EPA	6020	1
Boron	EPA	6010	1
Boron	EPA	6020	1
Cadmium	EPA	6010	1
Cadmium	EPA	6020	1
Calcium	EPA	6020	1
Calcium	EPA	6010	1
Chromium	EPA	6010	1
Chromium	EPA	6020	1
Cobalt	EPA	6010	1
Cobalt	EPA	6020	1
Copper	EPA	6020	1
Copper	EPA	6010	1
Hardness, Total (as CaCO3)	EPA	6010	1
Iron	EPA	6010	1
Iron	EPA	6020	1
Lead	EPA	6010	1
Lead	EPA	6020	1
Magnesium	EPA	6010	1
Magnesium	EPA	6020	1
Manganese	EPA	6010	1
Manganese	EPA	6020	1
Mercury, Liquid Waste	EPA	7470	1
Mercury, Solid Waste	EPA	7471	1
Molybdenum	EPA	6010	1
Molybdenum	EPA	6020	1

Matrix Type/Parameter Name	Reference	Method Number	Notes
Nickel	EPA	6010	1
Nickel	EPA	6020	1
Potassium	EPA	6010	1
Potassium	EPA	6020	1
Selenium	EPA	6010	1
Selenium	EPA	6020	1
Silica	EPA	6010	1
Silver	EPA	6010	1
Sodium	EPA	6020	1
Sodium	EPA	6010	1
Strontium	EPA	6020	1
Strontium	EPA	6010	1
Thallium	EPA	6020	1
Thallium	EPA	6010	1
Tin	EPA	6010	1
Vanadium	EPA	6010	1
Vanadium	EPA	6020	1
Zinc	EPA	6010	1
Zinc	EPA	6020	1
Alcohols	EPA	8015	1
Chlorinated Herbicides (MOD)	EPA	8151	1
EDB & DBCP	EPA	8011	1
Nitroaromatics & Nitramines	EPA	8330	1
Organochlorine Pesticides	EPA	8081	1
Polychlorinated Biphenyls	EPA	8082	1
Polycyclic Aromatic HC (HPLC)	EPA	8310	1
Total Pet Hydrocarbons - Diesel	EPA	8015	1,2
Total Pet Hydrocarbons - Diesel	WDOE	NWTPH-Dx	1
Total Pet Hydrocarbons - Gasoline	EPA	8015	1
Total Pet Hydrocarbons - Gasoline	WDOE	NWTPH-Gx	1

Matrix Type/Parameter Name	Reference	Method Number	Notes
Total Petroleum Hydrocarbons	FL	PRO	1
BNA Extr (Semivolatile) Organics	EPA	8270	1
Volatile Organic Compounds	EPA	8260	1
Alpha, Gross	EPA	9310	1
Beta, Gross	EPA	9310	1
Radium 228	EPA	9320	1
Corrosivity	EPA	1110	1
Cyanide, Reactive	EPA	9014(7.2)	1
Ignitability, Pensky-Martin	EPA	1010	1
Ignitability, Setaflash	EPA	1020	1
Paint Filter Liquids	EPA	9095	1

Accredited Parameter Note Detail

(1) Accreditation based in part on recognition of Florida Department of Health NELAP accreditation. (2) Provisional pending receipt of an acceptable PT result.



Authentication Signature

November 1, 2007
Date

Stewart M. Lombard, Lab Accreditation Unit Supervisor

Parameters Denied Accreditation

GEL Laboratories, LLC

Charleston, SC

Parameter Name	Reference	Method Number	Notes	Matrix
Total Organic Halides	EPA	9020	1	S

Denied Parameter Accreditation Footnotes

(1) Denied pending receipt of an acceptable PT result.

Matrix Definitions - D = Drinking Water; N = Non-potable Water; S = Solid and Chemical Material; A = Air and Emissions.

APPENDIX H

ARCHEOLOGICAL MONITORING PLAN

APPLIED ARCHAEOLOGICAL RESEARCH, INC.
Cultural Resource Management and Historic Preservation

4001 NE Halsey Street, Suite 3
Portland, OR 97232
Phone (503) 281 9451
Fax (503) 281 9504

August 20, 2008

Clif Gray
MKM Engineers, Inc
Sacramento, CA

RE: Revised Archaeological Monitoring Plan for Lead Contaminated Small Arms Firing Ranges, Camp Bonneville, Vancouver, Washington

Dear Mr. Gray:

I have reviewed the revised monitoring plan that Sachin Saldanha provided to me regarding archaeological monitoring during lead remediation activities at Camp Bonneville in Clark County, Washington. The revised plan incorporates suggestions made by the Cowlitz Indian Tribe, the U.S. Army Corps of Engineers, and me. It includes a higher level of archaeological involvement in the remediation project than the original plan, which should increase the likelihood of finding archaeological objects if they are present in the project area of potential effect. I fully accept and endorse the plan.

If I can provide additional information or if AAR can be of further service, please call me at 503-281-9451 or e-mail me at bill@aar-crm.com. Thank you.

Sincerely,

Bill R. Roulette, M.A., RPA
Principal Investigator

Archaeological Monitoring of Lead Contaminated Small Arm Firing Ranges
Camp Bonneville, Vancouver, Washington
8/19/08

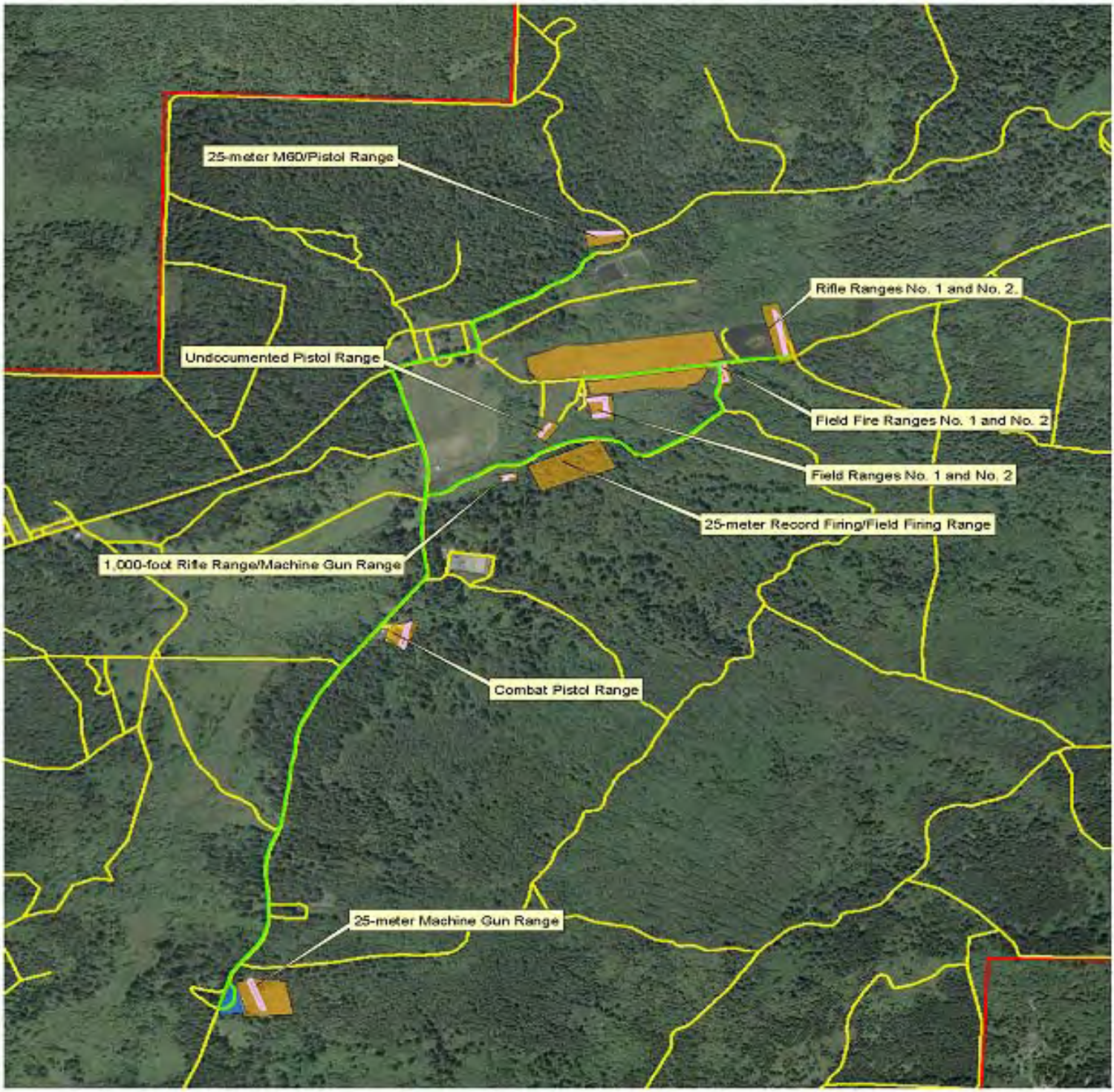
This archaeological monitoring procedure has been prepared to monitor for the presence of archeological objects during the remediation of nine (9) small arm firing ranges at the Former Camp Bonneville Military Reservation (CMBR), which involves the excavation of contaminated soils from range floors and berms and the screening of these soils to remove lead bullets and bullet fragments. CBMR comprises approximately 3,840 acres and is located in southwestern Washington, approximately 11 miles northeast of Vancouver, Washington. The Department of the Army used Camp Bonneville for live fire of small arms, assault weapons, artillery, and field and air defense artillery between 1910 and 1995. Since 1947, Camp Bonneville has also provided training for a variety of military and nonmilitary units from the National Guard, Reserves, and U.S. Air Force to federal, state, and local law enforcement agencies. Camp Bonneville includes approximately 820 acres of land leased from the state of Washington Department of Natural Resources (DNR).

In July of 1995, Camp Bonneville was selected for closure under the 1995 Base Realignment and Closure (BRAC) process. In October 2006, the Army transferred ownership of the property to the County which subsequently transferred the land to the Bonneville Conservation Restoration and Renewal Team, LLC (BCRRT). The BCRRT will hold the deed of the property during investigation and clean-up activities at the site. The Washington State Department of Ecology (WDOE) is the lead regulatory agency with primary responsibility to oversee the cleanup actions performed by BCRRT.

From February 2003 to October 2006, the Army conducted investigations and cleanup actions at Camp Bonneville under an Enforcement Order issued by WDOE. During these investigations, the extent of lead contamination on the range floors of these ranges was identified and delineated. The general objective of the cleanup action for sub-unit RAU-2A (described as consisting of 21 small arms range [SAR] areas) is the “excavation and removal of lead contaminated soil” from nine small arms ranges. These ranges have been identified in the Prospective Purchase Consent Decree (PPCD) entered on October 13, 2006, the Final Remedial Investigation Feasibility Study (RI/FS) Report for RAU 2A (Baker, 2007) and the Final Cleanup Action Plan (CAP) Small Arms Ranges (RAU2A) (Baker, 2008).

These documents also identify lead as the only contaminant of concern for the nine small arms ranges listed below and shown on Figure 1:

1. Combat Pistol Range (RAU-2A-4);
2. Undocumented Pistol Range (RAU-2A-15);
3. 1,000-inch Rifle Range and Machine Gun Range (RAU-2A-16);
4. 25-meter M60 and Pistol Range (RAU-2A-17);
5. 25-meter Machine Gun Range ((RAU-2A-18);
6. 25-meter Record Firing Range and Field Firing Range (RAU-2A-19);
7. Field Firing Ranges ((RAU-2A-20);
8. Rifle Ranges No.1 and No.2 (RAU-2A-21); and
9. Field Fire Ranges No.1 and No.2 (RAU-2A-22).



Legend

- Camp Bonneville Property Perimeter
- Central Impact Target Area Perimeter
- Roads and Trails
- Access Route
- Firing Ranges Boundary
- Processing Area 1
- Berm

N
W E
S

0 305 610 1,220 1,830 2,440 Feet

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

HTW SITES

Drawn On: 4/18/2007 Drawn By: QX Reviewed By: SS

Analysis of results from previous investigative studies has identified areas with localized elevated lead concentrations (exceeding MTCA standards) associated with the range floors as requiring remediation. In addition the berms associated with 8 of the 9 ranges have also been identified as requiring cleanup. This cleanup action involves a combination of excavation, screening, stabilization, sampling and disposal (in accordance with RCRA and MTCA standards and guidelines) either on or off-site.

There have been no recorded archaeological findings on any of the firing ranges during the previous pedestrian survey. Given the degree of expected disturbance that had occurred at these firing ranges, the expectation of finding National Register of Historic Properties eligible archaeological deposits is low; however, there is a moderate likelihood that pre-contact and historic-era artifacts are present in the materials. It is estimated that a total of approximately 12,000 cubic yards of soil will be excavated from range floors and berms during the lead remediation process. Six of the ranges involve berms cut into the natural topography. These "hillside cut" berms will be remediated by removing the surface layers of soil (approximately one-foot thick layers) from the berm for processing. Three large free-standing berms containing roughly 5,000 cubic yards of soil will be completely excavated and processed. These berms had been constructed by using soil material from other previous firing ranges on the CBMR. The range floors of all nine firing ranges had been significantly disturbed during their original construction, including cut and fill, leveling, grading and other activities. Further descriptions of these nine firing ranges and the lead remediation procedures can be found in the Operations Plan for Lead Remediation of Small Arms Ranges (MKM 2008).

In order to evaluate the processed soils for the presence of archaeological objects and human remains, the following procedure will be employed. Due to lead contamination levels, Category I and II sediments will be treated in a different way than Category III sediments.

1. **General Procedure** – Archaeological monitoring will be conducted by an Archaeological Monitor under the supervision of a Professional Archaeologist. For safety reasons (both Unexploded Ordnance [UXO] and airborne lead-dust particulate), this examination does not need to occur while the equipment is operating. Rather, a combination of techniques will be employed, including visual examination of sifted materials, pedestrian survey of exposed surfaces, and subsurface testing of clean sediments. All archaeological investigation shall occur once excavation dust has abated and the exposure has been cleared by UXO technicians. The Archaeological Monitor should be able to examine the soil exposure at the same time the lead-level testing technician is sampling soils from the exposure.

2. **Qualifications** – The Archaeological Monitor shall minimally have the equivalent basic archaeological training and experience described in the Office of Personnel Management's Individual Occupational Requirements for General Series-193. The Professional Archaeologist must meet the Secretary of the Interior's qualifications (36 CFR Part 61) and has the specialized experience and expertise necessary to identify and evaluate any pre-contact or historic-era archaeological materials encountered during all ground disturbing activities within the Camp Bonneville Firing Range clean up action for sub-unit RAU-2A.

3. **Safety and Health** – The BCRRT's construction contractor will brief the archeologist on any health and safety elements under which the Archaeological Monitor will perform the monitoring. The Archaeological Monitor will provide the proper personal protective equipment (e.g., hard hat, steel toed shoes, and safety glasses) as required for project health and safety. BCRRT will arrange for the Archaeological Monitor to brief the

Construction Manager and Supervisor(s) about the procedures for the event of encountering pre-contact and historic-period archaeological deposits and human remains described herein.

4. **Category I and II soils** – All materials to be disposed of off-site as hazardous waste must be screened by the primary, secondary and tertiary screens described in step 5 below. These include both the Category I and Category II soils (expected to be respectively derived from Work Areas 1 and 2). Fine soils passing through the set of three screens may be immediately processed for transfer offsite and disposal as hazardous waste. The "day piles" derived from the triple-screen work must be reviewed by the Archaeological Monitor. Once these day piles are cleared by an Archaeological Monitor, these larger materials may be processed for transfer offsite and disposed of as hazardous waste, or they may be re-used onsite pending analysis of lead levels.

5. **Screening process of excavated contaminated materials.** All Category I and II soil materials excavated will be processed using a vibrating multi-stage screening system. The mesh size interval on the screens will be varied with a larger spacing at the top and the smallest at the bottom level per the following:

   - Primary screen will have a spacing of 5-inches (to capture vegetation debris, large rocks etc);
   - Secondary level will have a spacing of 3-inches (to capture smaller rocks, brush debris etc); and
   - Tertiary level will have a spacing of 0.5-inches (to capture bullets and bullet fragments).

   Segregation piles. As soils are segregated by the screening system during the work day, the different size materials will be isolated into "day piles" for temporary storage

   Inspection of screened materials. After the end of soil screening activities for each work day (approximately 3:30 PM Pacific time) a Professional Archeologist (as defined by the Secretary of the Interior), or an a Archeologist working under the supervision of a Professional Archeologist, accompanied by a trained hazwaste/UXO technician will be given access to all of the screened day piles. The Archeologist or Professional Archeologist will examine the materials in these day piles for the presence of objects of archeological interest.

   Once the day piles have been examined by the Archeological Monitor and determined to be clear of objects of archeological interest (or those objects have been removed) the day piles will be released for disposition as described in the Operations Plan for Lead Remediation of Small Arms Ranges (MKM 2008).

   Initial identification and notification of items of archeological interest. When objects of archeological interest are identified in a day pile, the Archeologist or Professional Archeologist will notify the Construction Manager of this finding. The Construction Manager will determine the location from which the screened soil was excavated. The Professional Archeologist will inspect that location for additional objects of archeological interest. No additional soil excavation will occur at this location until it has been reviewed and cleared by the Professional Archeologist.

6. **Category III soils** – When reached, all Category III soils exposed shall be visually inspected for the presence of pre-contact and historic-era artifacts. If the sediments are to

be removed (either for reuse or disposal off site) or subject to disturbance via transfer, re-grading, or dismantling (or further processing) a subsurface archaeological investigation will be required. Further archaeological assessment may be necessary should cultural material be discovered as a result of the subsurface investigation, as determined by the Corps in consultation with DAHP and the Affected Tribes. If the berms are found not to contain archaeological material, sediment removed from them may be utilized elsewhere on-site pending visual inspection of the materials, following placement, by the Archaeological Monitor. For safety reasons the visual examination will occur once excavation dust has abated and the exposure has been cleared by UXO technicians at the same time the lead-level testing technician is sampling soils from the exposure.

The subsurface investigation will consist of shovel/auger test probes in the berms. Additional probes surrounding the berm may be needed to characterize the nature and extent of any archaeological materials if encountered in the berms. The probes will be placed no more than 20 meters apart and be 50 centimeters in diameter to a minimum depth of 1 meter and 25 centimeters in diameter below that depth to a maximum depth of 2 meters below the surface of the berm. Sediment excavated from the shovel/auger probes will be passed through one-quarter-inch-mesh hardware cloth. Artifacts, if found, will be retained for analysis. The archaeological sampling of the berms will conducted by an individual possessing the basic archaeological training and experience described in the Office of Personnel Management's Individual Occupational Requirements for General Series-193 under the supervision of a Professional Archaeologist.

7. **Discovery Procedures for Recording of Incidental Features and Artifacts.** If incidental or demonstrably non-NRHP eligible cultural materials or features are discovered during construction, the Monitor will immediately halt work at that location and notify the on-site Construction Supervisor. Incidental or demonstrably non-NRHP eligible cultural materials or features include—but are not limited to—isolated pre-contact or historic period artifacts, and cultural materials younger than 50 years old. The discovery area and a surrounding buffer zone shall then be delineated with flags tied to long stakes that are driven in to the ground. These stakes shall not be removed. The Monitor will thoroughly document and sample the cultural material. The buffer zone established around the discovery zone shall be large enough to allow ground disturbance activities to resume outside the buffer.

8. **Protocol for Inadvertent Discovery of Potentially NRHP Eligible Cultural Resources.** If potentially NRHP eligible cultural resources are discovered, the Monitor will immediately halt work at that location and notify the on-site Construction Supervisor. Potentially NRHP eligible cultural materials include; evidence of prehistoric or historic features including postholes/molds, hearths, pits, walls, foundations, and other evidence of structural remains; shell midden, non-human bone, lithic debitage, formed-stone –bone –shell –wood or –fiber implements, historic-period glass and ceramics. The discovery area and a surrounding buffer zone will then be delineated with flags tied to long stakes that are driven in to the ground. These stakes shall not be removed. The buffer zone established around the discovery zone shall be large enough to allow ground disturbing activities to resume outside the buffer. The Monitor will then coordinate with the on-site Construction Supervisor to determine whether further impacts to the NRHP eligible cultural resources can be avoided in which case the Monitor will thoroughly document and sample the disturbed cultural material. If further impacts to the NRHP eligible cultural resources cannot be avoided, the Archaeological Monitor shall contact the Corps Archaeologist. The Corps will then immediately notify affected Tribes and the DAHP. The Corps, in consultation with the DAHP and affected Tribes, will determine the next course of action.

9. **Protocol for Inadvertent Discovery of Human Remains.** Any time that a bone, which may or may not be human, or any funerary object is discovered, construction activity will cease immediately to allow the Monitor to conduct a preliminary analysis to determine if the remains are human. Funerary objects can include, but are not limited to, items made of copper; shell and ground-stone beads; ground-stone, carved-bone, and shell adornments; and carved/ground objects representing people or animals. Upon such a discovery, no additional excavation or stockpiling of materials will occur and the area of discovery and a surrounding buffer zone shall then be delineated with flags tied to long stakes driven into the ground. These stakes shall not be removed. The buffer zone established around the discovery area shall be large enough to allow ground disturbing activities outside of the buffer. If the Monitor is not present at the time of the discovery the on-site Construction Supervisor will first ensure that the discovery area and a sufficient buffer zone is flagged-off and secured from further disturbance, and then will contact the Monitor. The Monitor shall proceed with the following steps:

    a. If the material is determined to be human or possibly human, the Monitor will immediately notify the on-site Construction supervisor, the Clark County Sheriff and Medical Examiner, and the Corps Archaeologist. The Corps will then immediately notify the Affected Tribes and the DAHP.

    b. The treatment and disposition of all human remains will be determined in accordance with all applicable state and federal laws.

    c. Exposed human remains and any associated or non-associated funerary objects will be treated with dignity and respect.

    d. Ground disturbance activities within the discovery area and the buffer shall not resume until, the Corps, in consultation with the DAHP and affected Tribes (and the Medical Examiner), has determined proper disposition of the remains and has given permission, in writing, to proceed.

    e. The Monitor will prepare a professional report that describes the discovery, notification of concerned parties, steps taken in response to the discovery, and the final disposition of remains. The report shall be submitted to the Corps within 13 months of permit issuance.

10. **Procedures for Archaeological Monitoring and the Treatment of Archaeological Resources**. BCRRT will inform all construction contractor(s) about the archaeological monitoring procedures and protocols. BCRRT will authorize the Archaeological Monitor to pause construction periodically as needed for a closer examination of exposed sediments and/or historic-period and pre-contact period artifacts.

    a. The Archaeological Monitor will record the daily progress of the construction and monitoring work. At the completion of the monitoring, the Archaeological Monitor will prepare a report on the methods and results of the work, illustrated with maps, drawings, and photographs as appropriate.

    b. After monitoring has been completed, the final disposition of any artifacts or other cultural material collected will be determined by BCRRT in consultation with the DAHP, the Cowlitz and interested and involved parties.