

**Memorandum for: Rich Wilson, Fort Lewis Public Works**

**From: Gwyn Puckett, CENWS-EC-TB-ET**

**Subject: Soil Sampling – Path Forward at Former Ranges**

This memorandum describes additional soil sampling to be performed at the former pistol range at Miller Hill, the berm at the former infiltration range on Evergreen Avenue and the former skeet range at Fort Lewis, Washington based on review of the initial sampling data. It is estimated that the additional sampling will take three days to complete. A backhoe will be required to assist in collecting the samples to help expedite the fieldwork.

#### **Miller Hill Former Pistol Range**

Lead contamination was observed at concentration above 250 mg/kg in the majority of sampled berm (Figure 1). Maximum observed concentration was 1780 mg/kg. In almost all cases, exceedences of 250 mg/kg were also observed in the 1-2 foot interval. Since no bullets were observed during sampling, it is not clear if the lead contamination is derived from use as a range or if the contamination was derived from the berm source material used (e.g. graded material from Miller Hill Main ranges).

In order to establish boundaries of the lead contamination in this area, additional sample locations will be placed within the trench behind the main berm, in the area directly before the berm, and at the smaller “berm” close to the road (Figure1). Initially, there will be four sample location per area in a row (approximately 50 feet apart), filling in with additional samples as needed to minimize uncertainty. Additionally, two sample locations will be placed at either end of main berm to establish boundaries of contamination. All locations will be excavated to 1-foot depth below ground surface (bgs). This translates into, initially, 14 locations with one sample per location.

To cost effectively evaluate depth of contamination at this small range, additional depth samples (1-2 feet bgs or deeper as needed) will be collected at locations MH4, MH9, and MH16. These locations were selected to establish depth of contamination likely expected from a concentration range of surface contamination. This information will then be used to assume a reasonable estimate of depth of contamination for use in the Feasibility study.

As the original sample locations were spaced 10 ft. apart on the main berm, no co-located duplicates will be collected.

To determine potential field variability, three of the previously collected samples (MH 1, 8, and 17) will be analyzed as precision samples. These samples were selected because the initial results were near 250 mg/kg; therefore, these locations will be examined further to determine influence of field variability on potential decisions.

### **Evergreen Former Infiltration Range**

As previously presented, lead contamination was detected throughout the majority of the Evergreen Infiltration Range berm. Based on our statistical evaluation of the data from the impact side of the berm, no additional sampling is needed for evaluating cleanup alternatives. However, the sample collected from the backside of the berm indicated lead contamination might also be present on this unused portion of the berm.

In order to establish the extent of contamination on the backside of the berm, additional samples will be collected from this side of the berm. Areas to be sampled include the trench (toe of the berm) and at the same height of the impact zone. Initially six sample locations from each area will be collected (approximately 50 ft. apart), filling in with additional samples as necessary to minimize uncertainty. Samples will be collected from both the 0" to 12" and 12" to 24" depth intervals. This translates into initially 12 locations, two samples per location, for a total of 24 additional samples. If contamination is found and additional samples are required, an additional row of sample will be collected for an initial maximum of 18 sample locations, two samples per location, for a total of 36 additional samples.

If both levels of this side of the berm indicate contamination is present, this information will be used to assume soil volumes for the Feasibility Study. If the trench samples do not contain lead concentrations above 250 mg/kg, an additional row of sample midway between the trench and the upper row of samples will be collected to refine soil volume assumptions.

### **Former Skeet Range**

Initial sample results from the Skeet range sampling indicate that the majority of lead contamination at this site is limited to an area roughly 450 feet away from the firing points, extending to the gravel road to northwest in some areas (Figure 2).

Additional samples need to be collected to fill in areas of uncertainty of the extent of contamination. Thirteen new locations will be sampled, including from sample locations across the gravel road (if possible without encountering utilities) to the northwest of the former skeet range. New samples will be collected from three depth intervals (0-1, 0-3, and 0-6 inches bgs; Figure 4). If the surface samples areas contaminated, the location will also be sampled at the subsurface (12 to 24 inches). Additionally, sample locations ST32, ST35, and ST46 will be revisited and resampled at the three depth intervals. These sample locations were selected to provide a range of lead concentrations to evaluate concentration gradients with depth.

Co-located field duplicates will be collected at sample locations ST34 and ST65. These samples were selected because they represent potential outliers in the contamination distribution patterns. These locations will be examined further to determine influence of field variability on potential decisions. In order to determine if particle size should be considered, prior to the new field sampling, archived soil samples from the following sample locations (0 to 6 in. depth interval) will be sieved with a No. 60 sieve and reanalyzed with the XRF: ST33, ST35, ST36, ST37, ST38, ST44, ST45, ST46, ST48 (Figure 4).

Although initial sampling data indicates lead contamination extends to the 2-foot interval at four of the sampled locations, we do not recommend additional sampling past this interval for the purposes of refining soil volumes for the Feasibility study. Based on the dispersed lead contamination pattern and isolated exceedences with depth, we recommend assuming contamination extends to one foot for the FS. Uncertainty of depth of contamination could then be addressed during remediation. As an example of this, refinement of actual depth of contamination could be delineated during a removal action by collecting confirmation samples following removal.

Existing data indicates impact to groundwater from lead is not likely. Lead concentrations are seen to decrease with depth, and all detected soil concentrations are below the 3-phase action level of 3000 mg/kg. Therefore, additional delineation of contamination with depth for lead is not required to determine potential impact to groundwater.

PAHs were detected in several of the samples delivered to the laboratory; Figure 3 provides the cPAH TEF values for these sample locations. In general exceedences of the MTCA Method A unrestricted land use cleanup level for cPAH TEF as benzo(a)pyrene were limited to an area roughly 100 feet from the shooting area. Five additional samples will be collected in order to delineate the horizontal extent of PAH contamination (Figure 3). In addition, two sample locations, ST11 and ST16, will be sampled from the 12" to 24" depth interval to determine the vertical extent of the PAH contamination.

## **Reporting**

The information from this next round of sampling will be provided to Fort Lewis Public Works for review as a technical memorandum similar to previous site investigation report formats. It is anticipated that this report will be provided for review roughly 6 weeks from completion of field activities.

cc: Kym Takasaki  
Kira Lynch  
File

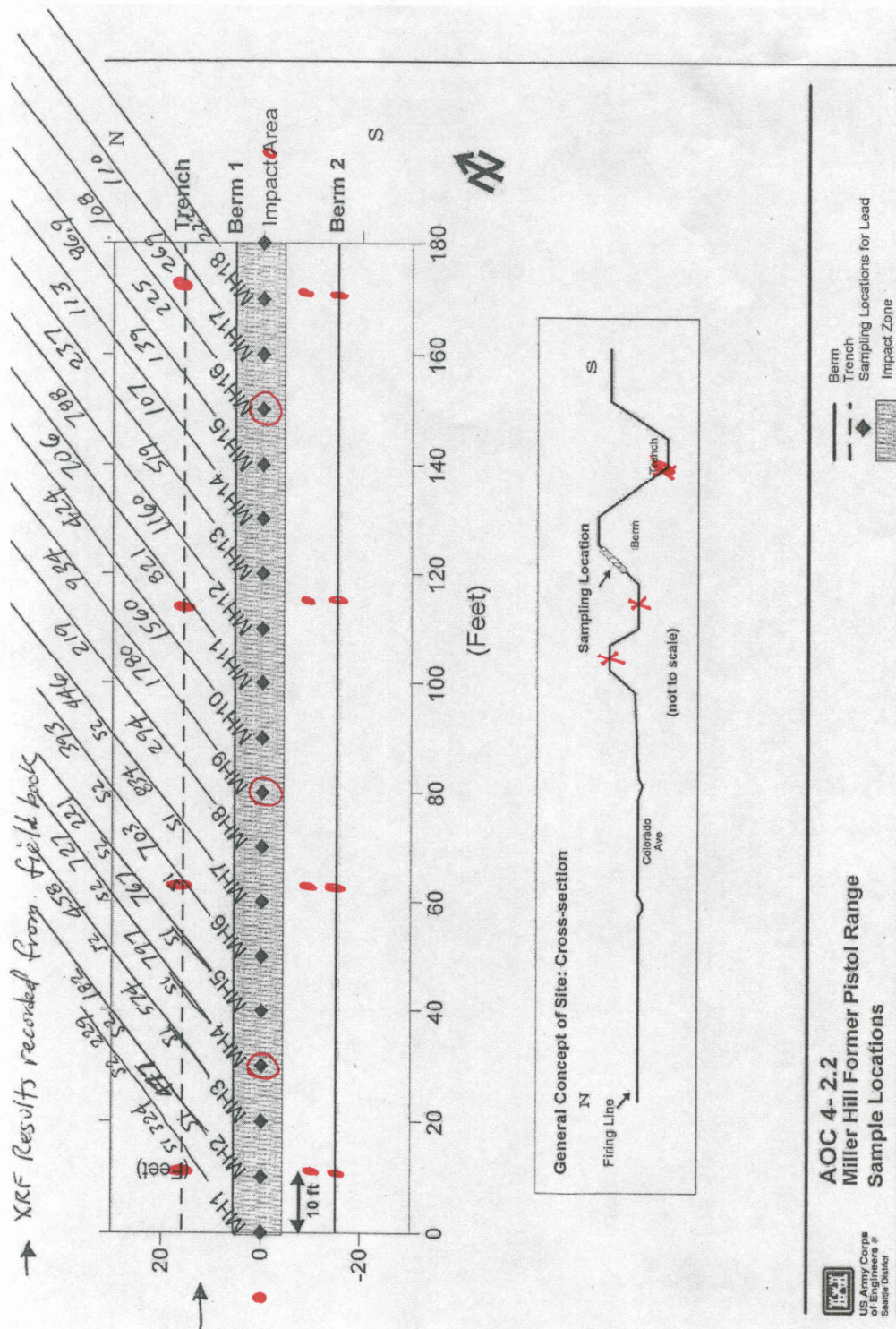


Figure A-6. Sampling Grid For Impact Berm at the Miller Hill Pistol Range (AOC 4-2.2)

new sample locations

Figure 1. New sample locations at the Former Pistol Range at Miller Hill

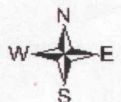




**Former Skeet Range  
Sample Locations  
Fort Lewis, WA**



US Army Corps  
of Engineers  
Seattle District



*13  
+ 2 dups*

0 50 100 150 200 Feet

- Sample Points *dups*
- Picnic Shelter
- Trails
- Paved Roads
- Rec Areas
- new locations*

**Figure 2. New Sample Locations for Lead at the Former Skeet Range**



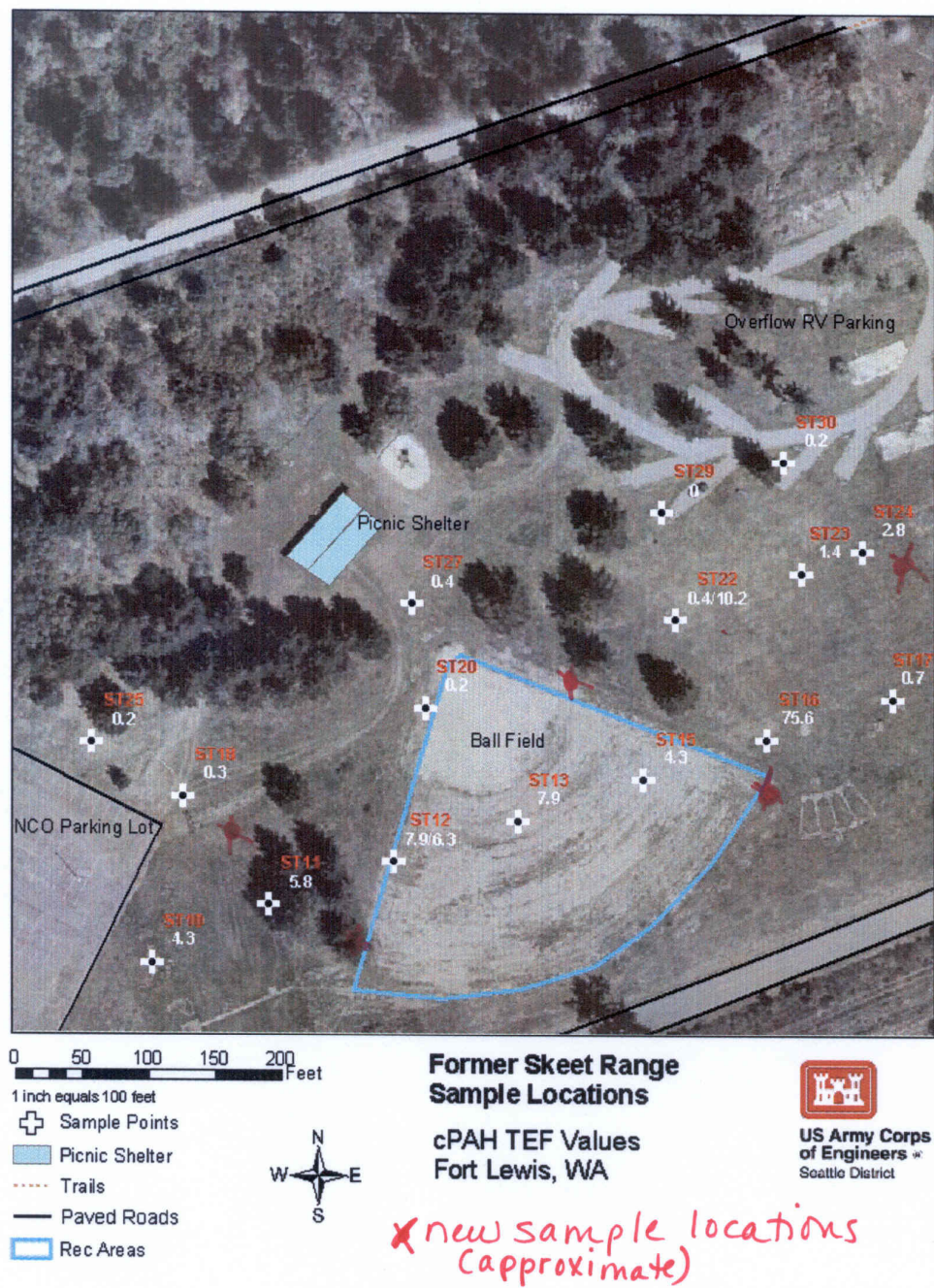


Figure 3. Additional Samples for PAHs at the Former Skeet Range



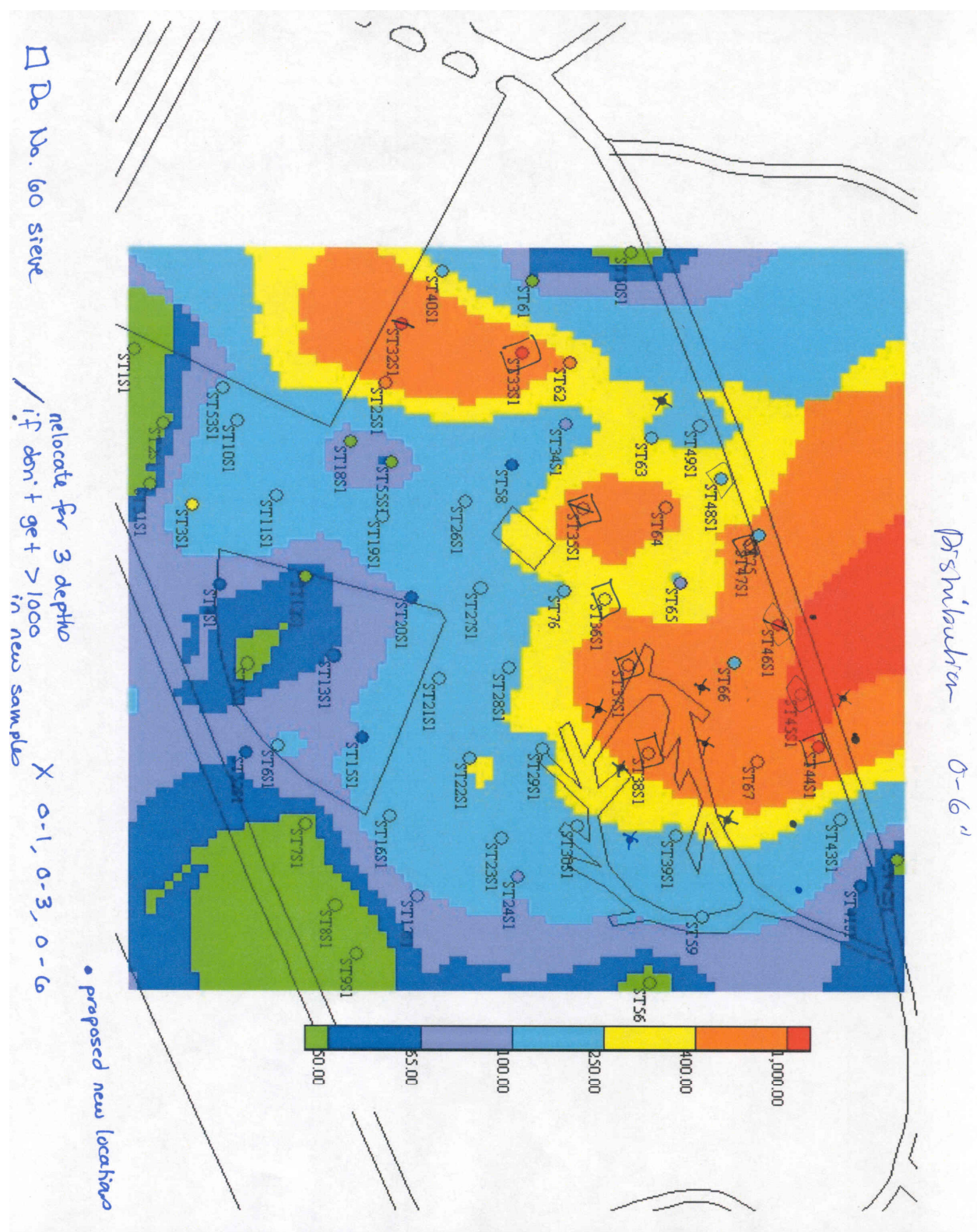


Figure 4. Additional Samples at the Former Skeet Range