Addendum 1

Revised Draft

Addendum 1–to the Remedial Investigation Work Plan

Sound Berm Investigation

FWA 102 Former Communications Site
Fort Wainwright, Alaska

Prepared for

Department of the Army
U.S. Army Corps of Engineers,
Alaska District

P.O. Box 6898
Elmendorf AFB, Alaska 99506-6898

Contract No. W911KB-05-D-0010
Task Order 0009

Revision 1, 25 July 2007

CH2MHILL
301 W. Northern Lights Boulevard, Suite 601
Anchorage, AK 99503

ADDENDUM 1

Sound Berm Investigation

Purpose

This document serves as an addendum to the May 2007 *Remedial Investigation/Feasibility Study Management Plan, FWA 102, Former Communications Site, Fort Wainwright, Alaska* (RI Management Plan). It addresses the characterization of the Sound Berm at the Former Communication Site (FCS). The purpose of this addendum is to ensure that the Sound Berm does not pose a direct contact risk to human health. Consistent with the June 6 and 7 meeting to review the Draft RI Management Plan, the FCS Management Team's decision was to use multi-increment (MI) soil samples as a screening tool to eliminate sections of the Sound Berm that are not a risk. If any sections of the Sound Berm exceed established risk screening criteria, then discrete samples will be collected to calculate baseline risk and characterize for subsequent management decisions.

Background Information

The Sound Berm is a 6-foot (ft)- to 10-ft-high earthen structure designed to be a sound barrier separating the railroad tracks and the housing units on the FCS. It extends from the northeast corner of the site running approximately 1,200 ft along the east boundary toward the south perimeter where it extends approximately 1,000 feet to the west. The Sound Berm was generated from near surface soil and organic matter (such as tree stumps) obtained during site clearing in the FCS and imported soil from other Fort Wainwright construction sites. Consequently, contaminants found in other areas of the site could also be in the Sound Berm and may or may not correlate with FCS soil samples collected elsewhere.

Previous Sampling Results

Two relatively short sections of the Sound Berm have been partially characterized for polychlorinated biphenyls (PCBs). One of the sections is located in the southwest portion of the Sound Berm. Twenty samples were collected from the berm and analyzed using a field screening method (Hach PCB Test Kit). Four of the 20 samples indicated the presence of PCBs above 1 part per million (ppm). These four samples were submitted for lab analyses and PCBs were not detected. Because the results from the field screening appear to be inconclusive and because the sample locations appear to be limited to the perimeter of the berm, it is recommended that this portion of the Sound Berm be re-sampled for PCBs and for other chemical constituents during this field investigation effort.

The other partially characterized section is that portion of the Sound Berm situated over the former Transformer Service Area (TSA). Twenty-five samples were collected from this section and tested with the Hach Field Screening Kit. Five of the 25 field-screened samples exceeded the 1 ppm cleanup level for PCBs. Two of the five field samples were analyzed in the laboratory and only one of these exceeded criteria. This soil below this portion of the

Sound Berm will be re-sampled for PCBs in conformance with MEC clearance procedures. As discussed above, the Sound Berm soil will be characterized using MI sampling procedures. Sample collection and processing will follow the procedures described in the State of Alaska Department of Environmental Conservation's (ADEC) Draft Guidance on Multi-Incremental Sampling (March 2007).

Data Quality Objectives (DQOs)

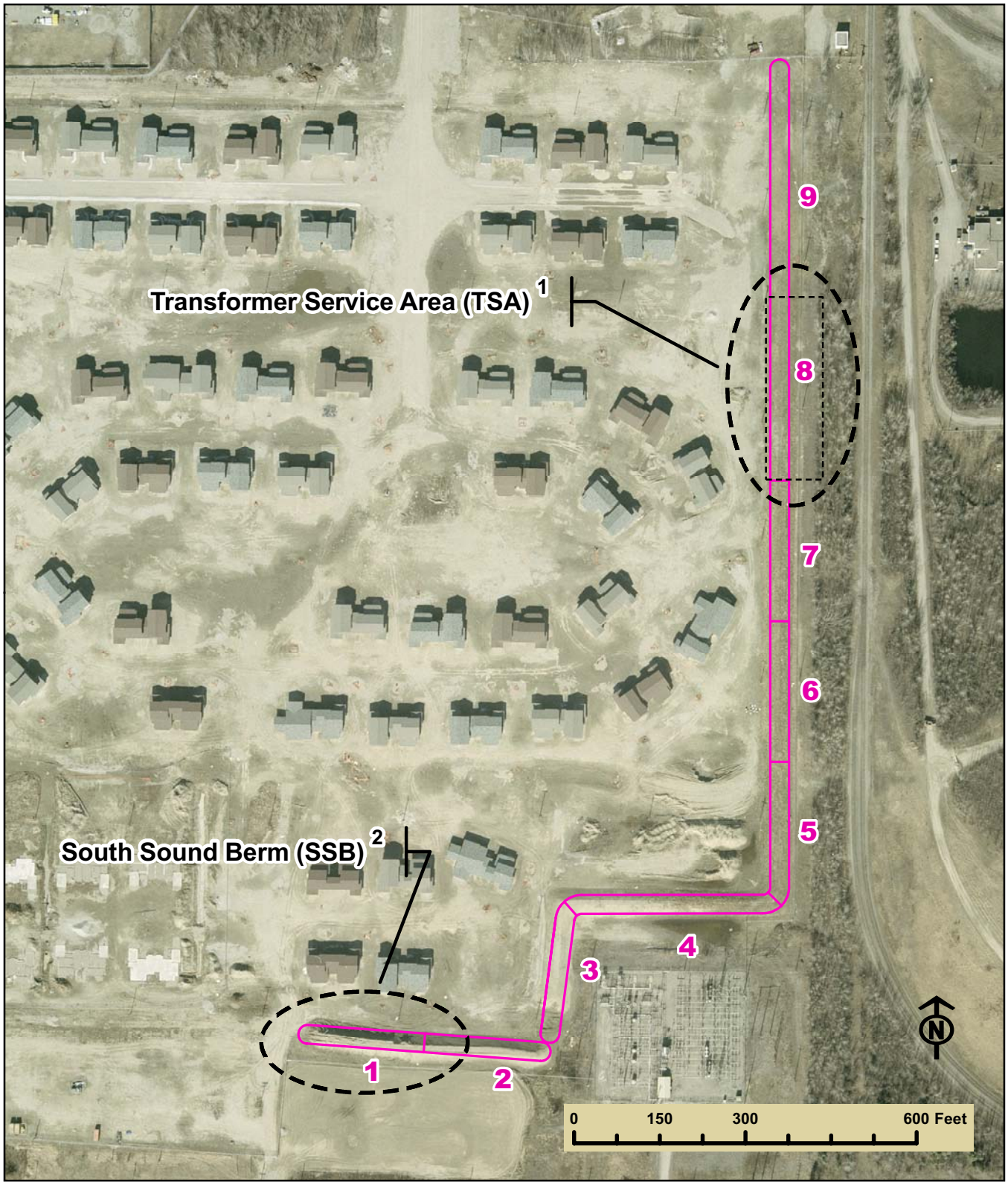
A DQO process was used to document the purpose of data to be collected for the RI. The objective of this addendum is to assess the nature and extent of chemicals in the Sound Berm soil that present unacceptable risk to human health.

Sample results will be validated following Level III protocols. Ten percent of the results will be validated following Level IV protocols. Screening values for the determination of risk are 1/10th of ADEC's most conservative Method 2 ingestion cleanup levels, and as appropriate, inhalation and migration to groundwater cleanup levels. These cleanup levels can be found in 18 AAC 75 (Tables B1 and B2) and in ADEC Technical Memorandum 01-007, *Additional Cleanup Levels*. U.S. Environmental Protection Agency (EPA) Region 6 Soil Screening Levels may also be used for assessing human health direct contact risk for any compounds not included in ADEC Tables. If soil results do not exceed risk based criteria, no additional action is needed. In accordance with ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007) the calculated 95% UCL will be compared to risk-based screening criteria. If the MI soil sample results exceed risk-based screening criteria (e.g., 1/10th of ADEC soil cleanup levels), then discrete samples for compounds of concern shall be collected within the affected Decision Unit. All of the discrete sample data will be used in the baseline risk assessment. If discrete sample results show an unacceptable risk, then the data will be used in the Feasibility Study for the FCS. Agency approval will be obtained before any follow-on discrete sampling is performed.

Sampling Approach

All MI field and laboratory sampling and quality assurance and control procedures will follow ADEC guidance ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007). The following bullets highlight the key elements of the Sound Berm investigation:

- Soil samples will be randomly collected from a systematic grid established over nine Decision Units (see Figure 1-1).
- Each Decision Unit is an approximately 200- to 400-ft-long section of the Sound Berm.
- Sound Berm will be sampled from all sides from 0 to 2 ft depths.
- The top 24 inches of underlying mineral soil will be collected; organic material will be excluded.
- One MI soil sample will be collected from 8 of the 9 Decision Units; a duplicate and triplicate MI sample will be randomly collected from the 9th Decision Unit.
- UCLs will be calculated for the triplicate and the regular samples per the guidance



\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_1-1_TakuSoundBerm.mxd 7/10/2007 15:40:50PM

Legend

MI Sampling Decision Unit

Transformer Service Area (TSA)

Historical Sampling Results

[1] TSA: 2 PCB lab samples, one exceeding cleanup criteria

[2] SSB: 4 PCB lab samples, all non-detect

Figure 1-1
Former Communications Site
Fort Wainwright, Alaska
Sound Berm

- Each MI soil sample will be composed of 30 incremental samples consistent with ADEC guidance that requires a minimum of 30 to 50 increments. The duplicate and triplicate sample quadrants, within each increment, will be determined randomly by dice roll, but samples may not be from the same quadrant.
- For volatiles, samples will be field preserved directly in methanol. Volatile samples will not be sieved.
- For non-volatiles, a bulk soil sample of the entire 3'' column (e.g. the 3'' hand auger from 0-24 inches, or approximately 60 grams of soil per sample increment) will be coarse screened with a 6-mm (0.25-inch) sieve and sent to the laboratory. The laboratory will sieve (#10 sieve to 2-mm size), subsample, and distribute through the lab for analysis. For MI sampling of metals the laboratory will digest 10 grams of sample to achieve a fundamental error requirement of less than 15%.
- Laboratory procedures have been submitted to the ADEC for review.
- Additional information about MI sampling protocols and quality assurance (QA)/quality control (QC) requirements for the Sound Berm investigation can be found in the FCS Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP), respectively.

Sample Collection and Analyses

Sample collection procedures are provided in the FSP and QAPP. Field quality control samples including equipment blank, trip blank, and matrix spike/matrix spike duplicate samples will be collected. Details will be specified in the FSP and QAPP. Table 1-1 presents the summary of analytical methods that will be followed in this Addendum.

TABLE 1-1
Analytical Methods for Sound Berm Soil

Analysis	Method Number	Container	Preservative	Maximum Holding Time	Number of Soil Samples
VOCs	EPA SW8260B	1, 4-oz amber glass jar with septa lid	Methanol 4°C	14 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
SVOCs	EPA SW8270C	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)	4°C	14 days to extraction, 40 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
PCBs	EPA SW8082	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)	4°C	14 days to extraction, 40 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
Metals/Mercury	EPA SW6010/6020/ SW7471A	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)	4°C	28 days for mercury, 6 months for all others	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
GRO	AK 101	1 4-oz amber glass, septa lid	Methanol 4°C	28 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
DRO/RRO	AK 102/103	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)	4°C	14 days to extraction, 40 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)

TABLE 1-1
Analytical Methods for Sound Berm Soil

Analysis	Method Number	Container	Preservative	Maximum Holding Time	Number of Soil Samples
Chlorinated Pesticides	EPA SW8081A	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)jars	4°C	14 days to extraction, 40 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
Chlorinated Herbicides	EPA SW8151A	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)	4°C	14 days to extraction, 40 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)
Explosives	EPA SW8330	2, 1-liter widemouth glass jars (these same containers are used to hold soil for all non-volatile sample analyses)	4°C	14 days to extraction, 40 days to analysis	11 MI samples (one from each Decision Unit plus 2 QC) (Duplicate/Triplicate from Decision Unit 9)

AK = Alaska
C = centigrade
DRO = diesel-range organics
EPA = U.S. Environmental Protection Agency
GRO = gasoline-range organics
MI = multi-increment
PCB = polychlorinated biphenyl
RRO = residual-range organics
SVOC = semivolatile organic compound
QC = quality control
VOC = volatile organic compound

Responses to Comments

REVIEW COMMENTS	PROJECT: RI Former Communication Site, Ft. Wainwright DOCUMENT: WP Addendum #1, Sound Berm Investigation	
U.S. ARMY CORPS OF ENGINEERS	DATE: 6/30/07 REVIEWER: Robert D. Brock, POA PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
Addendum 1 Sound Berm					
1	Purpose	Delete all but the first two sentences of this section.	A	This section was revised to incorporate comments from all reviewers.	
2	Area of Investiga-tion	Explain how MEC was determined and that a conservative approach was used (see email from Beth Astley, CRREL). Consider squaring off the area for ease of locating in the field. Add that if site conditions change (i.e. debris is encountered in other areas) that the plan will be revisited and changed as needed. Add that UXO technicians (two reams) will be onsite to support Building 48/49 investigations and test pit installations and will be available to provide support as warranted by changed site conditions. Work below EXISTING grade in MEC area will require UXO support	A	Information about how the MEC was conservatively determined is included in this response to comments and will be included in Addenda and Plans if MEC may be encountered. As the Sound Berm is located above grade and MEC clearance procedures do not apply to above grade structures, this section was revised accordingly.	
3	DQOs	Validated using Level III or IV protocols? Explain.	A	Typically, there are four types of data reduction, validation, and reporting deliverables that depend upon the DQOs of the individual project. The specific data	

U.S. ARMY CORPS OF ENGINEERS	DATE: 6/30/07 REVIEWER: Robert D. Brock, POA PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
				deliverable level must be defined in the project-specific SAP. See also response to Sharon Richmond's Comment No. 6 below.	
4	Table 1-1	Reference for Extractable VOC method? Purpose of this sample?	A	Extractable VOC samples have been eliminated from the FSP and this Addendum.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: Sharon Richmond PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
1.		The first paragraph indicates that multi-increment (MI) sampling data will be used for a baseline risk assessment. As agreed upon in our planning meeting, MI data can not be used for risk assessment because it does not address acute exposure.	A	The Sound Berm Sampling Addendum will be revised in Section 1-1 to state that the purpose is to ensure that the Sound Berm does not pose a direct contact risk to human health. Consistent with the June 6 and 7 meeting to review the Draft RI Management Plan, the FCS Management Team's decision was to use multi-increment (MI) soil samples as a screening tool to eliminate sections of the Sound Berm that are not a risk. If any sections of the Sound Berm exceed established risk screening criteria, then discrete samples will be collected to calculate baseline risk and characterize for disposal	
2.		I recognize that this will be a dynamic work plan and agree that this is the best approach but we need a decision "tree" to document how decisions will be made. This is critical for approval of this work plan.		The decision tree included as Figure 4-2 of the draft Work Plan applies to the MI soil sampling for the Sound Berm. If the MI soil sample results are below risk screening levels, then it is considered clean. If the MI soil sample results are above risk screening levels, then discrete sampling (grid pattern) will be used to locate the source, calculate baseline risk, and characterize the area for appropriate management decisions. Other decision trees will be developed for other parts of the RI.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: Sharon Richmond PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
3.	Second par.	The management team has not yet agreed upon the boundaries of the MEC area and the non-MEC area. I think we should have a meeting about this on Monday as suggested in Julie's email on 6/25/07. Approval of this and other addenda hinges upon this decision.		The development of the area where MEC clearance is potentially required was presented in the email sent to RPMs from Bob Brock on 6/25/07, and discussed on the conference call on the same date. The area was based on a geophysical survey of magnetic anomalies, backed up by locations of recovered MEC, historical photographs, and the former river channel. The purpose of Figure 1-1 was to delineate the area where MEC clearance is not required so that intrusive RI fieldwork can begin. Note that MEC clearance is not required for aboveground berms and soil piles anywhere at the site, so Figure 1-1 has been revised in Addendum 1 to depict the Sound Berm features only.	
4.	Page 2. First full par.	Please use 1 mg/kg cleanup level instead of criteria.	A	Will revise the Addendum and the FSP to say cleanup level instead of criteria.	
5.		I understand that the former transformer storage area will be sampled differently from the other portions of the sound berm, which will be sampled using MI techniques, but I don't understand what "at a later date in accordance with MEC clearance procedures" means. If this area will be sampled using soil	A	The Transformer Service Area (TSA) will be sampled using soil borings and discrete sampling with UXO support.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: Sharon Richmond PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
		borings and discrete sampling with UXO support, please state this.			
6.	Page 3.	Please briefly explain Level 4 protocols. (Sorry, I'm not familiar with data validation procedures.)	A	Typically, there are four types of data reduction, validation, and reporting deliverables that depend upon the DQOs of the individual project. The specific data deliverable level must be defined in the project-specific SAP. Level 4 is appropriate for investigative, confirmatory, or closure results. Critical decisions may be made using these data and should be used for projects that require a high degree of confidence in the accuracy of the data. A Level 4 report will include all elements required for the Level 1-3 report formats and all of the associated raw data. In the Level 4 report, the relative scale used for all chromatographic and other instrument data must be supplied in a scale that facilitates review from hard copy. Sufficient "blow ups" of complex areas of sample chromatograms are provided in the Level 4 report. The following information is also supplied in a Level 4 report:	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: Sharon Richmond PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
				• Sample preparation logs. • Example calculation for obtaining numerical results from at least one sample for each matrix analyzed; provide algorithm. • Ion Ratio information for dioxin/furan methods Additional information about the Level 4 report for the FCS RI is included in the QAPP.	
7.	Sampling Approach.	The systematic grid is not presented. Suggest using the phrase “30 to 50 samples” instead of approximately 33 samples. It isn’t clear why “approximately 33 samples” was chosen.	A	A figure depicting the systematic grid is provided in the FSP. The Sound Berm is systematically divided into 9 Decision Units, each measuring approximately 200 to 400 feet in length. Each Decision Unit along the Sound Berm will be sampled from the top and sides from 11 cells lengthwise and three cells widthwise. One sample will be collected from each cell in a random fashion. This yields 33 samples per Decision Unit.	
8.		Approval of this document hinges upon approval of the field sampling plan and QAPP.	A	Comment noted. The revised FSP and QAPP will be posted for agency review on the FTP site.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: Sharon Richmond PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	USACE BACKCHECK
9.	Table 1.1.	Please add a note explaining why VOC samples will be preserved with sodium bisulfate instead of methanol. I know that we won't be closing the site with these data so I'm not terribly concerned about this but we should document why we're using an unapproved method.	A	VOC samples will be preserved with methanol per the instructions of the *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007). This will be reflected in the FSP and the QAPP.	
10.	Table 1.1.	Please discuss using MI sampling for metals with Earl.	A	Comment noted; CH2M HILL will contact Earl. <u>Earl was contacted for discussion of MI sampling for metals.</u>	Not contacted.
11.	Figure 1.	Our team needs to agree upon the MEC vs. non-MEC areas. See Comment 3.	A	Agreed. See response to Comment No. 3.	
12.	General Comment	Addenda should be replaced with addendum throughout document.	A	Comment noted; replacement made.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
1.	1-1 Purpose	If the purpose of this sampling activity is to collect data for use in a risk assessment, then why will multi-increment sampling occur? Why not collect 33 discrete samples?	A	The Sound Berm Sampling Addendum will be revised in Section 1-1 to state that the purpose is to ensure that the Sound Berm does not pose a direct contact risk to human health. Consistent with the June 6 and 7 meeting to review the Draft RI Management Plan, the FCS Management Team's decision was to use MI soil samples as a screening tool to eliminate sections of the Sound Berm that are not a risk. If any sections of the Sound Berm exceed established risk screening criteria, then discrete samples will be collected to calculate baseline risk and characterize for disposal.	Accepted
2.	Figures	Please provide figures with available site data plotted for reference.	A	Figure 1-1 has been revised to delineate the Sound Berm and available site data.	Accepted
3.	1-1 Previous Sampling Results	At what depth were previous samples collected? Is sampling 2 ft as proposed appropriate based on previous results? The initial management plan had incremental samples being collected only in the top 6 inches. Please provide consistency and justification for MI sampling in the top 2 feet.	A A	The depths of the previous Sound Berm samples are not known. Consistent with the June 6 and 7 meeting to review the Draft RI Management Plan, the FCS Management Team decided to sample at 0 to 2 feet depths. The justification was that there was existing knowledge about how the berm was constructed and no reason to think that surface soil is different than subsurface soil.	Accepted. However, the assumption regarding subsurface soil should be evaluated as an uncertainty. Additionally,

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
				Institutional controls will be considered in the Feasibility Study.	appropriate institutional controls (no dig) will be required for regulatory compliance for soil 0-15 feet.
4.	1-2 DQOs	Approach not acceptable as presented. If MI results exceed ADEC cleanup levels, there is no need for additional discrete sampling. *Marty, I don't get this comment. If the results are above cleanup levels, then they do need to get more samples.* If MI results exceed risk based screening levels (1/10 ADEC cleanup levels), discrete sampling of all nodes should be conducted to calculate risk. If discrete samples indicate unacceptable risk, then management decisions should follow.	A	At the June 12 and 13 review meeting, the FCS Management Team indicated if an MI soil sample is greater than risk screening criteria (ADEC cleanup levels), then collect discrete samples to locate the source, calculate baseline risk, and characterize for management decisions such as removal of that section of the berm. Comment noted on approval needed for follow-on discrete sampling if required.	Accepted. Discrete sampling of the sound berm decision unit(s) for risk assessment purposes (if required) will require separate addendum and approval as necessary.
5.	1-2 Sampling Approach	Please clarify that MI samples taken at 2 ft depths shall be collected from all sides of the berm in the recommended systematic random	A	MI soil samples shall be collected at 0 to 2 feet depths and from all sides of the berm in a systematic random manner. Additional	Accepted

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
		manner. MI sample should be collected in a systematic random approach over the decision unit. In systematic or systematic random sampling, the first location should be randomly determined; each location within the initial grid/square should have an equal chance of being sampled (randomness). The sampling location in subsequent grid squares is then the same as the randomly determined first grid location. Provide additional details, including an example grid figure, as to how systematic random sampling locations will be determined for the decision unit.		details, including a figure depicting the Decision Unit grid and sample increment locations, will be provided in the Field Sampling Plan (FSP).	
6.	1-2 Sampling Approach	*Approximately* 33 increments? Recommend revising text to read "*a minimum of 30-50 increments, per ADEC guidance…*".	A	Text will be revised as suggested. The FSP will provide detail on how the 30 increments were selected. <u>The FSP has been changed to 30 increments.</u>	Accepted. Note that the FSP specifies thirty (30) increments per decision unit (not 33).
7.	1-3 Sampling Approach	The QAPP provides very little additional information on MI sampling and the FSP has not been reviewed. Neither the QAPP nor the FSP have been approved at this time. All comments and/or approvals are contingent upon approval of a final FSP and QAPP.	A	Comment noted. The revised FSP and QAPP will provide additional detail on MI sampling methods. These work plans are subject to the approval of the FCS Management Team.	
8.	1-3	How will the increments be collected? Will	A	The soil will be collected using a	See

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
	Sampling Approach	hand augers or a coring device be used? Will the entire 2' core be used as the increments or will it be subsampled, scraped, etc., to attain the increment?		decontaminated hand auger. The surficial soil and any organic matter will be stripped from the incremental sample location. The top 24 inches of underlying mineral soil will be collected and placed into an "MI mixing bucket." The bucket will be used to churn all the incremental samples so that the contents are uniformly distributed. Oversize material will screened out, then the entire bulk soil sample (approximately 60g per sample increment) will be shipped to the lab for additional screening (#10 sieve to yield a minus 2 mm soil) and sub-sampling. Field and laboratory methods will follow ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007). The final FSP will provide additional detail on MI sampling procedures.	comments below on volatile and non-volatile MI sample collection.
9.	1.3 Sampling Approach	MI non-volatiles. The MI guidance recommends 30-60 grams per increment be collected and additional mass if oversized material is encountered (page 9). Approximately 500-1000 g of material following sieving should be available (page 10). Recommend adding this clarification to ensure adequate, representative mass is collected.	A	CH2M HILL has been in close contact with the project laboratory to confirm the sample mass required for MI non-volatile extraction and analyses. <u>We will ship the entire 3'' column from 0 to 2 feet to the lab.</u> -. (Oversize material will be removed before sieving is completed.) <u>This is expected to meet the recommended mass requirements.</u> The additional material sent	Not accepted. The 30-60 gram requirement is per MI increment (30), the 500-100 gram mass is the

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
				to the project laboratory will ensure adequate mass is collected and will allow for additional analyses if necessary. Sub-sampling procedures will follow ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007).	post sieving (<2mm) requirement. If the entire 3" diameter column will be collected and sieved, please state that this is expected to meet the recommened mass requirements.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
10.	1.3 Sampling Approach	MI non-volatiles. Please specify that a single MI sample jar containing 30-50 grams will be collected and submitted per analysis (DRO/RRO, SVOC, etc.). The jars should not be filled as stated in the initial management plan. Coordination with the laboratory to ensure the minimum extraction mass, 30 grams, from the appropriate sample jar is required. Sub-sampling of the <2mm fraction should be performed per ADEC guidance, clarification required. Additionally, recommend specifying that a minimum of one additional sample jar be collected and submitted per MI sample in the event of breakage or if laboratory re-analysis is required.	A	The entire <6mm fraction from each increment will be submitted to the laboratory. As stated above for MI non-volatiles, the project laboratory shall sub-sample the bulk soil sample (appoximately 1.8 kg) in accordance with . sub-sampling procedures in ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007). The laboratory SOP for the sieving and subsampling procedure for non-volatiles has been submitted for ADEC review.	Not accepted. The FSP states the MI sample will be sieved to <6mm and ~2 kg submitted to the laboratory for further sieving (<2mm), subsampling and analysis. Unless, subsampling per ADEC guidance is performed in the field, the entire <6mm fraction should be submitted to the laboratory. Additionally,

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
					please provide the laboratory SOP for the sieving and subsampling procedure for non-volatiles for ADEC review.
11.	1.3 Sampling Approach	The MI sample should not be air dried for 12-24 hours prior to sieving, as this may not be appropriate for all analytes. Provide additional details on incremental sampling, sieving and sub-sampling procedures.	A	The MI soil sample will not be air-dried for 12 to 24 hours prior to sieving. Additional details on incremental sampling, sieving, and sub-sampling procedures are provided in the FSP and QAPP. <u>The laboratory SOP for the sieving and subsampling procedure for non-volatiles has been submitted for ADEC review.</u>	Not accepted. See above comment. Additional details on field and laboratory subsampling are required.
12.	1.3	Include 95% UCL calculation. Add that the triplicate results will be used for the 95%	A	A 95% UCL calculation will be used to compare MI soil sample results from each	Accepted. However,

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
	Sampling Approach	UCL calculation and that the 95% UCL only will be used to assess contaminant concentrations.		Decision Unit to the risk screening criteria. The calculated 95% UCL MI results will be compared to risk levels (1/10th Method 2 ingestion/ inhalation). The 95% UCL for all Decision Units and triplicate sample results shall be calculated as described in Section VI, Quality Assurance and Control of ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007). Per the guidance, triplicate samples will be collected at a frequency of 10%, which means one triplicate sample for the 9 sections of Sound Berm.	please revise the DQO section to state that the calculated 95% UCL MI results will be compared to risk levels (1/10th Method 2 ingestion/ inhalation)
13.	1.3 Sampling Approach	Duplicate/triplicate samples must be collected from different random locations. Recommend adding clarification as to how this will be determined. Specify a minimum distance and directions for duplicate/triplicate locations. Recommend a minimum of one-half (1/2) the grid size. Refer to MI guidance for guidance on marking/flagging the initial (random) location and specify an adequate direction and spacing distance for duplicate/triplicate sample locations.	A	A triplicate sample will be randomly collected from Decision Unit 9. Dice will be rolled for quadrant selection for duplicate and triplicate MI samples; they may not be from the same quadrant. The details of how the triplicate sample will be collected are provided in the revised FSP.	Not accepted. The duplicate/ triplicate MI samples should be collected from alternate quadrants, not 5' north and east as specified in the FSP.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
					Revise FSP to state dice will be rolled for alternate quadrant selection for duplicate and triplicate MI samples.
14	1.3 Sampling Approach	MI sampling for metals is not recommended at this time. Sieving to <2mm may not be appropriate for metals determinations, since larger metal particles would be screened out and theoretically bias the sample results (low). Grinding may introduce metals, specifically chromium, into the samples. Fundamental error requirement cannot be achieved with the normal 1 gram digestion mass. Additional information addressing metals MI sampling and analysis is required prior to approval.		Per discussion with Mr. Earl Crapps, ADEC, the laboratory will digest 10 grams of sample to achieve the fundamental error requirement.	Not accepted. This comment was omitted and not addressed at all. Earl was not contacted.
15.	1-3 Table 1-1	Please provide extraction methods for all analyses.	A	Extraction methods for all analyses are provided in the QAPP.	Accepted
16.	1-3 Table 1-1	Volatiles preservatives are incorrect.	A	Volatile preservatives have been corrected. Volatile sample increments will be collected from the 2' depth. The entire initial aliquot of methanol must be in the	See comment below on volatile MI collection

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
				sampling jar prior to addition of the MI soil increments.	and methanol field preservation.
17.	1-3 Table 1-1	EPH and VPH analyses should be deleted.		Comment noted; EPH and VPH analyses have been deleted.	Accepted
18.	1-3 Table 1-1	Volatiles should be included in the suite of analyses for surface soils collected at 0-2ft bgs. Methanol preserved MI sampling procedure for volatiles should be followed. Per QAPP and ADEC, the methanol field preserved VOCs should be collected in 4-oz amber glass jars with septa lids. VOCs may be collected and analyzed 1-3 from the same container as the AK101, dependent on lab requirements.	A	Volatile analyses are included in the suite of analytical methods for soil samples collected from the Sound Berm and will be preserved with methanol. The MI soil samples for volatiles will be collected in the field from the 2' depth without any sieving. For the 30 incremental samples, 1 to 2 grams will be collected from each incremental sample location and placed into the same 4-oz jar. A 3-ml syringe will be used at each Decision Unit. The syringe will have a wide mouth and will be used to collect 1 gram of soil from each of the sub-sampling locations. The entire initial aliquot of methanol will be in the sampling jar prior to addition of the MI soil increments. The methanol, cannot be spilled and no splashing can occur as each gram of soil is added. In the end, 30 grams of soil and ~30 mls of the pre-spiked methanol will be in the 4-oz amber jar with a septa lid.	Not accepted. Specify in the FSP that the volatile sample increments will be collected from the 2' depth. Per guidance, the entire, initial aliquot of methanol should be in the sampling jar prior to addition of the MI soil increments. Please revise FSP

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: ADEC/Brewer/Crapps PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted W - comment withdrawn	RESPONSE (Response to backcheck comments underlined)	BACKCHECK
				Specific field procedures for collecting MI soil samples for volatile analyses are provided in the FSP and are consistent with the instructions provided in ADEC's *Draft Guidance on Multi-Incremental Soil Sampling* (March 2007).	accordingly. Again, the FSP specifies 30 increments per MI sample.
19.	1-3 Table 1-1	Specific volumes should be specified for MI samples.	A	CH2M HILL has been in close contact with the project laboratory to confirm the sample mass required for MI non-volatile and volatile samples. For non-volatile samples, approximately 1.8 kg of <6mm soil will be provided to the laboratory. For volatile samples, 30 grams of soil and ~30 mls of the pre-spiked methanol will be in the 4-oz amber jar with a septa lid. These volumes are provided in the FSP.	See above comments. FSP states 2 kg of <6mm will be submitted to lab and 30 increments (~30 grams) for volatiles.
20.	Figure 1-1	Please identify the berm on figure 1-1 in relation to the where MEC clearance is required. The area outlined in green is noted as where samples will be collected under this Addenda, but this area encompasses clearly more than the berm area being addressed in this addenda. Please revise figure legend as appropriate.	A	The location of the Sound Berm is depicted on Figure 1-1 and is referenced in the legend. MEC clearance is not required for sampling areas above grade like the Sound Berm, therefore MEC clearance zones are not depicted on this Figure.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
1.	General Field Health and Safety Concerns	EPA feels that it is premature to reduce the level of onsite MEC-related safety precautions at this time. EPA considers MEC location, delineation and characterization at the FCS to be of the utmost concern and considers the MEC areas, as yet, undefined. Please see Specific Comment No. 1 for more detail.	D	Geophysical surveys, historical photographs, and several years' worth of construction and investigation all indicate that the MEC precautions can be reduced in the area indicated on Figure 1-1.	EPA feels that there is merit in the Army's response to this comment, but continues to have some reservations on the path forward. Furthermore, EPA recognizes that the MEC issues would be more appropriately addressed as part of planning for subsurface intrusive

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
					work such as the soil gas and groundwater investigation activities. EPA therefore agrees to defer further discussion of the MEC issue and supports the Army's decision to remove the MEC discussion from this Addendum.
2.	General Clarification on needed for scope	The order of information presented in this addendum invites questions as to whether the samples will be analyzed consistently and with a broad enough analytical scope that	A	See responses to specific comments below.	This resolution is acceptable to EPA.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	of analyses for defining COPCs	COPCs will be confidently identified. EPA has made a number of suggestions that may help to bring the overall robustness of the sampling design into focus. Please refer to Specific Comments Nos. 5, 9, 15 and others.			
3.	Specific Comment No. 1 p 1-1, par 2, Sentence 1	MEC has been definitively found and removed from this site. Thus, the potential for additional MEC items being unearthed is clearly more likely than that estimated by the Huntsville MMCX. EPA reiterates its utmost concern on this issue, both as it applies to the immediate safety of onsite workers and for the long term safety of residents and site visitors, not to mention the potential of harm to the environment by the release of hazardous filler constituents. EPA feels that it is premature to reduce the level of onsite MEC-related safety precautions until the RI investigation has generated convincing evidence that the MEC affected areas have been fully delineated, and characterized. This addendum does not present a basis for the MEC-clearance subdivision; thus EPA surmises that it is based upon the distribution	D	Geophysical surveys, historical photographs, and several years' worth of construction and investigation all indicate that the MEC precautions can be reduced in affected areas. Per agreement at the June 6 and 7 meeting, CH2M HILL will include a chapter in the Interim Draft RI Management Plan that pulls together all available information in support of MEC risk level at the site. We will develop a conceptual site model for MEC, which will be used to produce the hazard assessment.	See back-check response to EPA General Comment 1. (Army Item ID 3).

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
		of geophysical anomalies and an expectation that no false negatives (i.e. undetected MEC) exist in the geophysical data. To EPA's knowledge, the geophysical data has not yet been fully analyzed or interpreted and the results have not been formally reported to the team for its review. Additionally, EPA notes that the documents and records reviewed during the PSE1 provide insufficient information to adequately document historical site activity. This lack of background information additionally undermines the proposal to reduce MEC related safety protocols in any area of the FCS. EPA maintains its position that MEC clearance continues to be necessary in all portions of the FCS. Recommendation: Reinstitute MEC clearance FCS-wide. Additionally, replace the text in the "Area of Investigation" section with text that describes the Sound Berm and adjacent areas to be investigated pursuant to this addendum.	A	As MEC clearance is not required for aboveground berms, the current text under "Area of Investigation" has been replaced with text describing the Sound Berm.	

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
4.	Specific Comment No. 2 p 1-1, par 4, Sentence 2	A figure should be cited here showing the sound berm boundary. Recommendation: Add the sound berm to Figure 1-1 rather than citing Figure 1-2, which is better used later when discussing the proposed investigative activities.	A	The Sound Berm has been delineated on Figure 1-1 as suggested.	The Army's revisions resolve the issue; however EPA suggests citing Figure 1-1 on Page 1-1 in paragraph 2 sentence 1 so that the reader can visually follow the site description text.
5.	Specific Comment No. 3 p 1-1, par 4,	Please also mention the presence of organic matter, such as tree stumps, and voids in the berm.	A	Have added this information.	Thank you.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	Sentence 3				

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
6.	Specific Comment No. 4 p 1-1, par 4, Last sentence	If it is known that the soils brought in from other areas of Fort Wainwright were sampled prior to incorporation into the sound berm and no hazardous substances were detected, then EPA recommends stating that information here. If it is not known whether the soils were sampled, then the last sentence should clarify that the contaminants potentially existing in the sound berm may or may not correlate with those found previously in FCS samples.	A	Other than the PCB samples collected from a portion of the Sound Berm, it is unknown if the soil used to construct the Sound Berm has been previously sampled. The Addendum will be edited to clarify that the contaminants potentially existing in the Sound Berm may or may not correlate with those found previously in FCS soil samples collected elsewhere. However, if the soil came from off site, it likely passed the required construction specifications for clean fill.	EPA agrees with the revision however, it suggests that part of the function of the work plan is to document the current understandin g of the site. Thus the substance of the Army's last sentence in its response should be spelled out in the text. Is the soil known to have been

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
					determined to be clean fill or is that an assumption? Part of the rationale for broad spectrum sampling would be to answer this question if documentation on the soil disposition does not exist or is not available.
7.	Specific Comment No. 5 p 1-2, par 1, Last	EPA agrees with the proposal that the previously sampled areas of the sound berm be re-sampled for PCBs and for additional analytes. EPA Recommends specifically identifying the proposed additional analytes		Other than the PCB samples described in this Addendum, it is unknown if the soil used to construct the Sound Berm has been previously sampled. The analytical methods proposed for the Sound Berm	This response is acceptable.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	sentence	in the text here and also developing and including a "Proposed Sample Summary Table", where all proposed samples (and QA samples) to be collected are identified and described. EPA additionally suggests including in the table each anticipated sample location, location IDs, types of sample (e.g. discrete, multi-increment, etc), intended depth or depths of MI incremental samples, plus a sample specific list of all analytical methods to be completed. Also, EPA recommends including a column in the table that identifies any field features of interest or decision parameters (if any are known from previous work) that might guide field decisions regarding sample location selection. Also include a number of contingency samples, to allow flexibility in the field. [A similar table could also be developed that presented details for all previously collected samples. This would provide a useful mechanism for comparing the data sets and for effective design review and decision making].		soil samples are listed in Table 1-1. Specific analytes for each method are listed in the FSP and the QAPP. All soil samples will be MI collected from 0 to 2 feet depths as agreed by the FCS Management Team. Sample locations correspond to the MI Sampling Grid described above and are specified in the FSP. With the exception of the TSA, there are no known field features of interest.	
8.	Specific	As discussed in Specific Comment No. 1,	D	See response to specific Comment No. 1.	See back-

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	Comment No. 6 p 1-2, par 1, Last sentence	MEC clearance procedures should be used at all sampling locations. EPA recommends adding an additional sentence stating that MEC clearance and safety procedures will be conducted during the re-sampling.			check response to EPA General Comment 1. (Army Item ID 3).
9.	Specific Comment No. 7 p 1-2, par 2, First sentence	EPA suggests citing a figure showing the location of the TSA. EPA recommends adding the TSA to Figure 1-1.		Figure 1-1 has been revised to delineate the Sound Berm, the location of the TSA, and the Decision Units within the Sound Berm.	Excellent revision to the Figure. Thank you.
10.	Specific Comment No. 8 p 1-2, par 2, last sentence	As discussed in Specific Comment No. 1, MEC clearance procedures should be used at all sampling locations. EPA recommends removing from this sentence the phrase “but at a later date”.	D	See response to Specific Comment No. 1; also deleted the term, ‘later date.”	See back-check response to EPA General Comment 1. (Army Item ID 3).
11.	Specific Comment No. 9 p 1-2, par 2, Last	EPA agrees with the proposal that the previously sampled areas of the sound berm be re-sampled for PCBs but suggests that the same substances analyzed for in the southwestern berm samples be analyzed for	A	See response to Comment No. 5. Samples collected from the TSA portion of the south Sound Berm will also be analyzed for all of the methods listed in Table 1-1.	Acknowledged. This response is acceptable to EPA.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	sentence	the TSA Berm samples as well. Recommendation: Revise the text to add additional proposed analyses (be specific) along with the PCB analysis. Also, include these samples on the additional "Proposed Sample Summary Table" described in EPA Specific Comment No. 5.			
12.	Specific Comment No. 10 p 1-2, par 4, Sentence 5	Multi-increment sampling should be introduced earlier than it is. There it should be described briefly with an explanation as to why MI sampling is appropriate for sampling the sound berm. EPA suggests adding the MI introduction and description in a new paragraph immediately preceding the DQO section.	A	A sentence has been inserted in the section preceding the DQO section stating that consistent with the June 6 and 7 meeting to review the Draft RI Management Plan, the FCS Management Team's decision was to use to use MI soil samples as a screening tool to eliminate sections of the Sound Berm that are not a risk. If any sections of the Sound Berm exceed established risk screening criteria, then discrete samples will be collected to calculate the baseline risk and characterize areas of concern for disposal.	Good. Nice resolution.
13.	Specific Comment No. 11 p 1-2, par	This portion of text is confusing. Sentence 4 begins "If soil results do not exceed risk…." But Sentence 5 begins "If the Multi-increment (MI) soil sample results….." It is	A	The text has been revised to say "MI soil results" for all sections of the text. See also response to Comment No. 5 above.	This is acceptable.

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	4, Sentences 4, 5, etc	unclear from previous content that different sampling techniques would be applied, thus it is unclear how "soil results" differ from "MI results". EPA suggests that the addition of the "Proposed Sample Summary Table", described above, would help clarify this. Please revise the text as necessary.			
14.	Specific Comment No. 12 p 1-2, par 5, Whole section]:	EPA recommends moving this section ahead of the DQOs. This move would solve some of the issues identified in previous Specific Comments, such as introducing MI sampling.	A	A sentence has been inserted in the section preceding the DQO section stating that consistent with the June 12 and 13 meeting to review the Draft RI Management Plan, the FCS Management Team's decision was to use MI soil samples for the Sound Berm.	Good.
15.	Specific Comment No. 13 p 1-2, par 5, bullet 4	Please clarify whether the MI triplicate sample will be collected from Decision Unit number 9, as depicted on Figure 1-2, or whether the ninth decision unit will be selected at random. Also, EPA recommends citing Figure 1-2 here.	A	The MI triplicate sample will be collected from Decision Unit No. 9, as depicted on Figure 1-2. Figure 1-2 has been eliminated.	Good.
16.	Specific Comment No. 14	Why approximately 33 incremental samples? What will determine the exact number of increments? Please clarify.	A	The word "approximately" will be removed. As described above, each Decision Unit along the Sound Berm will	This response resolves

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	p 1-2, par 5, bullet 4			sampled from the top and sides from 11 cells lengthwise and three cells widthwise. One sample will be collected from each cell in a random fashion. This yields 33 samples per Decision Unit.	EPA's concerns, however, the text in this response is slightly more detailed than that provided in the revised Addendum. EPA suggests blending the response into the revised text as appropriate.
17.	Specific Comment No. 15 p 1-3, Table 1-1	This table is good, but would be better if paired against a "Proposed Sample Summary Table", as suggested above.	A	A column was added to Table 1-1 to indicate the proposed number of samples (regular and QC).	This revision is acceptable. Note, however, that EPA prefers the

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
					form of the sample table provided in Addendum 2 to summarize the Soil Pile sampling.
18.	Specific Comment No. 16 Figure 1-1	The scale is obscured somewhat by the underlying aerial photographic detail, particularly the nearby road. Suggestion: Move or otherwise highlight the scale.	A	Figure 1-1 has been revised including the scale	Excellent. Thank you.
19.	Specific Comment No. 17 Figure 1-1	EPA recommends adding the following field features to Figure 1-1: The Sound Berm The TSA and the area bounding the previous TSA sample locations, and The southwestern area of the berm where previous samples were collected	A	These additions were made to Figure 1-1. The MEC/non-MEC clearance areas were removed as such clearance is not required for the Sound Berm.	Agreed. This resolution is acceptable to EPA.
20.	Specific Comment No. 18 Figure 1-	As discussed in Specific Comment No. 1, EPA recommends removing the colored boundary polygons indicating the two areas with different MEC safety protocols. If it is	D	MEC clearance is not required for sampling surface soil on the Sound Berm. The MEC clearance areas have been removed from Figure 1-1.	See back-check response to EPA General

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	1]	anticipated that samples will be collected adjacent to, but not directly from the sound berm materials, then one additional new polygon should be added (in addition to the Sound Berm polygon suggested above) encapsulating the entire area potentially impacted by the work proposed in this addendum.			Comment 1. (Army Item ID 3).
21.	Specific Comment No. 19 Cover Page and p 1-1 Title	Is this addendum addressing a sound berm or a soil berm? These two pages say two different things. EPA recommends exchanging “sound” for “soil” in the title on page 1-1.	A	Text in the title has been revised within this Addendum to consistently refer to this area as the Sound Berm.	Good.
22.	EPA Specific Comment No. 20 p 1-1, par 1, Sentences 1 & 2	These two sentences feel out of order. EPA recommends rewording slightly and changing the order.	A	Sentences modified.	Good.
23.	Specific Comment No. 21	These three sentences are not really necessary. EPA recommends removing these sentences.	A	Comment noted. However, the text was left as-is to respond to other commenters and for additional clarification of the	This response is acceptable to

U.S. ARMY CORPS OF ENGINEERS	DATE: REVIEWER: U.S. Environmental Protection Agency PHONE:	Action taken on comment by: CH2M HILL

Item No.	Page, Section.	COMMENTS	A - comment accepted D - disagree W - comment withdrawn	RESPONSE	BACKCHECK
	p 1-1, par 1, Sentences 3 to end of par			purpose for this Addendum.	EPA.
24.	Specific Comment No. 22 p 1-1, par 5, Sentence 2	EPA suggests spelling out all acronyms at their first occurrence, e.g. HACH PCB test.	A	HACH should be spelled Hach and has been corrected in this text. It is not an acronym, but rather, the last name of the husband and wife who founded the Hach Company. Other acronyms have been spelled out.	Thank you.

Addendum 2

Final

Addendum 2 to the Remedial Investigation Work Plan

Soil Pile Investigation

FWA 102 Former Communications Site
Fort Wainwright, Alaska

Prepared for

Department of the Army
U.S. Army Corps of Engineers,
Alaska District

P.O. Box 6898
Elmendorf AFB, Alaska 99506-6898

Contract No. W911KB-05-D-0010
Task Order 0009

Final, 18 September 2007

CH2MHILL
301 W. Northern Lights Boulevard, Suite 601
Anchorage, AK 99503

ADDENDUM 2

Soil Pile Investigation

Purpose

This document serves as an addendum to the May 2007 *Remedial Investigation/Feasibility Study Management Plan FWA 102 Former Communications Site Fort Wainwright Alaska* (*RI Management Plan*). It is being submitted to the FCS Team for review and approval. It addresses the chemical characterization of numerous soil stockpiles (soil piles) located at the Former Communication Site (FCS) for the soil disposal purposes. Multi-incremental sampling will be conducted to characterize the soil stockpiles. This approach was determined to be the most effective, efficient, and appropriate method for investigating this site.

All soil piles will be disposed of offsite in the Fort Wainwright Class I landfill unless they contain constituents that exceed Alaska Department of Environmental Conservation (ADEC) Table B1 or Table B2 soil cleanup levels provided in 18 AAC 75. If stockpile soils exceed these concentrations, they will be disposed of by the Defense Reutilization Management Office (DRMO) Fort Wainwright. If polychlorinated biphenyls (PCBs) are detected in the stockpiles located in the Exclusion Zone above the Fort Wainwright landfill acceptance criterion of 10 mg/kg, they will be disposed of as part of a separate polychlorinated biphenyl (PCB) removal project and will not be part of the work described in this addendum.

The U.S. Army, U.S. Environmental Protection Agency (EPA), and ADEC have agreed to conduct the remedial investigation/feasibility study (RI/FS) for the FCS using the Triad approach. An RI Management Plan addresses this approach and overall site management and includes the Quality Assurance Project Plan (QAPP), and Field Sampling Plan. The RI Management Plan should be used to find additional information on specific RI/FS tasks.

Area of Investigation

There are 47 soil piles at the FCS. The soil piles are generally located around the perimeter of the construction area as depicted in Figure 2-1 (Attachment 1). Table 2-1 (Attachment 1) lists the general location and estimated volume of each soil pile relative to subdivisions of the FCS site. As indicated in Table 2-1, the size of the soil piles range from approximately 10 to several hundred cubic yards. Table 2-1 also summarizes the proposed sampling program of these soil piles using the MI sampling approach.

Background Information

During housing construction activities, high levels of PCBs were encountered in soil in the southwestern corner of the site. Approximately 5 acres of this area were fenced off and designated as the PCB Exclusion Zone. There are 24 soil piles within the PCB exclusion

zone. The remaining 23 soil piles[1] were also generated during housing development from activities such as utility installation and building foundations. During the PSE Phase II Investigation, it was concluded that the stockpiles represented the same material as that found in the test pits excavated to investigate buried debris. The test pits and soil piles were determined to contain soil and debris consisting of scrap metal, concrete, asphalt, wood, and other inert waste materials. Since the final disposition of the soil piles is offsite disposal, they will need to be characterized to meet acceptance requirements.

Available Chemistry Data and Relationship to Soil Pile Characterization

Table 2-2 (Attachment 1) presents analytical results on soil pile sampling that was completed during the Preliminary Source Evaluation (PSE) Phase II Investigation (North Wind, 2007). It identifies any detected chemicals that exceed the Fort Wainwright Class 1 landfill acceptance criteria (i.e., ADEC Table B1 or Table B2 values for soil protective of groundwater, or in the case of PCBs, 10 parts per million [ppm]). Detected sample results that exceed landfill acceptance criteria are indicated in Table 2-2 by the use of bolding and gray shading.

In general, the existing analytical results for the soil samples show no detects or low levels of tested constituents. The data do not show any significant petroleum contamination (including both gasoline-range organic [GRO] and diesel-range organic [DRO] compounds). Similarly, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were generally not detected above their respective laboratory reporting level, or if they were detected in the case of SVOCs, the reported concentrations were significantly below the landfill acceptance criteria. DDT and its breakdown products were detected in some samples but all pesticide results, are below the landfill acceptance criteria. Similarly, polycyclic aromatic hydrocarbons (PAHs) were detected at low concentrations below the landfill acceptance criteria.

Pentachlorophenol (PCP) was detected above the landfill acceptance criteria in 4 samples (out of 15). In most cases, the reported concentration is J-qualified, meaning that the concentration is estimated. In all cases, the reported concentration was only slightly above the landfill acceptance criteria (0.010 milligrams per kilogram [mg/kg]). Consequently, soil piles outside the Exclusion Zone will be retested for PCP.

Arsenic was detected above landfill acceptance criteria levels (8 mg/kg) in a number of samples. Arsenic is, however, a naturally occurring metal, and the average background concentration calculated for Fort Wainwright was between 8 and 11 ± 6 mg/kg (USACE, 1994). In most instances, the detected concentration of arsenic was only slightly (2 to 5 mg/kg) above the landfill acceptance criteria and within the reasonable range of background. However, the arsenic concentration in one sample collected from Soil Pile 11 was considerably higher (31 mg/kg) than in other samples. Several other metals (antimony, cadmium, chromium, and zinc) also detected in this sample were above the landfill acceptance criteria. The PSE II Report indicated the presence of crushed drums and other metal debris in Soil Pile 11, which accounts for these results. Because of the size of this soil pile (less than 200 cubic yards), the existing analytical results, and the presence of metal

[1] There is no pile 16 shown in Figure 2-1, this pile was clean fill.

debris, Soil Pile 11 will not be sent to the to the Fort Wainwright landfill, but will be disposed of by the DRMO. [1]

Soil pile samples were also analyzed for chemicals associated with explosives. None were detected in the samples or, if detected, the levels were below the landfill acceptance criteria. However, one sample from Soil Pile 18 had a single J-qualified concentration of 2,6-dinitrotoluene at 0.017 mg/kg, which exceeds the landfill acceptance criteria of 0.0044 mg/kg. Since the existing result was flagged, this soil pile will be retested using Method SW8270 to confirm the presence of this chemical.

Data Quality Objectives

The objective of the work associated with this addendum is characterization of contaminant levels in the soil piles so that appropriate decisions about their disposal can be made. An abbreviated data quality objective (DQO) process was used to establish the type and quality of data needed to make the following decision:

> *Can soil from this soil pile (or group of soil piles) be disposed of in the Fort Wainwright municipal landfill, or does it need to be processed by DRMO for treatment and/or disposal?*

Key inputs to the decision are described in the following subsections.

Target Analytes

The soil samples used to characterize the soil for disposal need to be analyzed for all contaminants that are likely to be present based on what is known about the site. Nine piles have already been tested. The remaining 36 soil piles have not been sampled. With a few exceptions, the previous sample results provide a reasonable understanding of the types of contaminants that are not likely to be present in the soil piles, including VOCs, pesticides, explosives, most SVOCs, and most metals. Based on site history, PCBs may be present in soil piles within the PCB Exclusion Zone, but PCBs are not expected in soil piles outside of it.[2] Although SVOC compounds were not significantly represented in the tested soil piles, SVOC analyses (EPA Method SW8270) is recommended because it covers a wide range of organic compounds and is appropriate for chromatographic confirmation of compounds that may have been identified by another technique. Similarly, DRO and RRO constituents were not encountered in the tested soil piles, but due to the ubiquitous nature of these petroleum contaminants, testing for them is proposed in this investigation. Metals testing, particularly to confirm arsenic concentrations in soil piles, is also recommended. The following general list of target analyte groups has been established for the different soil pile areas:

- 24 soil piles in PCB exclusion zone (Soil piles 17 through 39 and soil piles SPF and SPD) **– PCBs**[3]
- 22 soil piles outside PCB exclusion zone (Soil piles 01 through 07; combined soil piles 08 and 09, 14, 15, combined soil piles 40 and 41, and soil piles SPA, SPG, SPB, SPC) **– DRO, RRO, Metals, and SVOCs**[4]

---

[1] Soil pile 11 and soil pile 12 are indistinguishable, so both piles will be sent to DRMO for offsite disposal.

[2] Based on 2005 PCB surface soil results (*Field Data Report*, Northwind, Inc., February 2006).

[3] Soil pile 18 also will be sampled for SVOC by Method SW8270 to confirm the detection of 2,6-dinitrotoluene.

4 Soil piles 4 though 9 in the northwest corner of the site also will be sampled for VOCs.

- Soil pile SPE will be sampled for PCBs as shown on Table 2-1.
- Soil piles 11 and 12 – No sampling; this combined soil pile will be processed by DRMO.

Detection Limits

The Fort Wainwright Class I landfill is the expected destination for the soil. According to their permit [Solid Waste Disposal Permit 0131-BA003], the landfill will not accept soil that contains hazardous substances in a concentration exceeding an "over 40-inch zone" migration to groundwater level set in 18 AAC 75.341, Table B1 or Table B2; the landfill will also not accept soil that contains PCBs in concentrations greater than 10 ppm.

The landfill acceptance criteria and the previous sampling results are listed in Table 2-2. The analytical methods used to characterize the soil piles for disposal should be capable of determining whether the target analytes are present in the soil at these levels or correspond to the requirements of the respective analytical methodology.

Representativeness

The soil samples submitted for analysis must be representative of the soil that will be disposed of, both in terms of the mean contaminant concentration and potential contaminant type.

Sampling Approach

A multi-increment (MI) sampling approach will be used to characterize the soil for disposal purposes. The MI sampling approach provides for better representation of the mean concentration within a defined decision unit as compared to a typical discrete sampling program. MI sampling is also advantageous because it reduces the number of analyses and costs compared to a typical discrete sampling program.

All MI field and laboratory sampling and quality assurance and quality control (QA/QC) procedures will follow ADEC guidance (*Draft Guidance on Multi-Increment Soil Sampling*, March 2007). The key elements of the soil pile MI sampling program include the following:

- Grouping small soil piles into single MI Decision Units of approximately 100 cubic yards. [1] Figure 2-1 and Table 2-1 depict the layout of the soil piles and summarize their volumes, respectively.
- Dividing large soil piles in multiple MI Decision Units (one Decision Unit per 500 cubic yards).
- The MI sample for each Decision Unit will be made up of approximately 30 randomly collected subsamples. Both surface and subsurface soil will be sampled. One-third of the subsamples will be obtained from the surface (0 to 2 feet); the remaining subsamples will come from random 2-foot-thick subsurface intervals collected from below half-height within the pile(s).[2] In this investigation, subsurface refers to soil below the surface of the soil pile, not soil below ground surface.

1 It was agreed during 8/6/07 conference call (ADEC, USACE, CH2M HILL) that piles within the same general area are similar in nature and therefore soil piles can be combined into the same decision unit.

2 In the absence of specific guidance, the split between surface and subsurface samples is based on professional judgment.

  - For smaller piles combined into one decision unit, the number of incremental samples per pile is based on the ratio of the pile volume to the total volume of the group of piles (Table 2-1). Each pile is divided into the appropriate number of increments and samples are collected from a random quadrant, A, B, C, or D, by rolling dice.
  - Larger piles are divided into multiple decision units. A grid of 30 increments is overlaid on each decision unit. Samples are collected from a random quadrant within each increment by rolling dice.

- For VOC analysis, samples will be field preserved directly in methanol. VOC samples will not be stored.
- For DRO, RRO, and SVOC analysis, 30 to 60 grams of soil will be collected at each subsample location/interval. The soil will be sieved in the field with a 6-mm (0.25-inch) screen to remove large particles, and the soil will be placed in 1 liter jars for transfer to the laboratory. The laboratory will sieve (#10 sieve to 2 mm size), subsample, and distribute through the lab for analysis.
- For metals analysis, unsieved MI samples will be collected and analyzed for TCLP. Unsieved samples will be collected from each of the 30 incremental sample locations. The entire volume (approximately 1 liter) will be homogenized and sent to the laboratory. The laboratory will subsample and obtain the required 100 g for analysis.
- Hand tools (trowels, shovels, and/or hand augers) will be used to collect the surface samples and subsurface samples.
- Triplicate samples will be collected at 10 percent of the Decision Units. Table 2-3 (Attachment 1) shows locations for the triplicate sampling and associated piles applied to each triplicate section. The relative standard deviation (RSD) results for each triplicate will be evaluated to ensure they are within 30 percent. ADEC MI sampling guidance will be followed to calculate the 95 percent upper confidence limit (UCL) for triplicate and regular samples. If the RSD results for a triplicate do not meet the ADEC criterion, the Decision Unit may need to be sampled discretely to determine the source of the variability.

Table 2-1 summarizes the MI sampling program for the soil piles. Additional information about sampling protocols and QA/QC requirements can be found in the FSC *Field Sampling Plan* and QAPP, respectively.

Analytical Methods

Table 2-4 lists the analytical methods to be used for soil pile characterization.

Evaluation of Results

All analytical results will be compared to the landfill criteria shown in Table 2-2, with the exception of the TCLP analysis for metals. TCLP metals results will be compared to the limits in Table 2-5. If any analytical results exceed the landfill criteria or TCLP results, the soil pile will be disposed offsite via DRMO, or in the case of PCBs, disposed as part of the PCB removal action.

References

ADEC. 2007. *Draft Guidance on Multi-Increment Soil Sampling*. Alaska Department of Environmental Conservation. March.

Code of Federal Regulations 261.24.

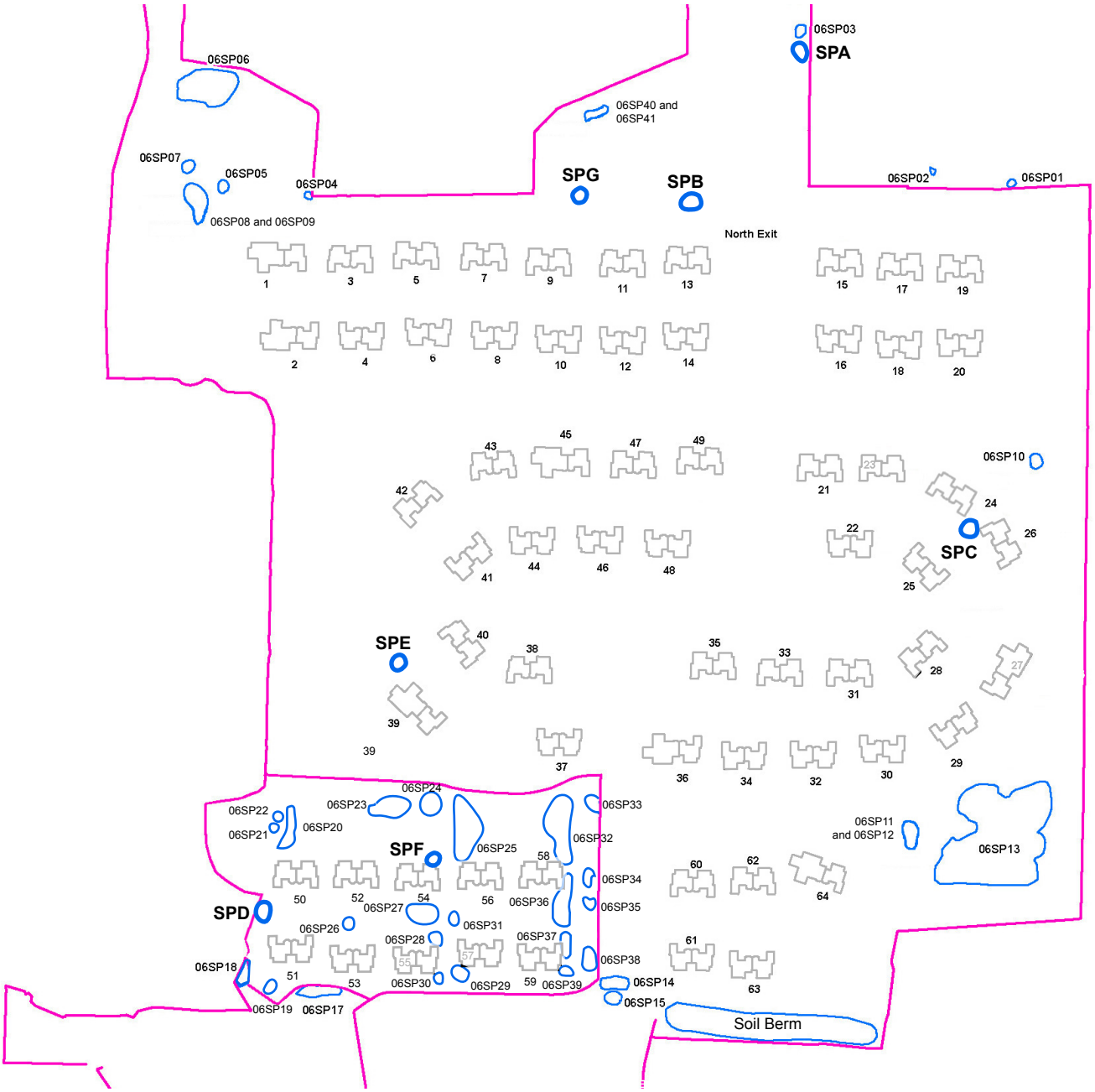
North Wind, Inc. February 2006. *FWA-102 Former Communication Site (Taku Gardens) Field Data Report, Fort Wainwright, Alaska.* Prepared for Department of the Army.

North Wind, Inc. May 2007. *Preliminary Source Evaluation II Report.* Taku Gardens Fort Wainwright, Alaska (Final).

USACE. 1994. *Background Data Analysis for Arsenic, Barium, Cadmium, and Lead on Fort Wainwright, Alaska.* U.S. Army Corps of Engineers, Alaska District. March.

ATTACHMENT 1

Figure and Tables



LEGEND

Buildings

Fence

Soil Piles

Additional Soil Piles SPA – SPG

Adapted from North Wind, Inc., PSEII Report, 2007

North

0 300 600

Approximate scale in feet

FIGURE 2-1
Location of Soil Piles
Remedial Investigation Work Plan, Addendum 2
Former Communications Site, Fort Wainwright, Alaska

TABLE 2-1
Soil Pile Sampling and Analysis Program
Taku Gardens, Fort Wainwright, Alaska

Group	Soil Pile	Volume (cy)	Number of Incremental Samples Per Soil Pile	MI Decision Units	Target Analyte Suites
Group 1 (north/north east corner)	06SP01	7	1	1	DRO, RRO, SVOCs, Metals
	06SP02	3	1		
	06SP03	36	7		
	06SP40[a]	0	0		
	06SP41[a]	28	6		
	SPA	35	7		
	SPB	32	6		
	SPG	8	2		
	Total Volume in Group	**149**			
	Total Number of Incremental Samples		**30**		
Group 2 (north/north west)	06SP04	2	1	1	DRO, RRO, SVOCs, Metals, VOCs
	06SP05	31	10		
	06SP07	58	19		
	Total Volume in Group	**92**			
	Total Number of Incremental Samples		30		
SP06 (northwest corner)	06SP06	1,111	120	4	DRO, RRO, SVOCs, Metals, VOCs
	Total Volume in Group	**1,111**			
	Total Number of Incremental Samples		120		
Group 3 (northwest)	06SP08[a]	296	30	1	DRO, RRO, SVOCs, Metals, VOCs
	06SP09[a]	0			
	Total Volume in Group	**296**			
	Total Number of Incremental Samples		30		
Group 4 (north/north east)	06SP10	78	14	1	DRO, RRO, SVOCs, Metals
	SPC	93	16		
	Total Volume in Group	**171**			
	Total Number of Incremental Samples		30		
Group 5 (southeast corner)	06SP11[a]	0	0	No MI Samples DRMO Disposal	DRO, RRO, SVOCs, Metals
	06SP12[a]	192	0		
	Total Volume in Group	**192**			
	Total Number of Incremental Samples		0		
SP13 (southeast corner)	06SP13 Base	2,111	131	10	DRO, RRO, SVOCs, Metals
	06SP13 Mound 1	510	32		
	06SP13 Mound 2	1,067	66		
	06SP13 Mound 3	1,133	71		
	Total Volume in Group	**4,821**			
	Total Number of Incremental Samples		300		
Group 6 (south)	06SP14	126	25	1	DRO, RRO, SVOCs, Metals
	06SP15	27	5		
	06SP16	0	0		
	Total Volume in Group	**153**			
	Total Number of Incremental Samples		30		
SP17 (southwest corner)	06SP17 Base	25	10	1	DRO, RRO, SVOCs, Metals
	06SP17 Mound	48	20		
	Total Volume in Group	**73**			
	Total Number of Incremental Samples		30		
SP18 (PCB Area)	06SP18	142	30	1	PCBs
	Total Volume in Group	**142**			
	Total Number of Incremental Samples		30		
SP20 (PCB Area)	06SP20	195	30	1	PCBs
	Total Volume in Group	**195**			
	Total Number of Incremental Samples		30		
Group 7 (PCB Area)	06SP19	28	9	1	PCBs
	06SP21	8	2		

TABLE 2-1
Soil Pile Sampling and Analysis Program
Taku Gardens, Fort Wainwright, Alaska

Group	Soil Pile	Volume (cy)	Number of Incremental Samples Per Soil Pile	MI Decision Units	Target Analyte Suites
	06SP22	11	4		
	06SP26	46	15		
	Total Volume in Group	**94**			
	Total Number of Incremental Samples		30		
Group 8 (PCB Area)	06SP23	333	21	2	PCBs
	06SP24	119	9		
	06SP25	600	30		
	Total Volume in Group	**1,052**			
	Total Number of Incremental Samples		60		
SP27 (PCB Area)	06SP27	398	30	1	PCBs
	Total Volume in Group	**398**			
	Total Number of Incremental Samples				
SP29 (PCB Area)	06SP29	107	30	1	PCBs
	Total Volume in Group	**107**			
	Total Number of Incremental Samples		30		
Group 9 (PCB Area)	06SP28	44	16	1	PCBs
	06SP30	17	6		
	06SP31	20	8		
	Total Volume in Group	**82**			
	Total Number of Incremental Samples		30		
Group 10 (PCB Area)	06SP32 Base	275	20	2	PCBs
	06SP32 Mound 1	407	29		
	06SP32 Mound 2	164	11		
	Total Volume in Group	**846**			
	Total Number of Incremental Samples		60		
Group 11 (PCB Area)	06SP33	52	18	1	PCBs
	06SP34	26	9		
	06SP35	9	3		
	Total Volume in Group	**87**			
	Total Number of Incremental Samples				
Group 12 (PCB Area)	06SP36 Mound 1	361	26	1	PCBs
	06SP36 Mound 2	48	4		
	Total Volume in Group	**409**			
	Total Number of Incremental Samples		30		
Group 13 (PCB Area)	06SP37	72	20	1	PCBs
	06SP39	36	10		
	Total Volume in Group	**108**			
	Total Number of Incremental Samples		30		
SP38	06SP38	95	30	1	PCBs
	Total Volume in Group	**95**			
	Total Number of Incremental Samples		30		
Group 14 (PCB Area)	SPD	8	4	1	PCBs
	SPE	19	11		
	SPF	28	15		
	Total Volume in Group	**54**			
	Total Number of Incremental Samples		30		
	Total Estimated Volume to Landfill		**10532**		
	Total Estimate Volume to DRMO		**192**		
			Total MI Samples (Triplicates not listed)	35	

[a]These piles are combined, not separate

TABLE 2-2
Soil Pile Analytical Results Compared to Landfill Criteria
Taku Gardens, Fort Wainwright, Alaska

Sample ID				**06SP01S01**	**06SP03S01**	**06SP03S02**	**06SP10S01**	**06SP11S01**	**06SP11S02**	**06SP11S03**	**06SP11S04**	**06SP14S01**	**06SP15S01**	**06SP16S01**	**06SP16S02**	**06SP16S03**	**06SP17S01**	**06SP17S02**	**06SP18S01**	**06SP18S02**	**06SP18S03**	**06SP40S01**
Location ID				06SP01	06SP03	06SP03	06SP10	06SP11	06SP11	06SP11	06SP11	06SP14	06SP15	06SP16	06SP16	06SP16	06SP17	06SP17	06SP18	06SP18	06SP18	06SP40
Sample Date				6/23/2006	6/27/2006	6/27/2006	6/22/2006	6/19/2006	6/19/2006	6/21/2006	6/21/2006	6/26/2006	6/27/2006	7/25/2006	7/25/2006	7/25/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	6/27/2006
Chemical Group	**Chemical Name**	**Units**	**Landfill Criteria**																			
VOC	1,1,1,2-Tetrachloroethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,1,1-Trichloroethane	mg/kg	1.0	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,1,2,2-Tetrachloroethane	mg/kg	0.017	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,1,2-Trichloroethane	mg/kg	0.017	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,1-Dichloroethane	mg/kg	12	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,1-Dichloroethene	mg/kg	0.030	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,1-Dichloropropene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,2,3-Trichlorobenzene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 UJ	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,2,3-Trichloropropane	mg/kg	0.002	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.40 U	--	0.20 U	0.28 UJ	0.16 UJ	0.27 UJ	0.19 UJ	--	0.0055 U
VOC	1,2,4-Trichlorobenzene	mg/kg	2.0	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	--	0.13 U	--	0.067 U	--	--	--	--	--	0.0055 U
VOC	1,2,4-Trimethylbenzene	mg/kg	95.2	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,2-Dibromo-3-chloropropane	mg/kg	--	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.40 U	--	0.20 U	0.28 UJ	0.16 UJ	0.27 UJ	0.19 UJ	--	0.011 U
VOC	1,2-Dibromoethane	mg/kg	3.06E-05	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.011 U
VOC	1,2-Dichlorobenzene	mg/kg	7.0	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	--	0.13 U	--	0.067 U	--	--	--	--	--	0.0055 U
VOC	1,2-Dichloroethane	mg/kg	0.015	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,2-Dichloropropane	mg/kg	0.017	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,3,5-Trimethylbenzene	mg/kg	25	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,3-Dichlorobenzene	mg/kg	12	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	--	0.13 U	--	0.067 U	--	--	--	--	--	0.0055 U
VOC	1,3-Dichloropropane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	1,4-Dichlorobenzene	mg/kg	0.80	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	--	0.13 U	--	0.067 U	--	--	--	--	--	0.0055 U
VOC	2,2-Dichloropropane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	2-Butanone	mg/kg	60	0.010 J	0.021 U	0.023 U	0.019 U	0.012 U	0.0062 J	--	--	0.012 U	0.029 J	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.011
VOC	2-Chlorotoluene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	2-Hexanone	mg/kg	--	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.011 U
VOC	4-Chlorotoluene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	4-Isopropyltoluene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	4-Methyl-2-pentanone	mg/kg	--	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.0063 J
VOC	Acetone	mg/kg	10	0.090	0.070	0.068	0.090	0.080	0.085 J	--	--	0.092	0.41	1.3 U	--	0.67 U	0.53 J	0.30 J	0.91 UJ	0.63 UJ	--	0.12
VOC	Benzene	mg/kg	0.020	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0012 J	0.0033 J	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Bromobenzene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Bromochloromethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Bromodichloromethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Bromoform	mg/kg	0.38	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Bromomethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.0055 U
VOC	Carbon disulfide	mg/kg	17	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.011 U
VOC	Carbon tetrachloride	mg/kg	0.030	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Chlorobenzene	mg/kg	0.60	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Chloroethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Chloroform	mg/kg	0.34	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Chloromethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	cis-1,2-Dichloroethene	mg/kg	0.20	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	cis-1,3-Dichloropropene	mg/kg	0.020	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Dibromochloromethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Dibromomethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Dichlorodifluoromethane	mg/kg	60	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Ethylbenzene	mg/kg	5.5	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Hexachlorobutadiene	mg/kg	8.0	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	--	0.13 U	--	0.067 U	--	--	--	--	--	0.0055 U
VOC	Isopropylbenzene	mg/kg	227	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Methylene chloride	mg/kg	0.015	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.011 U
VOC	Methyl-tert-butyl ether (MTBE)	mg/kg	--	0.016 U	0.021 U	0.023 U	0.019 U	0.012 U	0.013 U	--	--	0.012 U	0.040 U	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.011 U
VOC	Naphthalene	mg/kg	21	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	--	0.13 U	--	0.067 U	--	--	--	--	--	0.0055 U
VOC	n-Butylbenzene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	n-Propylbenzene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	o-Xylene	mg/kg	78	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	sec-Butylbenzene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Styrene	mg/kg	1.3	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 UJ	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	tert-Butylbenzene	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Tetrachloroethene (PCE)	mg/kg	0.030	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Toluene	mg/kg	5.4	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.0031 J	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	trans-1,2-Dichloroethene	mg/kg	0.40	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	trans-1,3-Dichloropropene	mg/kg	0.020	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Trichloroethene (TCE)	mg/kg	0.020	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Trichlorofluoromethane	mg/kg	--	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Vinyl chloride	mg/kg	0.0090	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.13 U	--	0.067 U	0.092 UJ	0.055 UJ	0.091 UJ	0.063 UJ	--	0.0055 U
VOC	Xylene, Isomers m & p	mg/kg	78	0.0080 U	0.011 U	0.012 U	0.0096 U	0.0061 U	0.0063 U	--	--	0.0060 U	0.020 U	0.26 U	--	0.13 U	0.18 UJ	0.11 UJ	0.18 UJ	0.13 UJ	--	0.0055 U
TPH	Diesel Range Organics	mg/kg	250	13	--	--	3.5	6.6	9.3	--	--	0.90 J	7.5 J	1.8	3.1 J	--	6.2 J	5.0	2.3	3.1	--	--
TPH	Gasoline Range Organics (C6-C10)	mg/kg	300	0.80 J	--	--	0.45 J	0.58 U	0.62 U	--	--	2.5 U	0.89 U	1.1 U	--	0.68 U	4.8 U	4.2 U	4.6 U	4.1 U	--	--
TPH	Residual Range Organics	mg/kg	11,000	50	--	--	15	32 J	30	--	--	6.7 J	79 J	9.6 J	18 J	--	33 J	23 J	8.0 J	16 J	--	--
SVOC	1,2,4-Trichlorobenzene	mg/kg	2.0	--	--	--	--	--	--	--	--	--	0.36 U	--	--	--	0.029 U	0.030 U	0.027 U	--	0.029 U	--

TABLE 2-2
Soil Pile Analytical Results Compared to Landfill Criteria
Taku Gardens, Fort Wainwright, Alaska

Sample ID				**06SP01S01**	**06SP03S01**	**06SP03S02**	**06SP10S01**	**06SP11S01**	**06SP11S02**	**06SP11S03**	**06SP11S04**	**06SP14S01**	**06SP15S01**	**06SP16S01**	**06SP16S02**	**06SP16S03**	**06SP17S01**	**06SP17S02**	**06SP18S01**	**06SP18S02**	**06SP18S03**	**06SP40S01**
Location ID				06SP01	06SP03	06SP03	06SP10	06SP11	06SP11	06SP11	06SP11	06SP14	06SP15	06SP16	06SP16	06SP16	06SP17	06SP17	06SP18	06SP18	06SP18	06SP40
Sample Date				6/23/2006	6/27/2006	6/27/2006	6/22/2006	6/19/2006	6/19/2006	6/21/2006	6/21/2006	6/26/2006	6/27/2006	7/25/2006	7/25/2006	7/25/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	6/27/2006
Chemical Group	**Chemical Name**	**Units**	**Landfill Criteria**																			
SVOC	1,2-Dichlorobenzene	mg/kg	7.0	--	--	--	--	--	--	--	--	--	0.36 U	--	--	--	0.029 U	0.030 U	0.027 U	--	0.029 U	--
SVOC	1,3-Dichlorobenzene	mg/kg	12	--	--	--	--	--	--	--	--	--	0.36 U	--	--	--	0.029 U	0.030 U	0.027 U	--	0.029 U	--
SVOC	1,4-Dichlorobenzene	mg/kg	0.80	--	--	--	--	--	--	--	--	--	0.36 U	--	--	--	0.029 U	0.030 U	0.027 U	--	0.029 U	--
SVOC	2,4,5-Trichlorophenol	mg/kg	90	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	2,4,6-Trichlorophenol	mg/kg	0.60	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	2,4-Dichlorophenol	mg/kg	0.45	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	2,4-Dimethylphenol	mg/kg	4.0	0.55 U	26 U	0.52 U	0.53 U	0.57 U	0.57 U	--	--	0.55 U	0.55 U	0.63 U	0.56 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	28 U
SVOC	2,4-Dinitrophenol	mg/kg	0.20	2.2 U	100 U	2.1 U	2.1 U	2.3 U	2.3 U	--	--	2.2 U	2.2 U	2.5 U	--	2.2 U	0.29 U	0.30 U	0.27 U	--	0.29 U	110 U
SVOC	2,4-Dinitrotoluene	mg/kg	0.0050	--	17 U	0.35 U	--	--	--	--	--	--	--	--	--	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	2,6-Dinitrotoluene	mg/kg	0.0044	--	17 U	0.35 U	--	--	--	--	--	--	--	--	--	--	0.058 U	0.060 U	**0.017 J**	--	0.057 U	18 U
SVOC	2-Chloronaphthalene	mg/kg	70	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	2-Chlorophenol	mg/kg	1.4	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	2-Methyl-4,6-dinitrophenol	mg/kg	--	2.2 U	100 U	2.1 U	2.1 U	2.3 U	2.3 U	--	--	2.2 U	2.2 U	2.5 U	--	2.2 U	0.29 U	0.30 U	0.27 U	--	0.29 U	110 U
SVOC	2-Methylnaphthalene	mg/kg	61	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	2-Methylphenol (o-Cresol)	mg/kg	7.0	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	2-Nitroaniline	mg/kg	--	1.8 U	84 U	1.7 U	1.7 U	1.8 U	1.8 U	--	--	1.8 U	1.8 U	2.0 U	1.8 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	88 U
SVOC	2-Nitrophenol	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	3,3'-Dichlorobenzidine	mg/kg	0.020	1.8 U	84 U	1.7 U	1.7 U	1.8 U	1.8 U	--	--	1.8 U	1.8 U	2.0 U	1.8 U	--	0.12 U	0.12 U	0.11 U	--	0.11 U	88 U
SVOC	3-Nitroaniline	mg/kg	--	1.8 U	84 U	1.7 U	1.7 U	1.8 U	1.8 U	--	--	1.8 U	1.8 U	2.0 U	1.8 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	88 U
SVOC	4-Bromophenyl phenyl ether	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	4-Chloro-3-methylphenol	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	4-Chloroaniline	mg/kg	0.50	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	4-Chlorophenyl phenyl ether	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	4-Nitroaniline	mg/kg	--	1.8 U	84 U	1.7 U	1.7 U	1.8 U	1.8 U	--	--	1.8 U	1.8 U	2.0 U	1.8 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	88 U
SVOC	4-Nitrophenol	mg/kg	--	--	100 U	2.1 U	2.1 U	--	--	--	--	--	--	2.5 U	--	2.2 U	0.29 U	0.30 U	0.27 U	--	0.29 U	110 U
SVOC	Acenaphthene	mg/kg	210	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	--	0.022 J	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Acenaphthylene	mg/kg	210	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Anthracene	mg/kg	4,300	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	--	0.047 J	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Azobenzene	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	Benzo(a)anthracene	mg/kg	6.0	0.36 U	17 U	0.35 U	0.057 J	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.073 J	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Benzo(a)pyrene	mg/kg	3.0	0.36 U	17 U	0.35 U	0.065 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.070 J	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Benzo(b)fluoranthene	mg/kg	20	0.36 U	17 U	0.027 J	0.11 UJ	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Benzo(g,h,i)perylene	mg/kg	1,500	0.12 J	3.9 J	0.079 J	0.095 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Benzo(k)fluoranthene	mg/kg	200	0.36 U	17 U	0.35 U	0.053 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.066 J	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Benzoic acid	mg/kg	390	1.8 U	84 U	1.7 U	1.7 U	1.8 U	1.8 U	--	--	1.8 U	1.8 U	2.0 U	1.8 U	--	0.33 J	0.32 J	0.28 J	0.31 J	--	88 U
SVOC	Benzyl alcohol	mg/kg	--	0.56 U	27 U	0.53 U	0.54 U	0.58 U	0.58 U	--	--	0.56 U	0.56 U	0.64 U	0.57 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	28 U
SVOC	Benzyl butyl phthalate	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.12 U	0.013 J	0.012 J	--	0.020 J	18 U
SVOC	bis-(2-Chloroethoxy)methane	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	bis-(2-Chloroethyl)ether	mg/kg	0.0020	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	bis(2-Chloroisopropyl)ether	mg/kg	--	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.14 U	0.15 U	0.13 U	--	0.14 U	18 U
SVOC	bis-(2-Ethylhexyl)phthalate	mg/kg	1,200	0.36 U	17 U	0.025 J	0.034 J	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.084 UJ	0.23 U	0.041 U	0.036 U	--	18 U
SVOC	Carbazole	mg/kg	2.0	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	Chrysene	mg/kg	620	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Dibenzo(a,h)anthracene	mg/kg	6.0	0.36 U	3.5 J	0.061 J	0.069 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Dibenzofuran	mg/kg	7.8	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	Diethyl phthalate	mg/kg	190	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.12 U	0.12 U	0.11 U	--	0.11 U	18 U
SVOC	Dimethyl phthalate	mg/kg	1,400	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	Di-n-butyl phthalate	mg/kg	1,700	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.046 U	0.045 U	0.039 U	0.039 U	--	18 U
SVOC	Di-n-octyl phthalate	mg/kg	810,000	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.12 U	0.12 U	0.11 U	--	0.11 U	18 U
SVOC	Fluoranthene	mg/kg	2,100	0.36 U	17 U	0.35 U	0.095 J	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.15 J	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Fluorene	mg/kg	270	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Hexachlorobenzene	mg/kg	0.73	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
SVOC	Hexachlorobutadiene	mg/kg	8.0	--	--	--	--	--	--	--	--	--	0.36 U	--	--	--	0.029 U	0.030 U	0.027 U	--	0.029 U	--
SVOC	Hexachloroethane	mg/kg	1.6	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	Indeno(1,2,3-cd)pyrene	mg/kg	54	0.11 J	2.9 J	0.063 J	0.14 J	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.012 U	0.012 U	0.011 U	--	0.011 U	1.3 J
SVOC	Isophorone	mg/kg	3.0	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	m,p-Cresol	mg/kg	--	1.1 U	100 U	2.1 U	1.1 U	1.1 U	1.1 U	--	--	1.1 U	2.2 U	1.3 U	1.1 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	110 U
SVOC	Naphthalene	mg/kg	21	--	--	--	--	--	--	--	--	--	0.36 U	--	--	--	0.012 U	0.012 U	0.011 U	--	0.011 U	--
SVOC	Nitrobenzene	mg/kg	0.060	--	17 U	0.35 U	--	--	--	--	--	--	--	--	--	--	0.058 U	0.060 U	0.053 U	--	0.057 U	18 U
SVOC	n-Nitrosodimethylamine	mg/kg	3.4	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.29 U	0.30 U	0.27 U	--	0.29 U	18 U
SVOC	n-Nitrosodi-n-propylamine	mg/kg	3.60E-04	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.39 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	n-Nitrosodiphenylamine	mg/kg	3.4	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	Pentachlorophenol	mg/kg	0.010	--	100 U	2.1 U	2.1 U	--	--	--	--	--	--	2.5 U	--	2.2 U	0.12 U	**0.038 J**	0.11 U	**0.034 J**	--	110 U
SVOC	Phenanthrene	mg/kg	4,300	0.36 U	17 U	0.024 J	0.018 J	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	--	0.13 J	0.0014 J	0.012 U	0.011 U	--	0.0017 J	18 U
SVOC	Phenol	mg/kg	67	0.36 U	17 U	0.35 U	0.35 U	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	0.37 U	--	0.029 U	0.030 U	0.027 U	--	0.029 U	18 U
SVOC	Pyrene	mg/kg	1,500	0.36 U	17 U	0.025 J	0.079 J	0.37 U	0.38 U	--	--	0.36 U	0.36 U	0.41 U	--	0.13 J	0.012 U	0.012 U	0.011 U	--	0.011 U	18 U
PEST	4,4'-DDD	mg/kg	47	0.043	--	--	--	0.011 J	0.014 J	--	--	5.00E-04 J	0.011 J	4.20E-04 J	0.0025 J	--	0.10 J	0.014 J	0.013 J	0.071 J	--	--
PEST	4,4'-DDE	mg/kg	150	0.022 J	--	--	--	0.073	0.061	--	--	0.0028 J	0.23	3.60E-04 J	--	0.0065	0.0032 J	2.90E-04 J	8.10E-04 J	0.0024 J	--	--
PEST	4,4'-DDT	mg/kg	88	0.40	--	--	--	0.33	0.34	--	--	0.010	0.98	0.0013 J	--	0.023 J	0.19	0.021 J	0.022 J	0.13	--	--

TABLE 2-2
Soil Pile Analytical Results Compared to Landfill Criteria
Taku Gardens, Fort Wainwright, Alaska

Sample ID				**06SP01S01**	**06SP03S01**	**06SP03S02**	**06SP10S01**	**06SP11S01**	**06SP11S02**	**06SP11S03**	**06SP11S04**	**06SP14S01**	**06SP15S01**	**06SP16S01**	**06SP16S02**	**06SP16S03**	**06SP17S01**	**06SP17S02**	**06SP18S01**	**06SP18S02**	**06SP18S03**	**06SP40S01**
Location ID				06SP01	06SP03	06SP03	06SP10	06SP11	06SP11	06SP11	06SP11	06SP14	06SP15	06SP16	06SP16	06SP16	06SP17	06SP17	06SP18	06SP18	06SP18	06SP40
Sample Date				6/23/2006	6/27/2006	6/27/2006	6/22/2006	6/19/2006	6/19/2006	6/21/2006	6/21/2006	6/26/2006	6/27/2006	7/25/2006	7/25/2006	7/25/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	6/27/2006
Chemical Group	**Chemical Name**	**Units**	**Landfill Criteria**																			
PEST	Aldrin	mg/kg	1.6	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	2.70E-04 J	5.80E-04 U	--	--
PEST	alpha-BHC	mg/kg	0.0026	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	5.30E-04 UJ	5.80E-04 U	--	--
PEST	alpha-Chlordane	mg/kg	--	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0028	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	5.30E-04 UJ	5.80E-04 U	--	--
PEST	beta-BHC	mg/kg	0.0090	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	4.40E-04 J	5.80E-04 U	--	--
PEST	delta-BHC	mg/kg	--	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	5.30E-04 UJ	5.80E-04 U	--	--
PEST	Dieldrin	mg/kg	0.015	0.037 U	--	--	--	0.019 U	0.019 U	--	--	0.0037 U	0.019 U	0.0043 U	0.0038 U	--	0.0054 J	7.80E-04 J	7.00E-04 J	0.0039 J	--	--
PEST	Endosulfan I	mg/kg	7.0	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	4.80E-04 J	5.90E-04 UJ	2.70E-04 J	3.50E-04 J	--	--
PEST	Endosulfan II	mg/kg	7.0	0.037 U	--	--	--	0.019 U	0.019 U	--	--	0.0037 U	0.019 U	0.0043 U	0.0038 U	--	0.045 J	0.0069 J	0.0054 J	0.013 J	--	--
PEST	Endosulfan sulfate	mg/kg	--	0.037 U	--	--	--	0.019 U	0.019 U	--	--	0.0037 U	0.019 U	0.0043 U	0.0038 U	--	0.047 J	0.0061 J	0.0058 J	0.032 J	--	--
PEST	Endrin	mg/kg	0.30	0.037 U	--	--	--	0.019 U	0.019 U	--	--	0.0037 U	0.019 U	0.0043 U	0.0038 U	--	0.019 J	0.0025 J	0.0023 J	0.013 J	--	--
PEST	Endrin aldehyde	mg/kg	--	0.037 U	--	--	--	0.019 U	0.019 U	--	--	0.0037 U	0.019 U	0.0043 U	0.0038 U	--	0.16 J	0.019 J	0.017 J	0.094 J	--	--
PEST	Endrin ketone	mg/kg	--	0.037 U	--	--	--	0.019 U	0.019 U	--	--	0.0037 U	0.019 U	0.0043 U	0.0038 U	--	0.019 J	0.0024 J	0.0018 J	0.013 J	--	--
PEST	gamma-BHC (Lindane)	mg/kg	0.0030	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	5.30E-04 UJ	5.80E-04 U	--	--
PEST	gamma-Chlordane	mg/kg	--	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0063	0.0094 U	0.0021 U	0.0019 U	--	0.0095 J	0.0014 J	0.0011 J	0.0069 J	--	--
PEST	Heptachlor	mg/kg	8.0	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	7.30E-04 J	0.0094 U	0.0021 U	0.0019 U	--	6.00E-04 UJ	5.90E-04 UJ	0.0015 J	5.80E-04 U	--	--
PEST	Heptachlor epoxide	mg/kg	0.20	0.019 U	--	--	--	0.0096 U	0.0097 U	--	--	0.0019 U	0.0094 U	0.0021 U	0.0019 U	--	1.20E-04 J	5.90E-04 UJ	5.30E-04 UJ	5.80E-04 U	--	--
PEST	Methoxychlor	mg/kg	52	0.19 U	--	--	--	0.096 U	0.097 U	--	--	0.019 U	0.094 U	0.021 U	0.019 U	--	0.069 J	0.0093 J	0.0076 J	0.047 J	--	--
PEST	Toxaphene	mg/kg	10	0.74 U	--	--	--	0.38 U	0.38 U	--	--	0.073 U	0.37 U	0.084 U	0.075 U	--	0.060 UJ	0.059 UJ	0.053 UJ	0.058 U	--	--
PCB	PCB-1016 (Aroclor 1016)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.060 U	0.30 U	0.059 U	0.058 U	--	0.055 U
PCB	PCB-1221 (Aroclor 1221)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.060 U	0.30 U	0.059 U	0.058 U	--	0.055 U
PCB	PCB-1232 (Aroclor 1232)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.060 U	0.30 U	0.059 U	0.058 U	--	0.055 U
PCB	PCB-1242 (Aroclor 1242)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.060 U	0.30 U	0.059 U	0.058 U	--	0.055 U
PCB	PCB-1248 (Aroclor 1248)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.060 U	0.30 U	0.059 U	0.058 U	--	0.055 U
PCB	PCB-1254 (Aroclor 1254)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.060 U	0.30 U	0.059 U	0.058 U	--	0.055 U
PCB	PCB-1260 (Aroclor 1260)	mg/kg	10	0.055 U	0.053 U	0.053 U	0.055 U	0.055 U	0.052 U	0.052 U	--	0.055 U	0.061 U	0.056 U	0.058 U	--	0.51	1.2	0.18 J	--	0.50 J	0.11
NNC	1,3,5-Trinitrobenzene	mg/kg	--	0.027 J	--	--	0.032 J	0.28 U	0.28 U	--	0.068 J	0.27 U	0.041 J	0.25 U	0.25 U	--	0.045 J	0.25 U	0.024 J	0.035 J	--	--
NNC	1,3-Dinitrobenzene	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	2,4,6-Trinitrotoluene	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	2,4-Dinitrotoluene	mg/kg	0.0050	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	--	--	--	--	--	--
NNC	2,6-Dinitrotoluene	mg/kg	0.0044	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	--	--	--	--	--	--
NNC	2-Amino-4,6-dinitrotoluene	mg/kg	--	0.33 U	--	--	0.32 U	0.34 U	0.34 U	--	0.30 U	0.33 U	0.33 U	0.30 U	0.30 U	--	0.30 U	0.30 U	0.30 U	0.30 U	--	--
NNC	2-Nitrotoluene	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	3-Nitrotoluene	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	4-Amino-2,6-dinitrotoluene	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	4-Nitrotoluene	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	Hexahydro-1,3,5-trinitro-1,3,5-triazine	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	Methyl-2,4,6-trinitrophenylnitramine	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 UJ	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	Nitrobenzene	mg/kg	0.060	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	--	--	--	--	--	--
NNC	Nitroglycerin	mg/kg	--	0.55 U	--	--	0.53 U	0.57 U	0.57 U	--	0.50 U	0.55 U	0.55 U	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U	--	0.26 J	--
NNC	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	mg/kg	--	0.27 U	--	--	0.26 U	0.28 U	0.28 U	--	0.25 U	0.27 U	0.28 U	0.25 U	0.25 U	--	0.25 U	0.25 U	0.25 U	0.25 U	--	--
NNC	Pentaerythritol tetranitrate	mg/kg	--	0.37 J	--	--	0.23 J	0.57 U	0.57 U	--	0.28 J	0.55 U	0.55 U	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U	0.50 U	--	--
METAL	Aluminum	mg/kg	--	10,000	7,180	7,360	--	10,800	10,700	18,100	4,000	10,200	10,300	8,610	--	8,870	11,400	10,800	12,100	--	10,800	7,800
METAL	Antimony	mg/kg	3.6	0.25 J	0.25 J	0.28 J	--	0.51 J	3.0 J	0.33 J	**118 J**	0.66 UJ	0.30 J	0.75 U	--	0.22 J	0.40 J	0.40 J	0.34 J	--	0.33 J	0.25 J
METAL	Arsenic	mg/kg	8.0	**9.0**	4.9	5.5	--	**10 J**	**9.3 J**	**9.4 J**	**31 J**	**9.9**	**8.9**	6.9	--	**8.6**	**11**	**10**	**8.9**	**11**	--	6.4
METAL	Barium	mg/kg	1,100	119	78 J	78 J	--	131	128	111	170	104	166 J	90	--	112	116	115	102	--	107	91 J
METAL	Beryllium	mg/kg	42	0.18	0.12	0.13	--	0.19	0.19	0.16	0.11	0.18	0.21	0.17	--	0.19	0.21	0.21	0.21	--	0.21	0.15
METAL	Bismuth	mg/kg	--	0.11 J	0.52 U	0.52 U	--	0.12 J	0.14 J	0.12 J	1.0	0.11 J	0.15 J	0.63 U	0.56 U	--	0.17 J	0.16 J	0.18 J	0.15 J	--	0.55 U
METAL	Boron	mg/kg	--	5.5 U	5.2 U	5.2 U	--	1.8 J	2.2 J	6.0 U	3.8 J	5.5 U	2.9 J	6.3 U	5.6 U	--	6.3 UJ	6.0 UJ	6.1 UJ	5.8 UJ	--	1.7 J
METAL	Cadmium	mg/kg	5.0	0.39	0.19	0.26	--	0.80	0.67	0.96	**23**	0.31	0.45	0.29	0.31	--	0.33	0.33	0.36	0.32	--	0.24
METAL	Calcium	mg/kg	--	6,820	4,250	4,420	--	7,310	7,370	6,750	2,630	7,080	8,450	4,500	--	5,200	5,820	6,080	4,150	--	5,410	5,090
METAL	Chromium	mg/kg	26	20 J	12	14	--	21 J	21 J	21 J	**94 J**	20 J	20	17	--	18	22	21	23	--	21	15
METAL	Cobalt	mg/kg	--	8.7	5.8	6.3	--	9.9	8.9	8.6	20	9.7	9.3	7.6	--	8.1	10 J	10 J	9.9 J	10 J	--	6.5
METAL	Copper	mg/kg	7,000	25	15	16	--	30 J	28 J	425 J	323 J	27	24	20	--	23	28	30	33	28	--	18
METAL	Iron	mg/kg	--	21,100	13,500	14,400	--	23,400	22,200	21,000	226,000	23,200	20,100	18,200	--	18,300	22,200	21,200	21,200	21,600	--	15,300
METAL	Lead	mg/kg	--	15 J	14 J	20 J	--	22 J	18 J	37 J	1,540	7.1 J	16 J	5.4	--	6.4	12	11	11	--	11	12 J
METAL	Magnesium	mg/kg	--	5,690	3,730	3,970	--	6,110	5,870	5,710	2,070	6,200	5,130	4,740	--	4,640	5,850	5,700	5,980	--	5,610	3,990
METAL	Manganese	mg/kg	--	367	227	276	--	416	372	421	546	407	486	336	--	424	305	299	261	--	289	261
METAL	Mercury	mg/kg	1.4	0.021 J	0.018 J	0.019 J	--	0.025 J	0.026 J	0.024 J	--	0.028 J	0.031 J	0.021 J	0.024 J	--	0.040 J	0.038 J	0.036 J	--	0.031 J	0.021 J
METAL	Molybdenum	mg/kg	--	0.54	0.34	0.38	--	0.68	0.61	0.66	14	0.60	0.77	0.50	--	0.67	0.98	0.85	0.64	--	0.71	0.49
METAL	Nickel	mg/kg	87	22	15	16	--	25 J	23 J	23 J	79 J	24	22	20	--	21	23	24	24	23	--	18
METAL	Phosphorus, Total (as P)	mg/kg	--	540	371 J	390 J	--	570	535	528	242	697	526 J	497	443	--	579	510	576	--	575	418 J
METAL	Potassium	mg/kg	--	943	1,090	788	--	1,060	1,020	1,000	402	893	1,160	700	--	824	1,000	953	976	--	1,030	963
METAL	Selenium	mg/kg	3.5	0.48	0.24 J	0.25 J	--	0.51	0.48	0.46	1.2 J	0.49	0.49	0.37 J	--	0.54	0.63	0.76	0.66	0.59	--	0.29 J
METAL	Silver	mg/kg	21	0.050 J	0.049 J	0.069 J	--	0.068 J	0.068 J	0.078 J	0.96	0.050 J	0.087 J	0.059 J	--	0.096 J	0.075 J	0.082 J	0.089 J	0.074 J	--	0.069 J
METAL	Sodium	mg/kg	--	401 J	275 J	294 J	--	395 J	406 J	368 J	157 J	468 J	340 J	348	--	317	447 J	431 J	401 J	--	458 J	285 J
METAL	Strontium	mg/kg	--	34 J	23 J	23 J	--	35 J	36 J	36 J	19 J	36 J	46 J	29	--	31	40 J	42 J	30 J	--	38 J	25 J
METAL	Thallium	mg/kg	--	0.064 J	0.16 U	0.16 U	--	0.079 J	0.072 J	0.069 J	0.22	0.056 J	0.055 J	0.19 U	0.17 U	--	0.11 J	0.18 U	0.18 U	0.18 U	--	0.17 U
METAL	Vanadium	mg/kg	3,400	37 J	28 J	28 J	--	41	40	37	14	44 J	37 J	35	--	34	38	38	38	--	36	31 J
METAL	Zinc	mg/kg	9,100	68 J	34 J	37 J	--	70	66	68	**12,200**	49 J	60 J	42	--	44	55	51	59	53	--	42 J

TABLE 2-2
Soil Pile Analytical Results Compared to Landfill Criteria
Taku Gardens, Fort Wainwright, Alaska

Sample ID				**06SP01S01**	**06SP03S01**	**06SP03S02**	**06SP10S01**	**06SP11S01**	**06SP11S02**	**06SP11S03**	**06SP11S04**	**06SP14S01**	**06SP15S01**	**06SP16S01**	**06SP16S02**	**06SP16S03**	**06SP17S01**	**06SP17S02**	**06SP18S01**	**06SP18S02**	**06SP18S03**	**06SP40S01**
Location ID				06SP01	06SP03	06SP03	06SP10	06SP11	06SP11	06SP11	06SP11	06SP14	06SP15	06SP16	06SP16	06SP16	06SP17	06SP17	06SP18	06SP18	06SP18	06SP40
Sample Date				6/23/2006	6/27/2006	6/27/2006	6/22/2006	6/19/2006	6/19/2006	6/21/2006	6/21/2006	6/26/2006	6/27/2006	7/25/2006	7/25/2006	7/25/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	8/19/2006	6/27/2006
Chemical Group	**Chemical Name**	**Units**	**Landfill Criteria**																			
HERB	2,4,5-T	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	2,4,5-TP (Silvex)	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	2,4-D	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	2,4-DB	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	4-Nitrophenol	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	Dalapon	mg/kg	--	0.018 U	--	--	--	0.019 U	0.019 U	--	--	0.018 U	0.020 U	--	--	--	--	--	--	--	--	--
HERB	Dicamba	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	Dichlorprop	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	Dinoseb	mg/kg	--	0.018 U	--	--	--	0.019 U	0.019 U	--	--	0.018 U	0.020 U	--	--	--	--	--	--	--	--	--
HERB	MCPA	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	MCPP	mg/kg	--	0.0073 U	--	--	--	0.0074 U	0.0074 U	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
HERB	Pentachlorophenol	mg/kg	0.010	**0.020**	--	--	--	0.0074 U	**0.024**	--	--	0.0073 U	0.0078 U	--	--	--	--	--	--	--	--	--
CONV	Bromide	mg/kg	--	2.7 U	--	--	2.6 U	2.8 U	2.8 U	3.0 U	--	2.7 U	2.8 U	--	--	--	--	--	--	--	--	--
CONV	Chloride	mg/kg	--	6.4	--	--	6.0	4.6 J	4.7 J	4.6 J	--	2.7 J	6.0	--	--	--	--	--	--	--	--	--
CONV	Fluoride	mg/kg	--	1.6 J	--	--	1.8 J	1.9 J	1.6 J	3.0 UJ	--	1.6 J	2.0 J	--	--	--	--	--	--	--	--	--
CONV	Nitrogen, Nitrate (as N)	mg/kg	--	3.6	--	--	8.1	--	--	--	--	1.2	43	--	--	--	--	--	--	--	--	--
CONV	Nitrogen, Nitrate-Nitrite	mg/kg	--	--	--	--	--	10	10	--	--	--	--	--	--	--	--	--	--	--	--	--
CONV	Nitrogen, Nitrite	mg/kg	--	0.27 U	--	--	0.26 U	--	--	--	--	0.27 U	0.28 U	--	--	--	--	--	--	--	--	--
CONV	Percent Moisture	percent	--	9.0	4.4	4.4	5.3	12	12	16	0.10 U	8.6	9.4	20	11	--	21	20	18	--	17	9.4
CONV	pH	units	--	8.1	8.6	8.2	8.2	8.0	8.0	7.8	--	8.2	7.4	--	--	--	--	--	--	--	--	7.6
CONV	Phosphorus, Total Orthophosphate (as P)	mg/kg	--	1.1 U	--	--	1.1 U	1.1 U	1.1 U	1.2 U	--	1.1 U	1.1 U	--	--	--	--	--	--	--	--	--
CONV	Solids, Percent	percent	--	--	--	--	--	--	--	--	--	--	--	--	--	--	82	80	86	84	--	--
CONV	Sulfate	mg/kg	--	62	--	--	42	69	55	36	--	24	33	--	--	--	--	--	--	--	--	--
CONV	Total Solids	percent	--	90	93	94	91	91	95	95	--	91	81	89	84	--	83	84	85	86	--	89

TABLE 2-3
MI Triplicate Sample Locations

Triplicate Sample Location	Geographic Area of Site	Piles that this Triplicate Result is Applied To
SP06	Northwest	SP04, SP05, SP06, SP07, SP08, SP09
SP03	Northeast	SP01, SP02, SP03, SP40, SP41, SPB, SPG
SP13	Southeast	SP13
SP27	Southwest	SP14, SP115, SP17-SP19, SPD, SPF, SPE

TABLE 2-4
Analytical Methods

Analysis	Method Number	Maximum Holding Time
PCBs	EPA SW8082	None
Metals	EPA SW6010/6020	TCLP Leaching 28 days for mercury, (180 days for other metals)
DRO/RRO	AK 102/103	14 days to extraction, 40 days to analysis
Pesticides	EPA 8081A	14 days to extraction, 40 days to analysis
VOCs	EPA SW8260	14 days to analysis
SVOCs	EPA SW8270	14 days to extraction, 40 days to analysis

TABLE 2-5
TCLP Limits for Metals

Method	Analyte	TCLP Limit (mg/L)[1]
SW6010B	Arsenic	5
SW6010B	Barium	100
SW6010B	Cadmium	1
SW6010B	Chromium	5
SW6010B	Lead	5
SW6010B	Mercury	0.2
SW6010B	Selenium	1
SW6010B	Silver	5

[1]Code of Federal Regulations 261.24

Responses to Comments

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addenda 1-4
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 3 Aug 07 REVIEWER: ADEC, Sharon and Earl, received by email PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
	1	Combining Stockpiles: Earl called Chuck Ramsey to discuss combining small stockpiles into one decision unit. Chuck said it was acceptable with a couple of conditions: 1)That all the stockpiles came from the same source and are (or can be assumed to be) similar in nature. This would need to be documented and agreed upon by the group. Sharon: Suggest discussing this and finalizing in a meeting minutes or similar to be included in the final overall work plan instead of holding up work further. I told Rielle today that I would be able to do a site visit next Tuesday and we can discuss this during the site visit if you think it would expedite things. 2)That the number of increments collected from each stockpile must be based on the cubic yards of each stockpile. So, if one stockpile was twice as big as another, twice as many correctly located increments need to be taken from the larger stockpile than the smaller one. Sharon: Agree. This makes sense.	1) During an 8/6 conference call it was agreed that piles within the same general area are similar in nature and therefore soil piles can be combined into the same decision unit. 2) The text will be amended to state large piles will be divided into multiple decisions units (one decision unit per 500 cubic yards). For small piles combined to one decision unit the number of incremental samples per pile will be based on the ratio of pile volume to total volume of group of piles. Large piles with multiple decisions units will have 30 increments per decisions unit.		
	2	Sharon: Page 2-1. Area of Investigation. States there are 44 stock piles. Background information section states there are 25 in the PCB EZ and 15 outside the EZ. Target Analytes states there are 25 soil piles in the EZ and 19 outside of the EZ. Figure 2-1 shows 06SP01-06SP41 (06SP16 is missing) plus the 7 soil piles represented by SPA-SPG. This should be reconciled in the final document. Also, were the SPA-SPG soil piles not accounted for in the PSEII or were they created during site investigtion?	Text will be reconciled. 06SP16 was clean fill and this will be noted in the addendum.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addenda 1-4
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 3 Aug 07 REVIEWER: ADEC, Sharon and Earl, received by email PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
	3	Earl: Page 2-3, Target Analytes. States that PCBs are not expected in soil piles outside of the exclusion zone. Do you agree, especially for the stockpiles located adjacent to the exclusion zone? If there is any question, I would recommend PCBs be analyzed for all stockpiles. Sharon: I don't think it's prudent to use sampling data from the nine piles that were tested last year to determine what might be in other soil piles because different areas were used for different purposes and Watterson mixed a lot of dirt around. Also, PCBs were detected outside of the Exclusion Zone (soil pile 17--I realize this soil came from the EZ, just need to correct text) and in the sound berm near the former transformer service area. Low levels (<1 mg/kg) of PCBs were detected at numerous locations across the site. The problem with using last year's data to eliminate COCs is that there weren't enough samples collected to adequately characterize all of the stock piles. Also, why are no soil piles being sampled for dioxin/furans?	PCBs are not expected in the soil piles outside of the exclusion zone, based on results of extensive surface soil sampling conducted in 2005. Soil pile 17 will be analyzed for PCBs. Piles outside of the exclusion zone will be tested for DRO/RRO, SVOCs and TCLP metals. VOCs will be analyzed for soil piles in the northwest corner near the known POL plume. Pesticides will be run for Group 6 piles to confirm earlier hits.		
	4	Earl: Page 2-3, Target Analytes. It is unclear from the text and the second bullet whether/where the full list SVOCs by 8270 will be reported and/or just PCP. Again, as a safeguard, I would recommend that the full list be reported. Since DRO is being analyzed, I recommend that RRO be run also. It is the same extraction/analyses and the additional cost minimal. Also, please be sure you agree with them dropping VOCs from the COC list. Sharon: Agreed. There's a VOC soil plume around the POL area that hasn't been fully delineated. Why is this being dropped?	Test will be corrected to clarify that the full list of SW8270 compounds will be analyzed. RRO will be run every where DRO is being run and VOC will be analyzed in piles 4-9 in the vicinity of the known POL plume.		
	5	Sharon: Page 2-4. Detection Limits. I think it's premature to state that all soil is expected to go to the landfill.	Comment noted. Soil piles 11 and 12 will be sent to DRMO. The text will be amended to annotate this.		
	6	Earl: Page 2-4, Sampling Approach. Grouping the smaller piles into single, ~100 cy decision units, seems appropriate, although some of them are pretty widely spaced. However, splitting the larger stockpiles into (arbitrary) 500 cy decision units, seems a bit large (?). Since it is all going off-site, I guess as long as solid waste accepts it we are OK. Just confirm that you are comfortable with their decision unit determination. Sharon: I spoke with Ken Spiers in Solid Waste and he said MI sampling was OK. Not sure if he's provided you with approval yet. He said he was expecting a written request. 500 CY does seem large but if Solid Waste is OK with it, then I'm not going to disagree.	It was agreed that decision units up to 500 cy were OK. To be conservative, SP06 in the northwest corner was broken up into 4 decision units (~ 275 cy/decision unit) since this pile is near a known contaminant plume.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addenda 1-4
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 3 Aug 07 REVIEWER: ADEC, Sharon and Earl, received by email PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
	7	Recommend that for metals any visual evidence of metal pieces during sample collection and sieving, be documented. Sieving and analysis of the <2mm fraction may bias the metals results low. Is this a concern for solid waste disposal? Sharon: Agreed. One of the samples last year had 197,000 mg/kg lead. I expect this was due to a metal fragment	It was agreed that we would analyze metals for TCLP. Soil will not be sieved before being sent to the laboratory.		
	8	Earl: Page 2-4, Sampling Approach. Third Bullet. Insufficient details are provided for the MI sampling. Additional information is needed in the addendum and/or FSP section. What is the basis for the 1/3 surface – 2/3 subsurface split? How will the systematic MI locations be determined – for combined stockpiles and for single stockpiles with multiple decision units? How will depths be determined? Etc. Sufficient details and/or examples, as provided for the sound berm MI sampling, are required for review and field implementation. Sharon: Also, wouldn't the larger decision units require more samples?	It was agreed that we would document that professional judgement was used for the surface/subsurface split. For smaller piles combined into one decision unit, the number of incremental samples per pile is based on the ratio of the pile volume to the total volume of the group of piles. Each pile is divided into the appropriate number of increments and samples are collected from a random quadrant, A, B, C, or D, by rolling dice. Larger piles are divided into multiple decision units. A grid of 30 increments is overlaid on each decision unit. Samples are collected from a random quadrant within each increment by rolling dice. The text will be amended to include more details on the MI sampling.		

	9	Page 2-4, Sampling Approach. Fourth Bullet. If the Sound Berm MI protocol will be followed, e.g. 3" core sieved to <6mm and submitted to the lab, please document. If not provide details on how the increment will be collected and how the minimum mass per increment will be determined.	See response to comment #8. For non-metal, non-volatile samples, a minimum of 60 gram of sample will be collected at each of 30 increments, as specified in the FSP (identical to the Sound Berm sampling). For VOC analysis, samples at each increment will be added to methanol-preserved sample containers. For metals analysis, unsieved MI samples will be collected and analyzed for TCLP. Unsieved samples will be collected from each of the 30 incremental sample locations. the entire volume (approximately 1 liter) will be homogenized and sent to the laboratory. The laboratory will subsample and obtain the required 100 g for analysis.		
	10	Specify the decision units that triplicate samples will be collected at, 4 total, and which decision units the triplicates will be applied to for 95% UCL determination.	Agreed. This will be clarified in the text. A table was added to show locations for the triplicate sampling and associated piles applied to each triplicate sample.		
	11	Sharon: Table 2-1. Earlier in the document, it states that pesticides can be detected using 8270 but this table distinguishes between SVOCs and pesticides and gives the impression different methods will be used.	Pesticides will be analyzed by 8081, but 8270 can be used for chromatographic confirmation.		
	12	Table 2-3 DRO/RRO are listed as an analytical method. Recommend stating that RRO will be included as an analyte earlier in the document. (See comment 3)	RRO will be added. Text will be modified accordingly.		

Addendum 3

Final

Addendum 3 to the Remedial Investigation Work Plan

Soil Gas Investigation

FWA 102 Former Communications Site
Fort Wainwright, Alaska

Prepared for

Department of the Army
U.S. Army Corps of Engineers,
Alaska District

P.O. Box 6898
Elmendorf AFB, Alaska 99506-6898

Contract No. W911KB-05-D-0010
Task Order 0009

Final, 18 August 2007

CH2MHILL
301 W. Northern Lights Boulevard, Suite 601
Anchorage, AK 99503

ADDENDUM 3

Soil Gas Investigation

Purpose

This document serves as an addendum to the May 2007 *Remedial Investigation/Feasibility Study Management Plan FWA 102 Former Communications Site Fort Wainwright Alaska* (RI Management Plan). This addendum addresses the characterization of soil gas located at the Former Communication Site (FCS) to provide chemical concentration data for the baseline risk assessment. The FCS site has been divided into two primary areas that affect how the fieldwork for the remedial investigation (RI) is conducted: the low probability of encountering Munitions and Explosives of Concern (MEC) Area and moderate to high probability of encountering MEC Area. Figure 3-1 depicts the location of these two areas. This addendum covers collection of sub-slab soil gas samples at all the buildings and subsurface soil gas samples in open areas within the low-probability MEC area only. This addendum does not address plans for collection of soil gas samples within the moderate-to-high MEC area. Plans for collection of soil gas within the moderate to high MEC area will be included in the Interim Draft RI Management Plan.

The U.S. Army, U.S. Environmental Protection Agency (EPA), and Alaska Department of Environmental Conservation (ADEC) have agreed to conduct the remedial investigation/feasibility study (RI/FS) for the FCS using the Triad approach. The RI Management Plan addresses this approach and overall site management and includes the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). This document is one of many addenda that provide detailed information about specific tasks of the RI/FS. This approach was determined to be the most effective, efficient, and appropriate method for investigating this site.

Background Information

The migration of volatile organic compounds (VOCs) from underlying contaminated soil is described as vapor intrusion and is the risk exposure pathway that will be investigated in this Work Plan Addendum. The historical activities at FCS include chemical spills from maintenance practices; fire training; leaks from tanks, pipelines, and transformers; and burial of drums and other wastes debris. Therefore, it is necessary to assess whether contaminant exposure through vapor intrusion poses potentially unacceptable risks to human health. Ambient outdoor air risk estimates and additional information on exposure pathways are included in the Risk Assessment Work Plan, Section 3.4.3.

Delineation of the MEC boundary lines, as shown on Figure 3-2, was accomplished by overlaying 2003, 2004, and 2007 geophysical data with 1949, 1956, 1982, and 2005 aerial photographs and digitizing polygons around areas that either had geophysical anomalies or surface debris. Historical photographs were used to identify areas where MEC disposal was most likely to have occurred. All of MEC uncovered to date has been within these areas. The boundary lines were conservatively expanded to the north of the tree line area and adjusted

to the west to easily distinguish housing units in each area. The geophysical data shown on Figure 3-2 is from 2004, prior to construction of the housing. The 2004 data are not clouded by anomalies from new construction.

Previous Sampling Results

A passive soil gas investigation was conducted at FCS in 2006 as part of the Preliminary Source Evaluation (PSE) Phase II Investigation. The 2006 soil gas investigation was conducted in the northwest potion of the site and near Building 49. It consisted of passive soil gas samples collected in 35 locations with a Gore™ Sorber. The sample locations selected in the PSE II Investigation were generally widespread within the northwest portion of the site to confirm the presence or absence of VOCs and not to define nature and extent. Previous passive soil gas sample points and area of elevated VOCs are shown on Figure 3-2.

Petroleum-derived constituents (total petroleum hydrocarbons [TPH]; C-11, C-13, and C-15 hydrocarbons; naphthalenes; and trimethylbenzenes) were detected in almost all sample locations (33 of 35), suggesting these compounds were ubiquitous throughout the area of investigation. Benzene, toluene, ethylbenzene, and xylene (BTEX) compounds were detected less frequently (6 of 35 locations) along the northern border of the FCS. Of the chlorinated solvents, only trichloroethene (TCE) and tetrachloroethane (PCE) were detected, and they appeared in fewer locations than petroleum constituents (5 out of 35 locations). The source of the PCE and TCE was assumed to be solvent use from the former motor pool. Tentatively identified compounds (TICs) detected appeared to be limited to chlorofluorocarbons (CFCs). The CFC source is unknown and is believed to be unrelated to the petroleum source. It is possible these constituents are associated with foam insulation covering underground utilities. The sample results from the PSE II Investigation are qualitative and cannot be used to determine actual concentrations of VOCs in a given location. Consequently, active soil gas sampling will be conducted to evaluate the nature and extent of VOCs in soil in this investigation.

Data Quality Objectives (DQOs)

A DQO process was used to determine the accuracy and quality specification that the collected data must meet to fill existing data gaps for the RI/FS. The purpose of the data is to decide whether future indoor residents may be exposed to VOC concentrations in soil gas that pose a potential for unacceptable risks through a vapor intrusion pathway. The soil gas test method should be capable of detecting VOCs at EPA Region VI values for Ambient Air Screening Levels multiplied by a factor of 10 (to adjust for soil gas to indoor air attenuation). Table 3-1 (at the end of this addendum) includes these values. The soil gas results will be evaluated by using the advanced Johnson and Ettinger (1991) *Model for Subsurface Vapor Intrusion into Buildings, Updated 2003* (SG-ADV Version 3.1; 02/04) (EPA, 2003) to estimate potential exposure from vapor intrusion. To the greatest extent possible, the site-specific building dimensions, foundation thicknesses, design values for air exchange rates, and other information will be used for the modeling. Additional site-specific factors (temperature, soil type, etc.) will be adjusted from the default values to provide site-specific estimates of exposure to vapors at FCS. Data obtained from this investigation will supplement soil and groundwater investigation results to refine the contaminant source evaluation for the FCS

site. In addition, sub-slab samples will be collected at the School Age Services (SAS) building, located adjacent to the northwest boundary of the FCS, to address the indoor air risk at that facility.

Sampling Locations

Figure 3-1 depicts the boundary of the low probability of encountering MEC area and the moderate to high probability of encountering MEC area. The sampling locations covered in the addendum are restricted to sub-slab locations and to the Low Probability MEC Area. Plans for collection of soil gas within the Moderate to High MEC Area will be included in the Interim Draft RI Management Plan.

Figure 3-2 shows the proposed 75 soil gas sample points in the Low Probability MEC Area and 30 sample locations at each building in the Moderate to High MEC Area for sub-slab samples (MEC area procedures addressed in RI Management Plan) for a total of 105 sample point shown. Sample location rationale is as follows:

1. One soil gas sample at each building for estimating risk of vapor intrusion to indoor air (25 samples from existing buildings in Low Probability MEC Area, 10 samples from potential future construction building footprints in Low Probability MEC Area, and 30 samples for existing buildings in Moderate to High MEC Area)
2. In areas of known VOC contamination, such as the northwest area of FCS, additional sample points to assess the extent of contaminations (22 samples)
3. In areas with no detected VOCs or no data (because of incomplete historical data), samples to identify potential sources (11 samples)
4. Targeting of the former slough channel to evaluate potential preferential pathways[1] (6 samples)
5. Sub-slab samples at the SAS building to address indoor air quality at that facility (1 sample shown, more possible)

Geophysical Anomaly and Utility Avoidance

Soil gas sample locations will be selected to avoid geophysical anomalies and existing utilities. Fifty-five of the proposed soil gas sampling points will be collected at a depth of 3 inches below the slab in the garage of each building. This sampling is considered safe from MEC hazard because sample equipment will not penetrate below the engineered backfill under each building. Careful review of as-built drawings, discussions with the construction contractor, and observations of utilities at the exposed slabs within the exclusion zone were conducted to reduce the chances for affecting buried utilities.

For soil gas samples in open areas GPS coordinates for sample locations, shown on Figure 3-2, will be used to mark sample locations in the field. The sample locations were selected to avoid geophysical anomalies and utilities. Additional anomaly avoidance and

[1] Note that soil type (identified through logging of soil borings) will also be used to evaluate potential for preferential pathways in the former slough channel.

location clearance with a magnetometer and current induction methods will be used if applicable.

Sample Collection Methods and Analyses

At each building, the slab will be cored in the garage area and a soil gas sample will be collected at a depth of 3 inches below the slab in accordance with EPA guidance (Attachment 1). In open areas, soil gas probes will be installed to a depth of approximately 6 feet below ground surface by using a direct-push drill rig. Soil gas samples will be collected directly into a Summa canister with Teflon tubing following the procedures outlined in the *Field Sampling Plan* (CH2M HILL, 2007). All soil gas results will be analyzed following EPA Method TO- 15. A list of the analytes and corresponding reporting limits for this method are summarized in Table 3-1.

TABLE 3-1
Reporting Limit Objectives for Method TO-15

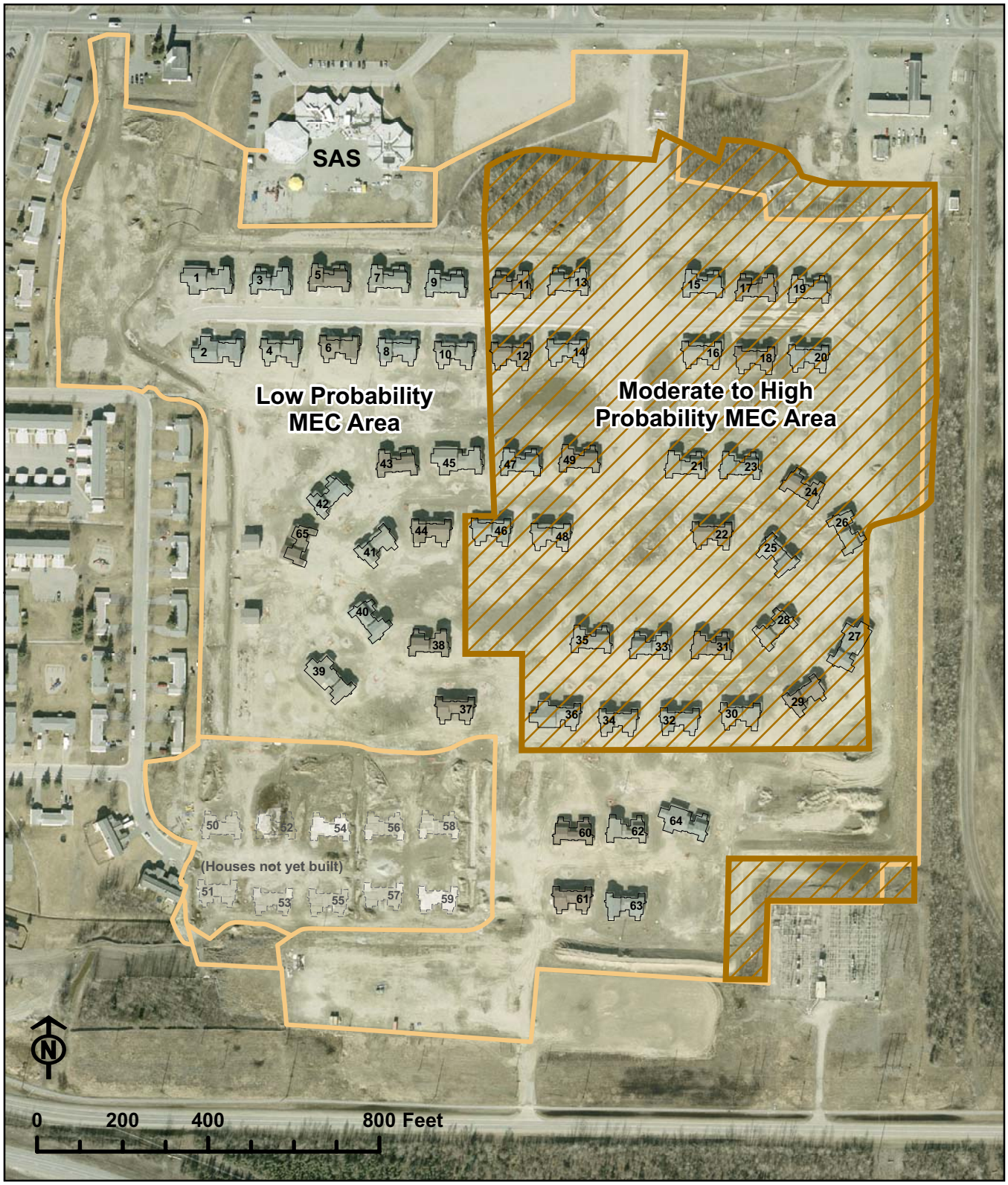
Analyte	Reporting Limit (ug/m^3)	USEPA Region VI Ambient Air Screening Level (ug/m^3)	Target Sub-slab Vapor Intrusion Screening Level (ug/m^3)[1]
1,1,1,2-Tetrachloroethane	1	0.26	2.6
1,1,1-Trichloroethane	1	2300	23,000
1,1,2,2-Tetrachloroethane	1	0.033	0.33
1,1,2-Trichloroethane	1	0.12	1.2
1,1-Dichloroethane	1	730	7,300
1,1-Dichloroethene	1	210	2,100
1,1-Dichloropropene	1	NA	NA
1,2,3-Trichlorobenzene	1	NA	NA
1,2,3-Trichloropropane	1	0.00096	0.0096
1,2,4-Trichlorobenzene	1	4.2	42
1,2,4-Trimethylbenzene	1	6.3	63
1,2-Dibromo-3-chloropropane	1	0.0001	0.001
1,2-Dibromoethane (EDB)	1	0.0034	0.034
1,2-Dichlorobenzene	1	0.25	2.5
1,2-Dichloroethane	1	0.074	0.74
1,2-Dichloropropane	1	0.099	0.99
1,3,5-Trimethylbenzene	1	6.2	62
1,3-Dichlorobenzene	1	8.3	83
1,3-Dichloropropane	1	NA	NA
1,4-Dichlorobenzene	1	0.28	2.8
2,2-Dichloropropane	1	NA	NA
2-Butanone	1	5200	52,000
2-Chlorotoluene	1	73	730
2-Hexanone	1	NA	NA
4-Chlorotoluene	1	NA	NA
4-Methyl-2-pentanone	1	3100	31,000

TABLE 3-1
Reporting Limit Objectives for Method TO-15

Analyte	Reporting Limit (ug/m^3)	USEPA Region VI Ambient Air Screening Level (ug/m^3)	Target Sub-slab Vapor Intrusion Screening Level (ug/m^3)[1]
Acetone	5	3300	33,000
Benzene	1	0.25	2.5
Bromobenzene	1	12	120
Bromochloromethane	1	NA	NA
Bromodichloromethane	1	0.11	01.1
Bromoform	1	1.7	17
Bromomethane	1	5.2	52
Carbon disulfide	1	730	7,300
Carbon tetrachloride	1	0.13	1.3
Chlorobenzene	1	52	520
Chlorodibromomethane	1	0.08	0.8
Chloroethane	1	NA	NA
Chloroform	1	0.084	0.84
Chloromethane	1	1.1	11
cis-1,2-Dichloroethene	1	37	370
cis-1,3-Dichloropropene	1	NA	NA
Dibromomethane	1	NA	NA
Dichlorodifluoromethane	1	210	2,100
Ethylbenzene	1	1100	11,000
Hexachlorobutadiene	1	0.087	0.87
Isopropylbenzene	1	400	4,000
m,p-Xylenes	1	100	1,000
Methyl tert-butyl ether (MTBE)	1	7.4	74
Methylene chloride	1	4.1	41
Naphthalene	1	3.1	31
n-Butylbenzene	1	37	370
n-Propylbenzene	1	37	370
o-Xylene	1	730	7,300
p-Isopropyltoluene	1	NA	NA
sec-Butylbenzene	1	37	370
Styrene	1	1100	11,000
tert-Butylbenzene	1	37	370
Tetrachloroethene	1	0.33	3.3
Toluene	1	5200	52,000
Total Xylenes	1	100	1,000
trans-1,2-Dichloroethene	1	63	630
trans-1,3-Dichloropropene	1	NA	NA
Trichloroethene	1	0.017	0.17
Trichlorofluoromethane	1	730	7,300
Vinyl chloride	1	0.16	1.6

ug/m^3 = micrograms per cubic meter

[1] EPA Region VI values for Ambient Air Screening Levels are multiplied by an attenuation factor of 10 to adjust for soil gas to indoor air attenuation.



\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_3-1_TakuChemRisk.mxd 9/19/2007 21:00:50PM

Figure 3-1
MEC Areas and Security Fences
Former Communications Site
Fort Wainwright, Alaska

Figure 3-2
Former Communications Site
Fort Wainwright, Alaska
Soil Gas Sample Locations

Legend

- Moderate to high probability MEC area
- Former slough channel
- Area within elevated VOC/POL concentrations
- 2006 passive gas sample locations
- Proposed soil gas locations

2004 Magnetic Data Vertical Gradient

- -4000
- -1000
- -500
- -200
- -100
- -75
- -50
- -20
- 0
- 40
- 75
- 100
- 200
- 500
- 1000
- 2000
- 4000

0 100 200 300 400 Feet

\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_3-2_Taku2004MagAnomalies.mxd 8/03/2007 10:05:50AM

Attachment 1

Standard Operating Procedure for the Collection of Sub-Slab Vapor Samples Using Summa™ Canisters

This procedure describes the approach for the collection of sub slab soil vapor samples in Summa canisters. It includes instruction on probe installation, leak checking, gas sampling, and probe abandonment. This SOP should be used in conjunction with project data quality objectives. Only persons trained in the collection of soil gas samples should attempt this procedure

1.0 Materials

1.1 Probe Installation
- Hammer drill and 7/8″ or 1″ and 5/16″ or 3/8″ bits
- Vacuum cleaner ('shop vac' type or hand held)
- Probe (1/4″ stainless steel tube with Swagelock or equivalent nut and ferrule)
- Probe seal (1/8″ NPT internal wrenching plug)
- Probe union (1/4″ male Swagelock or equivalent to 1/8″ female NPT)
- Nuts and ferrules (1/4″ stainless steel Swagelock or equivalent)
- Hack saw
- Mortar consisting of Portland Cement mix, Fix-it-All, or similar
- Large Q-tips or paper towels and water
- Tongue depressor, putty knife, or similar tool
- Tape measure

1.2 Leak check
- Leak check enclosure
- Compressed helium tank (balloon grade), helium regulator, flow meter (0-500 ml/min)
- Helium detector, or equal
- (alternative) Isopropyl alcohol and paper towels

1.3 Sampling
- Sampling union (1/4″ male Swagelock or equivalent to 1/4″ male NPT)
- Vacuum pump, sampling manifold
- ¼″ Teflon tubing, rubber tubing
- Flow controller
- Summa canister (sized appropriately for sampling requirements)
- Miscellaneous fitting to connect tubing to sampling union and Summa canister)

1.4 Probe Abandonment
- Probe removal fitting
- Crowbar

1.5 Miscellaneous
- Teflon tape
- 9/16″, ½″, crescent wrench, screw driver
- Extension cord
- Timer/watch
- Tools required to cut carpet, and/or tools needed for removal of other floor coverings

2.0 Probe Installation

2.1 Locate the sampling locations in accordance with the work plan. Check with local utility companies to identify utilities coming into the building from outside. If possible, look for known or suspected utility conduits and note their location on a map or in the field log. Be sure to confirm that the sample locations will not interfere with the known

underground utilities. Also note the location of the probe, locations of significant features (walls, cracks, sumps, drains, etc), and conditions of the slab and soil.

2.2 If needed, expose the concrete by cutting the carpet or other loose floor coverings (Note: Carpet need not be removed, but rather a 'L' shape cut to expose the concrete for drilling and the leak check enclosure). Drill a 7/8" or 1" diameter hole to a depth of 1-3/4" (measured to the center of the hole) to allow room for the installation of the probe nut and probe union (See Figure 2). Remove the cuttings using a vacuum cleaner. Be careful to not compromise the integrity of the slab during drilling (i.e., cracking it), although note if this occurs. It is important that the slab and the probe hole remain air tight for sampling and that cracks are noted.

2.3 Drill a 5/16" or 3/8" diameter hole through the remainder of the slab and approx. 3" down into the sub-slab material (See Figure 3). Drilling into the sub slab material creates a void that is free of obstructions that might plug the probe during sampling. Record the total depth of the slab and the depth drilled into the sub slab material.

2.4 Once the total depth of the slab is known, be sure that the probe (1/4" stainless steel tube with Swagelock or equivalent nut and ferrule) is cut with a hacksaw so that it does not extend beyond the bottom of the slab. Attach the probe union (1/4" male Swagelock to 1/8" female NPT) to the probe and tighten. Wrap the probe seal with Teflon tape and tighten into the union. See Figure 8 for an expanded view of the probe parts.

2.5 Wet the walls of the hole using the Q-tip or moistened paper towel. This helps the mortar bond to the drilled concrete. Prepare the mortar in accordance with manufacturer's directions to a stiff consistency. Make sure that the consistency is such that the mixture will not run down the sides of the hole and potentially clog the probe or hole. Place sample probe and sample union part way into the hole as shown in Figure 4. The probe tip should be at least one inch into the smaller diameter hole, but not so far that mortar can not be easily placed in the large diameter hole around the probe fittings. It is critical that the mortar mixture does not get into either end of the probe and cause a plug. Using the tongue depressor or similar tool, apply mortar around the base of the sampling probe and sampling union such that it will be sealed once it is in place.

2.6 Fill the hole with mortar, and press the probe further into the hole until its top is flush with the floor. In doing so, slightly wiggle the probe to create good 'wetting' contact between the probe and the mortar as well as the mortar and the drilled concrete. Scrape off excess and make sure there is clear access to the probe. See Figure 5.

2.7 Let dry for 24 hours

2.8 Be sure to never leave the probe hole open to atmosphere for extended periods to minimize the effects of surface infiltration.

3.0 Manifold Assembly and leak check

3.1 Make sure the sampling system is assembled (as shown in Figure 1 or 10) by connecting the sampling manifold to the soil gas probe and the purge system. <u>Do not connect the flow controller or canister at this time</u>.

3.2 Make sure the gas probe valve (valve #1) is closed.

3.3 Open the sample valve (valve #2) and the purge valve (valve #3) and turn the vacuum pump on. Make sure that the flow meter on the vacuum pump exhaust is reading 200 ml/min. Let the pump run for 1 minute to allow purging of potential contaminants from the manifold

3.4 Now close valve #2 to achieve a vacuum gauge reading of 10 inches of mercury or to a vacuum that will be encountered during sampling, which ever is greater. Close the purge valve #3 and shut the vacuum pump off.

3.5 If the pressure in the manifold has not changed after a minute, then the manifold is considered leak free. If not, repair any leaks prior to use and re-check the manifold.

3.6 Record the leak check date and time on the field sampling log.

4.0 Probe Leak Check and Probe Purging

4.1 The sampling system needs to be leak-checked and purged before sampling. Two different methods supported by the available literature/guidance are presented. One method uses helium gas as a tracer and allows for the assessment of potential probe leak prior to sample collection. The other method uses isopropyl alcohol as a tracer and allows for the assessment of potential probe leak after sample collection and analysis. Both these methods are acceptable and are detailed below.

4.1.1 Helium leak checking technique and purge

4.1.1.1 Remove the probe seal insert, wrap the sampling union fitting threads (1/8″ male NPT to ¼″ male Swagelock or equivalent) with Teflon tape (wrap the NPT threads only), and tighten into the exposed probe fitting. Thread the Teflon sample tubing through the rubber grommet in the leak check enclosure from the outside, and attach the tube to the sampling union using a nut and ferrule. Slide the enclosure down so it seals on the concrete slab. Attach the other end of the sample tube to the sampling manifold. See Figure 6 and 7.

4.1.1.2 Attach tubing to the flow meter on the helium tank regulator and the other end to the enclosure. Attach the exhaust tube to the enclosure and position the other end as far away as possible to avoid detection by the helium leak detector. See figure 9.

4.1.1.3 Put the helium detector on the exhaust line from the sample pump. Make sure valve 1 is closed. Open valves 2 and 3. Turn on the sample pump and helium detector.

4.1.1.4 Open the helium tank and set the flow meter for approximately 200 ml/min. Allow it to flow for 1 minute to fill the leak check enclosure before starting the purge. Make sure that the detector is not reading any helium before starting the purge.

4.1.1.5 Two liters of sub slab gas need to be purged before sampling. The purge time is 10 minutes at a flow rate of 200 ml/min. Close valve #2 and open valve #1 simultaneously and start timing for the purge volume. During the purge, observe the helium detector for indication of probe leakage (e.g. infiltration of room air into the probe). If a reading of >5% is observed, then the probe leak check has failed, and corrective action is required. This includes first checking the fittings and trying another purge and leak check. But may result in removing the probe and re-cementing it.

4.1.1.6 At the end of the purge time, close valves #1 and #3 and turn the pump off. If at any time during the purge the detector read < 5%, then the system is leak free and ready for sampling. If >5% was observed, then check the fittings and try again. If <5% cannot be achieved, then this probe must be abandoned and a new hole drilled. Be sure to record the helium leak check value on the field sheet.

4.1.1.7 Close the helium tank valve.

4.1.2 Isopropyl alcohol leak checking technique and purge

4.1.2.1 Moisten a paper towel with isopropyl alcohol. Wrap the isopropyl alcohol moistened paper towel around probe fittings at the slab surface. Note: It is important to keep the isopropyl alcohol completely away from the sample equipment and SUMMA Canister during the set up phase. The sampler must also change nitrile gloves between setting up the sample equipment and conducting the leak detection test. It is also important to instruct the laboratory to analyze for isopropyl alcohol. If isopropyl alcohol is detected by the laboratory at a concentration greater than 5% (50,000 ppmv) then the sample is deemed to be invalid due to a leak.

4.1.2.2 Two liters of sub slab gas need to be purged before sampling. The purge time is 10 minutes at a flow rate of 200 ml/min. Close valve #2 and open valve #1 simultaneously and start timing for the purge volume.

4.1.2.3 At the end of the purge time, close valves #1 and #3 and turn the pump off.

5.0 Sampling

5.1 The Summa canister has been evacuated to near absolute zero pressure. Care should be used at all times to prevent inadvertent loss of canister vacuum. Never open the valve affixed to the canister unless the intent is to collect sample or check the pressure. Use only a canister that has been certified to be clean.

5.2 Remove the canister valve cap, attach the vacuum gauge to the canister, and open the canister valve. Record the pressure reading and close and remove the valve. The pressure in the canister should be between 28″ and 30″ of mercury. If not, then the canister has leaked and should not be used for sampling.

5.3 Connect the flow controller to the manifold (at valve #2) and the Summa canister to the flow controller. The port on the flow controller that reads 'HP' or 'In' should be attached to the manifold. The port that reads 'LP' or 'Out' should be attached to the canister. Use only a flow controller that has been cleaned and properly adjusted.

5.4 To take the sample, confirm valve #3 is closed, and open valves #1 and #2. Slowly open the canister valve approximately one (1) full turn, and start timing. Record the start time on the field sampling log. During the sampling period, record the lowest pressure from the manifold gauge on the field log.

5.5 There are different sample time and flow rate protocols. These are subject to project requirements.

5.5.1 5 minute sample period, 850 ml canister: The flow controller is set for 150 ml/min. For an 850 cc Summa canister, it will take 5 minutes to collect a sample.

5.5.2 24 hour sample period, 6 liter canister: The flow controller is set for 3.75 ml/min. For a 6 liter Summa canister, it will take 24 hours to collect a sample.

5.6 At the end of the time, close the sample valve (valve #2) and the valve affixed to the canister. Remove the canister from the apparatus.

5.7 Re-attach the vacuum gauge and record the final pressure. The canister should only have 750 mls of sample in it based on a 150 ml/min sampling rate for 5 minutes. This should equate to between 2″ and 5″ final pressure in the canister. Record the sampling date, time, canister ID, flow controller ID, and any other observation pertinent to the sampling event on the field sampling log.

5.8 Remove the gauge from the can and tighten the cap back on with a wrench. Verify that canister valve is closed.

5.9 Fill out all appropriate documentation (sampling forms, sample labels, chain of custody, sample tags, etc.).

5.10 Disconnect the sample tubing from the probe, and remove the sampling union.

6.0 Probe Abandonment

6.1 After sampling, it is critical that the probe either be removed or plugged to prevent the creation of a new pathway for vapor intrusion.

6.2 If the probe is to be used again in the future, wrap the probe seal insert with Teflon tape, and tighten it into the probe opening using a hex key until it is tight and flush with the concrete floor.

6.3 If the probe is to be removed, insert the removal fitting into the probe. Using a crow bar, remove the entire probe assembly. If the probe can not be removed in this manner, then over drill the probe with the drill and 1″ bit. Fill the hole with cement mix.

Figure 1 – Sub slab
Sampling

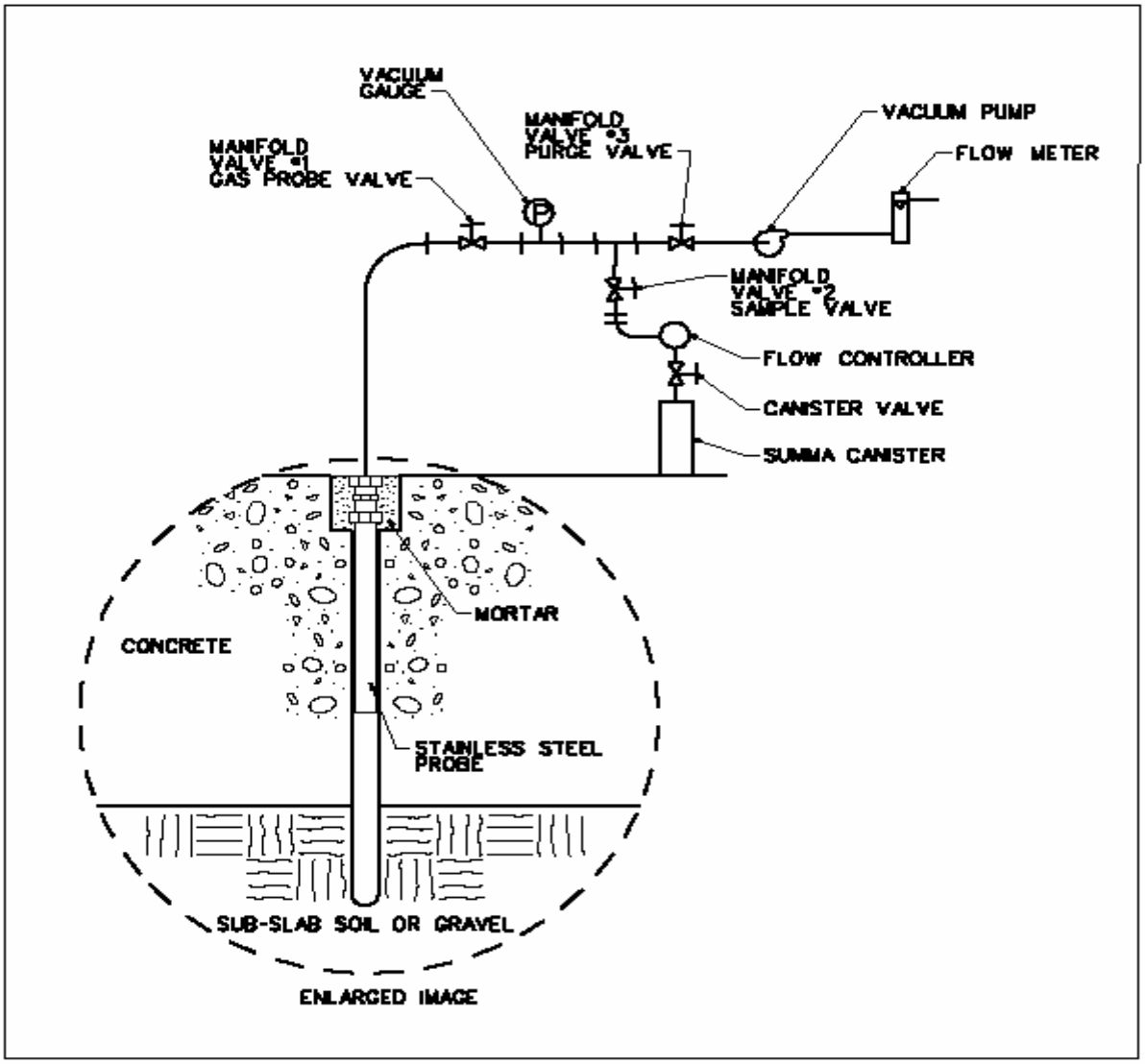


Figure 2 – Drilling 1” mortar hole to a depth of 1 ¾”

Figure 3 – Drilling 3/8” probe hole

Figure 4 – Installing Probe with mortar

Figure 5 – Installed probe, flush with slab

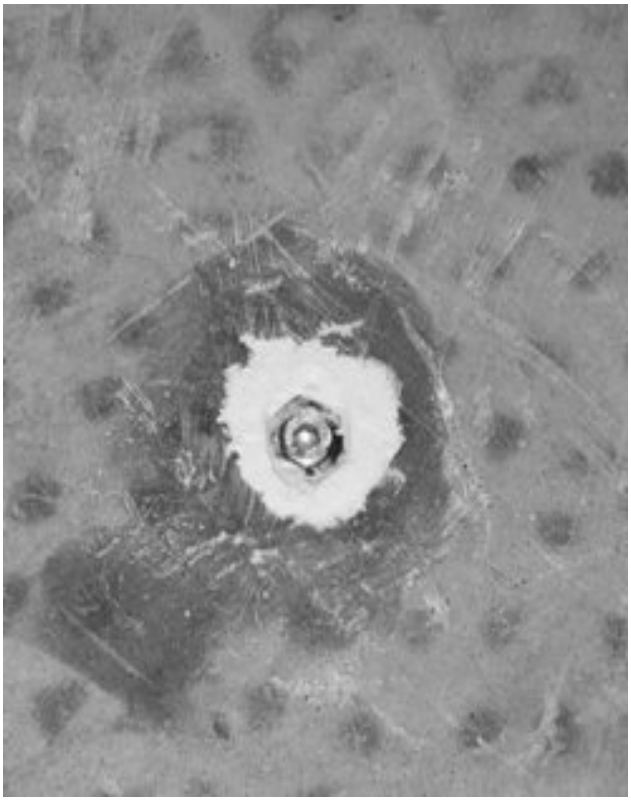


Figure 6 – Installed probe with sample tube

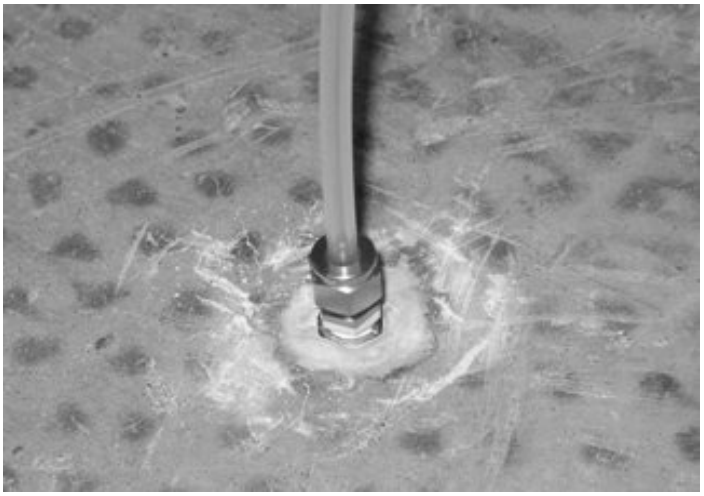
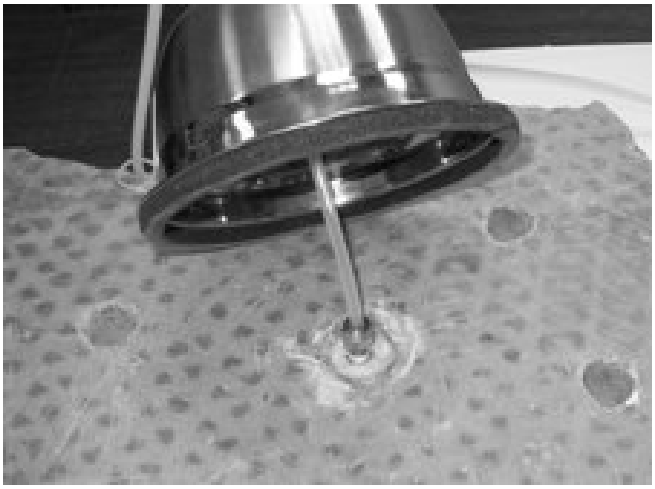


Figure 7 - Installing the helium leak check assembly



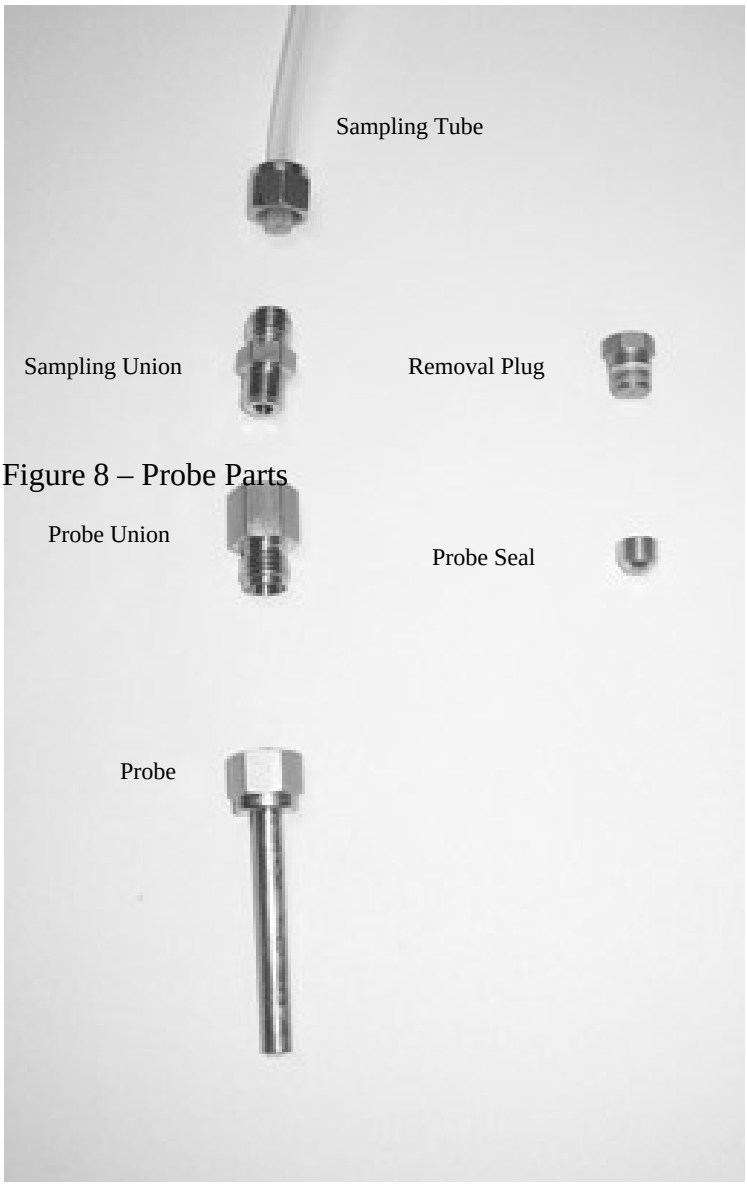


Figure 8 – Probe Parts

Figure 9 –Helium Leak Check Assembly

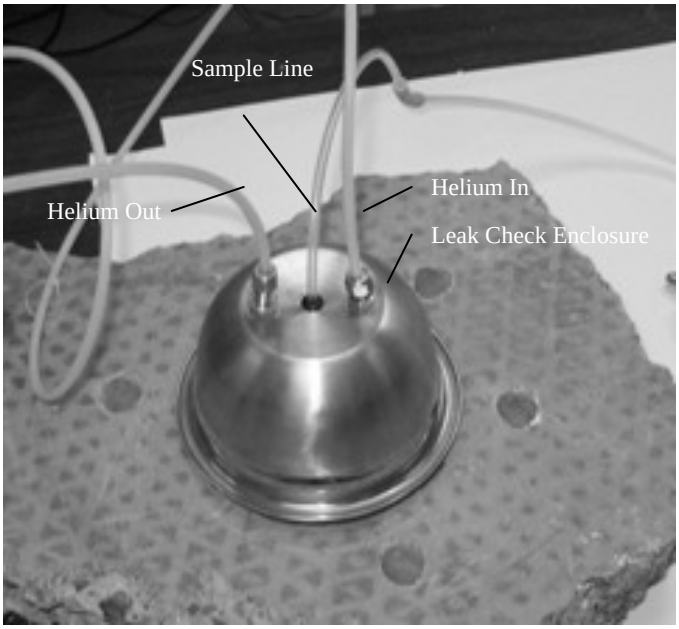
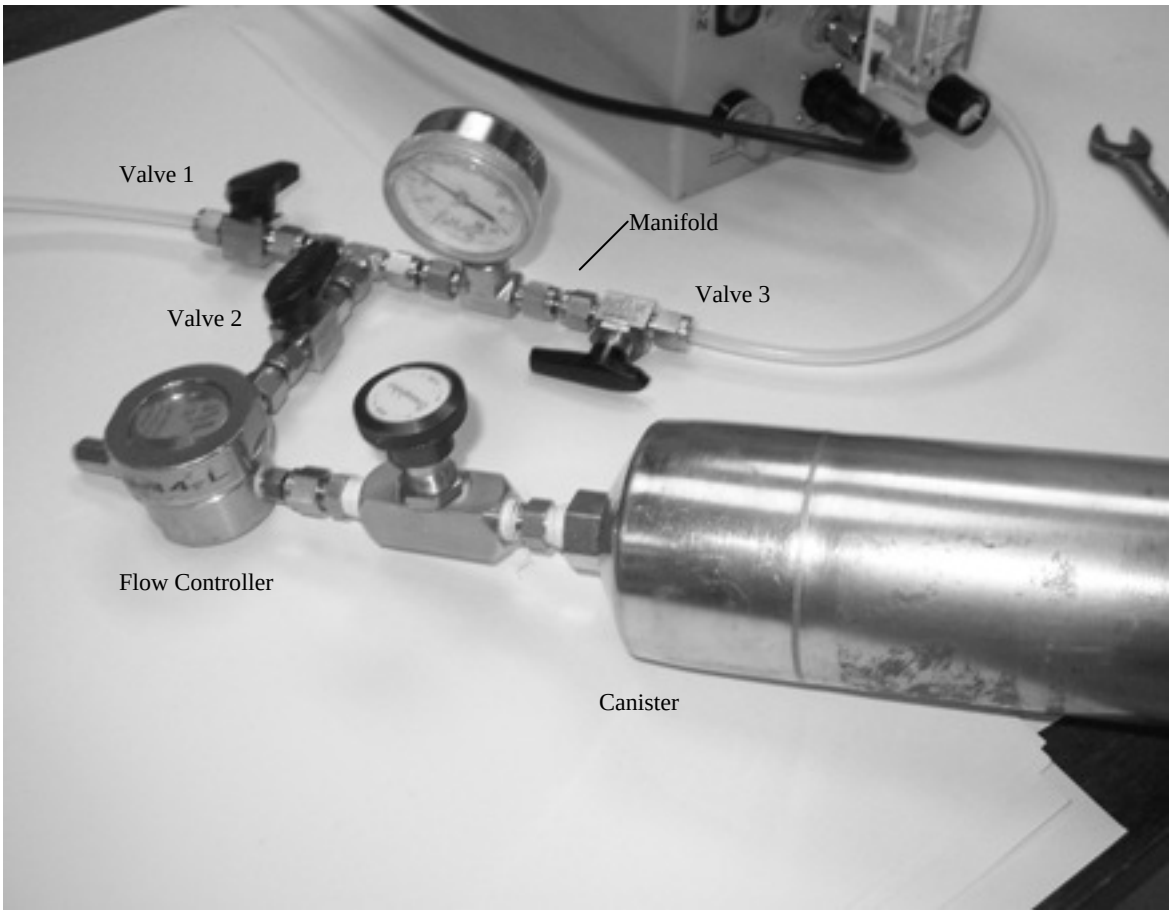


Figure 10 – Sampling Manifold



Responses to Comments

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

	DATE: 7/14/2007 **REVIEWER: C. Fosbrook** **PHONE: 384-2713**	**Action taken on comment by:**_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
Previous Sampling Results	**1**	Indicate on Figure 3-2 previous soil gas probes.	Locations of passive gas samplers were added to Figure 3-2. Area of elevated VOCs from previous passive soil gas samples is shown on Figure 3-2.		
DQOs	**2**	Screening values should be listed as Region 6 Risk Based Tables or 1/10 of ADEC Table C. In addition, the specific section in the RI Management Plan should be listed for a quick reference.	EPA Region 6 Risk Based Table for Ambient Air Concentrations multiplied by 10 will be used as Target Sub-Slab Vapor Intrusion Screening Level. The factor of 10 will account for attenuation from the slab to indoor air.		
Sample Approach	**3**	Clarify that this plan is only for installation of wells in areas on non-MEC as discussed in the "Area of Investigation". Note that a revised or second plan will be provided for work inside the MEC area. A brief discussion on the rational for the selection of each well by sub-area should be provided along with the PCOC that was discussed in the May meeting. This could easily be a short table by sub-area. Specific reference to the FSP section or RI Management plan would explain quickly to a reader the well installation protocols and sampling techniques.	The text will clarify that this plan is only for soil gas investigation with the "non-MEC" area. Soil gas procedures for the MEC area will be included in the RI Management Plan. We do not plan to discuss the rationale for soil gas samples by sub area. We will use the existing passive sampling data to focus the sampling in areas of known POL and chlorinated solvent contamination (e.g., north west corner POL area). Per discussion at the 6/6-7 meeting, the decision was to increase the density of soil gas sampling points in areas of known VOC contamination. In the areas with no VOCs detected or no data, 11 samples will be taken. We propose VOC analysis (TO15) at all locations - no changes by sub area. This is the analysis we need for calculation of migration to indoor air. The text will refer to FSP Section 2.2.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

		DATE: 7/14/2007 **REVIEWER: C. Fosbrook** **PHONE: 384-2713**	**Action taken on comment by:**_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
General	**4**	Comments and changes in WP #1 regarding MEC areas the MEC area and Non-MEC area should be carried to this plan	Text will be added to explain the conservative approach used to determine the MEC area. The text will also refer to the MEC Support Work Plan.		
General	**5**	Without completion of the RI Management Plan from May, it appears there is not a rational for so many soil probes. The rational discussed in the May meeting should be shortly summarized in this plan as well as referenced to the FSP section on installation, sampling and analytical.	The following rationale, developed at the 6/6-7 meeting will be added to the text: 1) One soil gas sample per building to satisfy our objective of qualifying risk of vapor intrusion to indoor air. 2) In areas of known VOC contamination, increase the density of sample points to assess the extent of contamination. **3)** In areas with no detected VOCs or no data, 11 samples are proposed to identify point sources since historical data is not complete.		
Purpose	6	It should be clearly that this specifically outlines the Soil Gas Analysis work. The Army, EPA and ADEC agreed to conduct the RI/FS for FCS utilizing the tri-ad approach. A Management Plan addressing the methods of the overall site management, QAPP and sampling techniques has been prepared. This document is one of many workplans that provide detailed information to the specific task of the RII/FS. This approach was determined to be the most effective, efficient and appropriate method for investigating this site. (Something like this should be stated at the beginning of each Addendum) >>>same comment from workplan #2	The addendum will clearly state that this outlines the soil gas work. This paragraph will be added to the Purpose section of the addenda.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 7/6/07 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
Previous Sampling Results	**1**	3rd sentence: soil gas sampling was not "widespread" but rather targeted the Northern POL area and the buried drum area near B49, because these were the only known areas (at the time) of potential contamination by VOCs.	This summary of the 2006 passive sampling approach will be added to this section.		
Figure 3-2	**2**	Please add to the Legend the soil gas points that NWI installed in 2006, so reader's unfamiliar with last years efforts can see exactly what area we have *passive* soil gas data for. The addition of this information will help support the text, as well as (hopefully) show that we plan to have adequate coverage over the POL area. Suggest moving one of the points at B64 to the eastern side of B64 (instead of 2 on the west side). What is faint line running through B64 and NW to swale area? May need to remove this faint path-looking line.	Locations of passive gas samplers were added to Figure 3-2. Area of elevated VOCs from previous passive soil gas samples is shown on Figure 3-2. Relocation of B64 point may not be feasible due to utilities along the east side of the building. The new approach is to locate many of the points within the footprint of the building, through the garage slab. The faint line is the former river channel/drainage swale. This will be more clearly marked on Figure 3-2.		
	3	end			

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 7/6/07 REVIEWER: Sharon Richmond, ADEC PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
3-1	1	Area of Investigation. I recognize that the boundaries of the Munitions and Explosives of Concern (MEC) vs. non-MEC area have yet to be resolved and that work in the munitions disposal area is not discussed in this document	Text will be added to explain the conservative approach used to determine the MEC area. The text will also refer to the MEC Support Work Plan.		
3-1	2	Background Information. Last sentence. Please reference the potential for contaminant exposure via inhalation of outdoor air. This is important because strong odors have been documented in outdoor air during site visits and during construction activities. Based upon the soil vapor data collected in 2006, it also seems likely that vapors are present near and/or under the School Age Services (SAS) Building. It is appropriate to include an evaluation of risks from exposure to indoor and outdoor air for residents, users of the SAS, and previous and future site workers.	The inhalation of outdoor air will be included in the risk assessment. Risk Assessment Work Plan, Section 3.4.3, addresses inhalation of ambient air and other exposure pathways.		
3-2	3	Data Quality Objectives. I believe that indoor air risk at the SAS and outdoor air inhalation risks should also be included in this section. See Comment 2	Text will be revised to add collection of one sub-slab sample at the SAS Building to address the indoor air risk. Risk Assessment Work Plan, Section 3.4.3, addresses inhalation of ambient air and other exposure pathways.		
3-2	4	Sampling Approach. 1st sentence. The number of sampling probes proposed in this document has not been agreed upon. At our April 2007 planning meeting, we agreed to place more probes around houses where volatile organic compounds (VOCs) are known to be present. My recollection is that houses in the northwestern area would have six probes while other houses would have four.	One soil gas probe at each building will be sufficient for estimating risk to indoor air. Additional sample points have been included in the NW area.		
3-2	5	Sampling Approach. 2nd paragraph. It is also possible that geophysical data collected this year will be required before soil boring locations are finalized. See Comment 1.	Text will be modified to add that the latest geophysics will be used in the selection of sampling locations.		
3-3	6	Sample Collection and Analyses. General Comment. Please provide detail regarding how sample locations were chosen. The Johnson & Ettinger model is most useful with vapor concentrations collected directly beneath a building. I understand that the radiant floor heating in these buildings prevents collection of sub-slab samples. I am also concerned that positioning vapor probes equidistant between buildings is not the most conservative approach. It is preferable to place them as close to each building as possible and as close as possible to a potential or known source. Depth of sampling would then be dependent on the depth of fill present beneath each building. Data collected in this manner will allow us to be most conservative.	We have confirmed that there is no radiant floor heating in the buildings. Therefore, the approach will be changed to core the slab in the garage at each house. An addendum to the FSP will be issued to cover the procedures for collecting the sub-slab soil gas sample.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 7/6/07 REVIEWER: Sharon Richmond, ADEC PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
3-3	7	Sample Collection and Analyses. General Comment. Although it is getting late in the season, I suggest considering the use of a field gas chromatograph and Tedlar bags for sample collection and analysis. This could allow for multi-depth sampling and more samples.	Multi-depth samples are not required for sub-slab samples. Multi-depth samples are not recommended for other areas. The field GC results would not be valid for risk assessment purposes and the detection level of the field GC may not be sensitive enough to give an affirmative "non-detect" for any areas. For this investigation we do not recommend using the field GC to ensure all data can be used in risk assessment. The locations shown on Figure 3-2 are the minimum sample locations; depending on results for all sampling efforts (groundwater, soil, etc) and assessment of risk, additional point may be added at a later date.		
3-3	8	Sample Collection and Analyses. General Comment. The Field Sampling Plan (FSP) describing how the samples will be collected has not been approved. I strongly encourage the Army to consider all comments that might have been submitted and incorporate them into the FSP before starting field work.	A revised FSP, addressing all outstanding comments has been submitted. Procedures for sub-slab soil gas sampling will be attached to the Addendum. These procedures will be added to the FSP.		
General	9	General Comment. The header for this document is incorrect. Please change "Addendum 2: Soil Pile Investigation" to "Addendum 3: Soil Gas Investigation".	The header will be corrected.		
General	10	General Comment. In addition to utility locates, as-builts, and contract drawings, it would be preferable to also consider preferential pathways such as utilidors, the former slough channel, and buried debris when deciding where probes will be placed. I suggest adding a section describing how final probe locations will be chosen if it is determined in the field that they need to be moved from the proposed locations. I think this is critical to ensuring that the final placement is agreed upon by all project managers.	Some of the soil gas sample points will be targeted in the former slough channel. We cannot target utilities. However, sub-slab samples account for migration via preferential pathways from utilidors, etc.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

	DATE: 19 Jul 07 **REVIEWER: Jacques Gusmano, EPA** **PHONE:**	**Action taken on comment by:**_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
General	**1**	EPA recommends the development of a geophysical anomaly/debris avoidance plan for use site-wide. Please see Specific Comment No. 1 for more detail.	Many of the samples have been moved to within the building footprint, and will be collected at a safe depth of 3 inches below the slab. For soil gas samples in open areas, CH2M HILL will use available geophysics, as-built drawings, and anomaly avoidance/ location clearance using a magnetometer. Additional MEC support procedures are included in the MEC Support Work Plan.		
3-1, par 2, Sent 1	**2**	The proposed subdivision of the FCS into “MEC” and “non-MEC” areas is based on a “preponderance of evidence” argument that incorporates four separate data sets 1) geophysical data, 2) historical/archival records, 3) 5 aerial photographs from a 60+ year period, and 4) observations made during recent construction activities. Because each data set differs in its quality and completeness, e.g. the geophysical data uncertainties are quantifiable and bounded whereas the aerial photos are “sparse” representing only five “samples”, the subdivision relies on a qualitative weighing of the four data sets. EPA feels that the geophysical data quality far exceeds that of the other sets and therefore should receive the highest weight in the integrated evaluation. Each of the data sets used are insufficient on their own to discriminate MEC from non-MEC debris, including the most quantifiable data from the geophysical surveys. Thus, adding sparse or otherwise lower quality data to the geophysics does not increase the amount of information that can be extracted by interpretation. More concisely, the discrimination capability of the combined data does not exceed the discrimination capability of its component parts. The geophysics has provided a high resolution image of potential buried metal site wide which should be interpreted within the context provided by the other three a priori data sets, but not constrained by them. EPA feels that the anomalies currently proposed as “not requiring MEC clearance” also deserve to be considered potentially hazardous, regardless of the presence or absence of MEC. *Continued on next page*	Figure 3-2 will be amended to include geophysical data. Anomalies in the non-MEC area will be avoided using the available geophysical data, and anomaly avoidance/ location clearance using a magnetometer. Additional MEC support procedures are included in the MEC Support Work Plan. Many of the samples have been moved to within the building footprint, and will be collected at a safe depth of 3 inches below the slab.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

	DATE: 19 Jul 07 **REVIEWER: Jacques Gusmano, EPA** **PHONE:**	**Action taken on comment by:**_____	

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
		Continued from previous page **EPA recommends** that the Army develop an anomaly/debris avoidance plan for use site-wide during all intrusive activities. EPA further recommends that this avoidance plan consider the full range of potential hazards and develop contingency plans for their proper response. Some of the issues the debris avoidance plan might include are: a) details regarding how the location of the geophysical anomaly edges (laterally and with depth) will be made readily and immediately available to the field personnel who will be conducting, directing and/or overseeing the intrusive activities. For instance, will the anomaly edges be flagged, or will they be re-acquired prior to breaking ground? How will anomalies at depth be avoided? How will the technical lead decide how to determine step-out distances when intrusive activities are proposed immediately adjacent to a geophysical anomaly? Even non-MEC metallic debris presents immediate safety hazards to onsite workers and potential additional releases of contaminants to the environment if buried drums or small containers were to be inadvertently ruptured. b) The avoidance plan might also provide detailed methods that will be used to compare the field observations with the predictions made from the geophysical data. For example, the plan should identify who will be responsible for cross-checking the field observations with the geophysical results and what that person's responsibilities will include. c) The avoidance plan might additionally include contingency plans if observables deviate from the expectations (as noted in bullet b). The contingency details should include decision trees and action plans for circumstances such as, what will be the plan of action is a geophysical anomaly can not be re-acquired (a geophysical false positive) or, conversely, what should be done if debris is found where no geophysical anomaly was recorded (a geophysical false negative). If the "preponderance of evidence" approach were to fail at this site, the results may not only compromise the safety of workers in the vicinity, but could potentially release additional contaminants to the environment, as well as heighten public concerns beyond current levels. These factors should be considered important enough to warrant assigning the geophysical results considerably more weight in the evaluation than the photos, archives, or even construction field notes. The order in which soil gas probes and well installation occur could be important. EPA suggests that the information obtained by the well borings could give information useful to the driving of soil gas probes, such as truth testing geophysical data.			

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

	DATE: 19 Jul 07 **REVIEWER: Jacques Gusmano, EPA** **PHONE:**	**Action taken on comment by:**_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
3-1, par 3 , Sent 1	**3**	A portion of this sentence reads "… work may require clearance and oversight measures." What criteria will be used to determine which circumstances that may require clearance? **Recommendation:** Clarify the "may require" aspect, either by adding a section in this addendum and citing that section here, or by developing a separate document (i.e. an avoidance plan) and citing that document instead.	Procedures for MEC support at the site will be presented in a separate document, the MEC Support Work Plan. The addendum will reference the MEC Support Work Plan.		
3-1, par 5	**4**	An overview figure would be helpful here. **EPA recommends** developing a figure that indicates the locations of existing site features (including key historical structures, existing wells, etc) on a detailed base map of the site, preferably using a high-resolution aerial photograph as the base layer with key site features labeled as necessary (i.e. building numbers, TSA location, etc.) This figure could then be used to indicate the locations of all proposed soil gas points, current plume boundaries or other soil gas relevant information.	Figure 3-2 will include the location of geophysical anomaly data (2004), MEC/non-MEC areas, previous passive soil gas sample locations, proposed soil gas sample locations, location of the river channel/drainage swale, and building numbers. Figure 3-1 will include aerial photograph, MEC/non-MEC area, and building numbers.		
3-2, DQOs	**5**	The first sentence states that "A DQO process was used to document the purpose of data to be collected…" The "purpose" is the Data Objective. The DQO process determines the accuracy and quality specifications that the data needs to meet in order to fill existing data gaps. **EPA recommends** expanding this discussion to identify both the purpose of the data as well as the quality requirements. EPA further suggests that this task may be easier if the section were moved "down", so that it follows the discussion of the specific tasks and activities proposed. Incidentally, "VOC" in sentence 1 should read "VOCs	The discussion will be expanded to identify the purpose of the data [(1) to decide whether future indoor residents may be exposed to VOC concentrations in soil gas that pose a potential for unacceptable risks via a vapor intrusion pathway. The quality requirements of the data will also be included in Table 3-1.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

	DATE: 19 Jul 07 **REVIEWER: Jacques Gusmano, EPA** **PHONE:**	**Action taken on comment by:**_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
3-2, para 2 in DQO, sentence 2		Enough information should be currently available to briefly indicate a few details on how much the default modeling parameters will need to be changed. **EPA suggests** listing each user-definable modeling parameters in either the text (as bullets?), or in a small table. EPA suggests that each variable be followed by a parenthetical statement of the default, minimum, mean, maximum values to be used. Also, because this is discussed in the DQO section, it is appropriate to discuss the soil gas quality requirements and how variances in them are expected to impact the modeling. This is also true for uncertainties in vadose zone structural heterogeneities such as clay or silt lenses or porosity and permeability changes that may not be fully realizable using the chosen modeling application. Are there any data gaps that currently exist that might confound the results of the soil gas data acquisition or the modeling effort?	The RI will collect the data needed to do the J&E calculation and the listing the default& mean input values and ranges at this time is premature. A sensitivity analysis will be conducted, as necessary, during the risk assessment. The revised approach of collecting soil gas beneath the building slab will decrease the impacts of variances and uncertainties in vadose zone structural heterogeneities such as clay or silt lenses or porosity and permeability changes, and will provide much more defensible results. To the greatest extent possible, site-specific building dimensions and design values for air exchange rates will be used.		
3-2, 3rd para, sent 1		This sentence states that "approximately 76 direct-push soil gas points will be completed…" **EPA recommends** adding a brief statement of exactly how many points are proposed plus the number of contingency/optional points that may be anticipated.	The text will be amended to include the total number of proposed soil gas points and a number of optional points that may be anticipated.		
3-2, 3rd para, sent 2		There appears to be a missing word ("the"?) between "within" and "northwestern portion". **EPA recommends** a minor correction here.	The text will be corrected		
3-2, 4th para, sent 1		This sentence states that "the boring locations were demarcated after reviewing …" First, the soil gas points are not really borings, but drive-points" Secondly, in what way were the soil gas points demarcated? On a map? On the ground? **EPA suggests** clarifying the use of the term "demarcated".	The text will be amended to state "drive point" instead of "boring" when referencing soil gas points. The text will remove "demarcated" and replace with " proposed locations identified on Figure 3-2."		
3-2, 4th para		EPA agrees with the objective to minimize potential disturbances of, or damage to, buried utilities or other underground structures, but suggests that the sentence should be expanded to include avoidance of geophysical anomalies as well**. EPA recommends** revising the text and adding figures indicating the proposed soil gas points relative to the geophysical data so that all known potential underground objects are clearly represented in this addendum	Agreed. The plan is to avoid utilities AND geophysical anomalies. Figure 3-2 and text will be amended to show proposed soil gas drive points and geophysical data		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addendum 3; Soil Gas Investigation
LOCATION: Fort Wainwright, Alaska

	DATE: 19 Jul 07 **REVIEWER: Jacques Gusmano, EPA** **PHONE:**	**Action taken on comment by:**_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
Figure 3-1		As discussed in EPA Specific Comment No. 1, this figure under-values the information provided by the geophysical surveys. **EPA recommends** removing the MEC delineation boundaries and making Figure 3-1 a base map showing the location of existing features and proposed soil gas drive points (See EPA Specific Comment No. 3).	Figure 3-1 shows the MEC and non-MEC areas. These boundaries are based on geophysical surveys. Since Addendum 3 references a "MEC "and "non-MEC" it is important to show that delineation.		
Figure 3-2		This Figure is too small and the font too light for easy reading. It is unclear why this format was selected for drive point illustrations rather than the Figure 3-1 style map. **EPA recommends** an alternative approach to this figure wherein the locations for points would be added to the geophysical survey results (separate maps for each methodology) so that the field personnel can make informed decisions regarding proximity to geophysical anomalies and the need for step-out locations and avoidance.	Figure 3-2 will be revised to include a site photo with geophysical data, previous passive soil gas sample locations, proposed soil gas drive points, buildings, and location of the river channel/drainage swale.		
Figure 3-2, Legend		**EPA recommends** including avoidance of geophysical anomalies in this note.	Geophysical anomalies will be added to the Figure 3-2 and identified in the legend.		
3-1, par 1, sent 1 &2		These two sentences feel out of order. **EPA recommends** rewording slightly and changing the order.	The text will be amended.		

REVIEW COMMENTS

PROJECT: Former Communications Site
DOCUMENT: Draft WP Addenda 1-4
LOCATION: Fort Wainwright, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: Bob Brock PHONE: 753-5612	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
Area of Investigation	**10**	See Item 2 above [Explain how MEC was determined and that a conservative approach was used (see email from Beth Astley, CRREL). Consider squaring off the area for ease of locating in the field. Add that if site conditions change (i.e. debris is encountered in other areas) that the plan will be revisited and changed as needed. Add that UXO technicians (two reams) will be onsite to support Building 48/49 investigations and test pit installations and will be available to provide support as warranted by changed site conditions. Work below EXISTING grade in MEC area will require UXO support]	Explanation of how the low-probability MEC area was determined will be included. The area was squared off for ease of locating in the field. The text will also reference the MEC Support Work Plan.		
Previous Sampling	**11**	Capitalize Benzene in fifth sentence.	Text will be amended		
DQOs	**12**	Will the soil gas data be validated?	Yes, the soil gas data will be validated.		

Addendum 4

Final

Addendum 4 to the Remedial Investigation Work Plan

Groundwater Investigation

FWA 102 Former Communications Site
Fort Wainwright, Alaska

Prepared for

Department of the Army
U.S. Army Corps of Engineers,
Alaska District

P.O. Box 6898
Elmendorf AFB, Alaska 99506-6898

Contract No. W911KB-05-D-0010
Task Order 0009

18 September 2007

CH2MHILL
301 W. Northern Lights Boulevard, Suite 601
Anchorage, AK 99503

ADDENDUM 4

Groundwater Investigation

Purpose

This document serves as an addendum to the May 2007 *Remedial Investigation/Feasibility Study Management Plan FWA 102 Former Communications Site Fort Wainwright Alaska* (remedial investigation [RI] Management Plan). This addendum addresses the characterization of soil and groundwater at the Former Communication Site (FCS) for source identification and to support the baseline risk assessment. The groundwater investigation includes characterization of soils because soil samples will be collected during installation of the monitoring wells. Proposed monitoring well locations and analytical methods for groundwater and soil are presented in this addendum.

The U.S. Army, U.S. Environmental Protection Agency (EPA), and Alaska Department of Environmental Conservation (ADEC) have agreed to conduct the RI/feasibility study (FS) for the FCS using the Triad approach. The RI Management Plan addresses this approach and overall site management and includes the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). This document is one of many addenda that provide detailed information about specific tasks of the RI/FS. This approach was determined to be the most effective, efficient, and appropriate method for investigating this site.

Area of Investigation

The FCS site has been divided into two primary areas that affect how the fieldwork for the RI is conducted: the Low Probability of Encountering Munitions and Explosives of Concern (MEC) Area and the Moderate to High Probability of Encountering MEC Area. Figure 4-1 depicts the location of these two areas. This addendum covers collection of groundwater samples in areas within the Low Probability MEC Area only. This addendum does not address plans for collection of groundwater samples within the Moderate-to-High MEC area. Additional wells will be installed in the Moderate-to-High MEC area upon completion of test pit activities that will clear the areas where wells will be installed. Plans for collection of groundwater samples within the Moderate-to-High MEC area will be included in the Interim Draft RI Management Plan.

Delineation of the Low and Moderate-to-High probability MEC areas, as shown on Figure 4-1, was accomplished by overlaying 2003, 2004, and 2007 geophysical data with 1949, 1956, 1982, and 2005 aerial photographs and digitizing polygons around areas that either had geophysical anomalies or surface debris. Historical photographs were used to identify areas where MEC disposal was most likely to have occurred. All of MEC uncovered to date has been within these areas. The boundary lines were conservatively expanded to the north of the tree line area and adjusted to the west to easily distinguish housing units in each area. The geophysical data shown on Figure 4-2 is from 2004, prior to construction of the housing. The 2004 data does not include anomalies generated during new construction. Figure 4-3 shows the geophysical data from 2007.

Previous Sampling Results

During the Preliminary Source Evaluation (PSE) II Investigation (Northwind, 2006), groundwater was sampled in 13 monitoring wells and analyzed for a wide range of organic and inorganic compounds. Ten of the wells sampled in 2006 were installed in 2006 and sampled only once, while three of the wells sampled in 2006 were installed during the 2005 field season and sampled in both the spring and fall of 2006. The three wells which were installed in 2005 and sampled twice in 2006 are located near the Building 52 polychlorinated biphenyl (PCB) hot spot.

Subsurface soil was sampled in 2005 and 2006 for polychlorinated biphenyls (PCBs), pesticides, metals, gasoline-range organic (GRO), diesel-range organic (DRO)/residual-range organic (RRO), volatile organic compound (VOC), semi-volatile organic compound (SVOC), and explosives. Petroleum, oil, and lubricant (POL)-contamination was identified in the northwest portion of the FCS site (Figure 4-2). Chlorinated solvents, pesticides, and explosives were also detected at the site. The coverage of previous subsurface soil and groundwater is not adequate to delineate the nature and extent of contamination for the RI. This addendum addresses collection of additional data required for source identification and for the baseline risk assessment.

Data Quality Objectives (DQOs)

A DQO process was used to determine the accuracy and quality specification that the collected data must meet to fill existing data gaps for the RI/FS. The objective of the groundwater sampling is to determine whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to base drinking supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern. The objective for soil sampling is to determine whether future site residents or excavation workers may be exposed to chemical concentrations in soil that pose a potential for unacceptable risk by direct contact.

Screening values used to assess which compounds are carried forward into the risk assessment are EPA Region 6 Risk Based Tables or 1/10th of the most conservative Alaska Department of Environmental Conservation (ADEC) soil and groundwater cleanup levels found in Title 18 Chapter 75 of the *Alaska Administrative Code* (AAC) (Tables B1, B2, and C) or in ADEC Technical Memorandum 01-007, (*Additional Cleanup Levels*.) Analytical methods have been selected with reporting limits low enough to meet these risk-based screening levels (see QAPP Section 5 Tables).

This investigation will generate soil and groundwater chemical results and water level data. Chemical data obtained from this investigation will be used with the results obtained from soil borings and soil gas investigations to determine the nature and extent of contamination on the FCS site. If constituents are detected in the soil and or groundwater at concentrations exceeding risk screening criteria these conditions will be evaluated in the baseline risk assessment and will be addressed in the Feasibility Study for the site as necessary. Groundwater quality parameters, including dissolved oxygen will be recorded for possible use in the Feasibility Study.

Groundwater Monitoring Well Locations

Figure 4-1 depicts the boundary of the "Low Probability of Encountering MEC Area" and the "Moderate to High Probability of Encountering MEC Area". The sampling locations covered in this addendum are restricted to the Low-Probability MEC Area. Additional wells will be installed in the "Moderate the High Probability of Encountering MEC Area" upon completion of test pit activities that will clear the areas where the wells will be installed. Plans for installation of wells within the Moderate-to-High MEC area will be included in the Interim Draft RI Management Plan.

Figure 4-2 shows the proposed location of 27 temporary monitoring wells in the Low Probability MEC Area. The proposed location of the 2 deep well locations are included on this figure, but since these wells are located in the Moderate to High MEC Area, the installation of these wells is not included in this addendum. Overall sample location rationale is as follows:

1. Site-wide coverage with approximately one monitoring every 0.75 acre
2. Additional monitoring wells in areas of known contamination (northwest portion of FCS) to delineate extent of contamination.
3. Monitoring wells located in former slough channel to identify potential preferential pathways.
4. Additional monitoring wells north of the FCS in the vicinity of the School Age Services (SAS) Facility.

Table 4-1 describes the number of proposed wells, and analyte groups by sub area. Sub areas are defined in the PSE 1 report (Oasis, 2007).

Well drilling, construction and development and soil and groundwater sampling procedures are provided in the *Field Sampling Plan* appendix of the *Draft RI Management Plan* (CH2M HILL, 2007). Installation of wells within the PCB exclusion zone will be scheduled to follow the PCB removal action.

Geophysical Anomaly and Utility Avoidance

Groundwater monitoring well locations will be selected to avoid geophysical anomalies and existing utilities. Careful review of as-built drawings, discussions with the construction contractor, and observations of utilities at the exposed slabs within the exclusion zone will be conducted to reduce the chances for affecting buried utilities during drilling.

GPS coordinates for monitoring well locations, shown on Figure 4-2, will be used to mark well locations in the field. Additional anomaly avoidance and location clearance with a magnetometer and current induction methods will be used if applicable. Personnel will follow *Health and Safety Plan* appendix of *Draft RI Management Plan* (CH2M HILL, 2007) and the *MEC Support Work Plan* (Jacobs Engineering Group, Inc.[JE], 2007) and use all required personal protective equipment when drilling.

TABLE 4-1

Proposed Wells and Analyte Groups by Sub Area

Sub Area	Proposed Number of Wells	Well Selection Rationale	PCOC for Soil and Groundwater	PCOC Selection Rationale
A	N/A	Area A is in the Moderate to High Probability for MEC Area and is not addressed in this Addendum	N/A (Area not sampled under this addendum)	N/A (Area not sampled under this addendum)
B[a]	12	Increased density of wells due to known POL plume in Area	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC, EPH, VPH, explosives	Known POL and chlorinated solvent contamination, possible pesticide and herbicide contamination, downgradient from known MEC disposal areas and past detections of explosive compounds
C	4	Increased density of wells due to known POL plume in Area	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC with TIC, EPH, VPH, Explosives	Known POL and chlorinated solvent contamination, possible pesticide and herbicide contamination, downgradient from known MEC disposal areas and past detections of explosive compounds
D	3	Target suspected source in northwest corner of electrical substation	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC with TIC, EPH, VPH, PCBs[b]	Potential POL, pesticide, herbicide, and VOC/SVOC contamination; uncharacterized anomaly recently identified[c]
E	8	Wells within and down gradient of known PCB contamination Includes wells installed in former slough channel area to identify potential preferential pathway.	GRO, DRO/RRO, Metals, Pesticides, Herbicides, VOC, SVOC, EPH, VPH, PCBs	Known PCB contamination, potential POL, pesticide, herbicide, and VOC/SVOC contamination

[a]Assume Area B extends to the south to meet the boundary of Area E and includes School Age Services (SAS) building and surrounding area.

[b]PCBs in water only at the proposed monitoring well downgradient from the recently identified anomaly at northwest corner of electrical substation.

[c]Recently identified anomaly at northwest corner of electrical substation

EPH = extractable petroleum hydrocarbons
DRO = diesel-range organic
GRO = gasoline-range organic
MEC = Munitions and explosives of concern
NA = Not applicable
PCB = polychlorinated biphenyl
PCOC = Potential contaminants of concern
POL = Petroleum, oil, and lubricant
RRO = residual-range organic
SVOC = semi-volatile organic compound
VOC = volatile organic compound
VPH = volatile petroleum hydrocarbons

Soil and Groundwater Sample Collection and Analyses

Monitoring wells will be installed using a truck- or an all terrain vehicle-mounted drill rig with a hollow stem auger drill. Installation methods will comply with *Recommended Practices for Monitoring Well Design, Installation, and Decommissioning* (ADEC, 1992).

The hollow-stem auger rig will be used to access the subsurface and collect soil cores for lithologic description and laboratory analysis. The water table at the FCS is expected to range from approximately 12 feet to 16 feet below ground surface (Northwind, 2007). For shallow wells, the screen will be placed such that approximately 5 feet is below water and 5 feet is above water table, or approximately 10 feet to 20 feet below ground surface.

Soil cores will be obtained continuously using decontaminated, 18–inch long, 3.4 inch outside diameter split barrel samplers. At a minimum, three soil samples will be collected in each monitoring well boring at the following depths: near the ground surface (approximately 2 to 3 feet below existing grade), in middle of the vadose zone at a location likely to contain contamination (e.g. clay lens, between approximately 4 and 10 feet below existing grade), and in the smear zone at depth of approximately 11 to 13 feet. A fourth sample may be collected, at the rig geologist's discretion where visual, photoionization detector (PID), or olfactory evidence of contamination is encountered. The field geologist or engineer will be responsible for directing activities, logging the lithology, and selecting the appropriate intervals for sampling. Proposed analyte groups are shown in Table 4-1.

Screening and collection of soil samples for laboratory analysis will be processed as follows:

- PID screening immediately upon opening the split-barrel sampler, followed by heated head space PID screening using procedures outlined in the *Field Sampling Plan* appendix of the *Draft RI Management Plan* (CH2M HILL, 2007).
- Samples to be analyzed for VOCs and GRO will be collected first, and quickly placed into prepared 4-ounce containers, followed by preservation with methanol.
- Samples to be analyzed for all other analytes will be homogenized prior to placing in the appropriate containers. These sample containers will be filled to the top, taking care to prevent soil from remaining in the lid threads prior to being sealed to prevent potential contaminant migration from or to the sample.

Pertinent observations made during sampling, such as the presence of odor or staining, or presence of debris or non-native fill soil will be recorded in the field logbook and on sample record forms.

Groundwater samples will be collected from each monitoring well using low-flow sampling methods. Field parameters will be monitored during well purging and samples will be collected when parameters stabilize. Well drilling, construction and development and soil and groundwater sampling procedures are provided in the *Field Sampling Plan* appendix of the *Draft RI Management Plan* (CH2M HILL, 2007).

Tables 4-2 and 4-3 present the sample collection summary for soil and groundwater samples to be collected from FCS during the groundwater investigation.

References

Alaska Department of Environmental Conservation (ADEC). 1992. *Recommended Practices: Recommended Practices for Monitoring Well Design, Installation, and Decommissioning*. April.

Alaska Department of Environmental Conservation (ADEC). 2001. *Clean-Up Levels: Calculated Cleanup Levels for Compounds without Tabular Values in Site Cleanup Rule,* Technical Memorandum 01-007.

CH2M HILL. 1996. *Groundwater Modeling at Building 3564, Delivery Order 5, Fort Wainwright, Alaska*.

CH2M HILL. 2007. *Remedial Investigation Management Plan (Draft).* May.

CH2M HILL. 2007 *Field Sampling Plan (Draft).* July.

CH2M HILL. 2007. *Quality Assurance Project Plan (Draft).* July.

Jacobs Engineering Group, Inc. (JE). 2007. *Munitions and Explosives of Concern Support Work Plan.*

Oasis Environmental Inc. (Oasis). 2007. *Preliminary Source evaluation 1, Narrative Report.* Interim Final. March.

Northwind, Inc. (Northwind). 2007. *Preliminary Source Evaluation II Report. Taku Gardens Fort Wainwright, Alaska (Final)*. May.

U.S. Environmental Protection Agency (EPA). 2005. U.S. EPA Region 6 Human Health Medium-Specific Screening Levels.

TABLE 4-2
Sample Collection Summary–Soil/sediment

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
GRO	AK101	1 x 4-oz wide-mouth amber glass	Add 25 grams sample to 4-oz jar. Add 25 mls methanol that is prespiked with surrogate, 4°C (VOC – SW8260 analyzed from same container)	28 days to analysis
DRO/RRO	AK102/AK103	1 x 4-oz. wide-mouth amber glass	4°C	14 days to extraction 40 days to analysis
Metals	SW6010/SW6020/SW7000	1 x 8-oz. glass	4°C	28 days for mercury; 6 months for all others
Organochlorine Pesticides	SW8081A	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis
Chlorinated Herbicides	SW8151	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis
VOCs and TICs	SW8260B	1 x 4-oz wide-mouth amber glass	Add 25 grams sample to 4-oz jar. Add 25 mls methanol that is prespiked with surrogate, 4°C (GRO – AK101 analyzed from same container)	14 days to analysis
Low-level VOCs	SW8260B	2 x 40 mL VOA vials	Add 5 grams sample to 40-mL VOA vial pre-preserved with 1 gram sodium bisulfate/5 mL water, 4°C	14 days to analysis
Semivolatile Organic Compounds	SW8270C SW8270C-SIM	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis
Extractable Hydrocarbon Speciation	NW EPH	1 x 4-oz. wide-mouth amber glass	4°C	14 days to extraction 40 days to analysis
Volatile Hydrocarbon Speciation	NW VPH	2 x 40-mL VOA vial, septa lid	Add 5 grams sample to 40-mL VOA vial with methanol	14 days to analysis
Explosives	SW8321	1 x 4-oz. glass	4°C	14 days to extraction 40 days to analysis

[a]Unless otherwise specified, method numbers refer to U.S. Environmental Protection Agency *Test Methods for Evaluation of Solid Waste, Physical and Chemical Methods*, SW-846, 3rd edition, Revision 4, 1996.
[b]All glass containers have polytetrafluoroethylene-lined lids.
[c]Triple the amount per laboratory for samples designated for matrix spike/matrix spike duplicate.

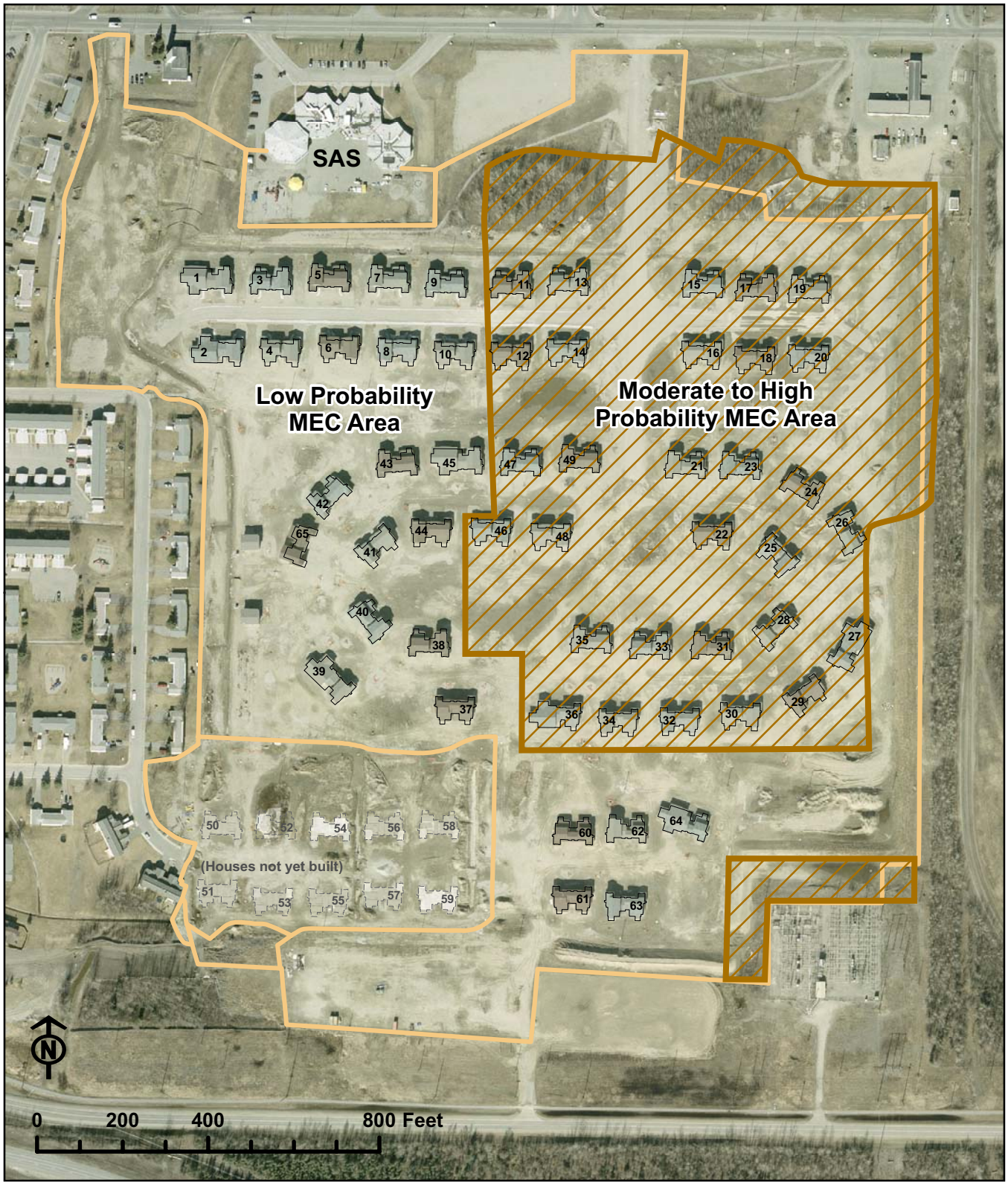
°C = degrees Celsius
EPH = extractable petroleum hydrocarbons
DRO = diesel-range organic
GRO = gasoline-range organic
mL = milliliter
RRO = residual-range organic
TICs = Tentatively Identified Compounds
VOA = volatile organic analysis
VOC = volatile organic compound
VPH = volatile petroleum hydrocarbons

TABLE 4-3
Sample Collection Summary–Aqueous/Liquid

Parameter	Analytical Method[a]	Container[b,c]	Preservative	Maximum Holding Times
Gasoline-Range Organics	AK101	3 x 40-mL amber glass, septa lid	No headspace HCl to pH<2 4°C	14 days to analysis
Diesel Range Organics/Residual Range Organics	AK102/AK103	1 x 1-liter amber glass	HCl to pH<2 4°C	14 days to extraction 40 days to analysis
Metals[d] (except Chromium VI)	SW6010/SW6020/ SW7000	1 x 500-mL HDPE	HNO_3 to pH<2 4°C	28 days for mercury 6 months for all others
Organochlorine Pesticides	SW8081A	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Polychlorinated Biphenyls[e]	SW8082	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Chlorinated Herbicides	SW8151	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Volatile Organic Compounds	SW8260B	3 x 40-mL amber glass, septa lid	HCl to pH<2, 4°C; no headspace	14 days to analysis
Semivolatile Organic Compounds	SW8270C/ SW8270C-SIM	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Transitional Explosives	SW8321	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis
Explosives	SW8330	1 x 1-liter amber glass	4°C	7 days to extraction 40 days to analysis

[a]Unless otherwise specified, method numbers refer to U.S. Environmental Protection Agency *Test Methods for Evaluation of Solid Waste, Physical and Chemical Methods*, SW-846, 3rd edition, Revision 4. 1996.
[b]All glass containers have polytetrafluoroethylene-lined lids.
[c]Triple the amount per laboratory for samples designated for matrix spike/matrix spike duplicate.
[d]Water samples will be analyzed for total metals (unfiltered samples). With low-flow sampling, filtering is not necessary.
[e]Only from wells within or down gradient of the PCB exclusion zone.

°C = degrees Celsius
HCl = hydrochloric acid
HDPE = high-density polyethylene
HNO_3 = nitric acid
H_2SO_4 = sulfuric acid
mL = milliliter



\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_3-1_TakuChemRisk.mxd 9/19/2007 21:00:50PM

Figure 4-1
MEC Areas and Security Fences
Former Communications Site
Fort Wainwright, Alaska

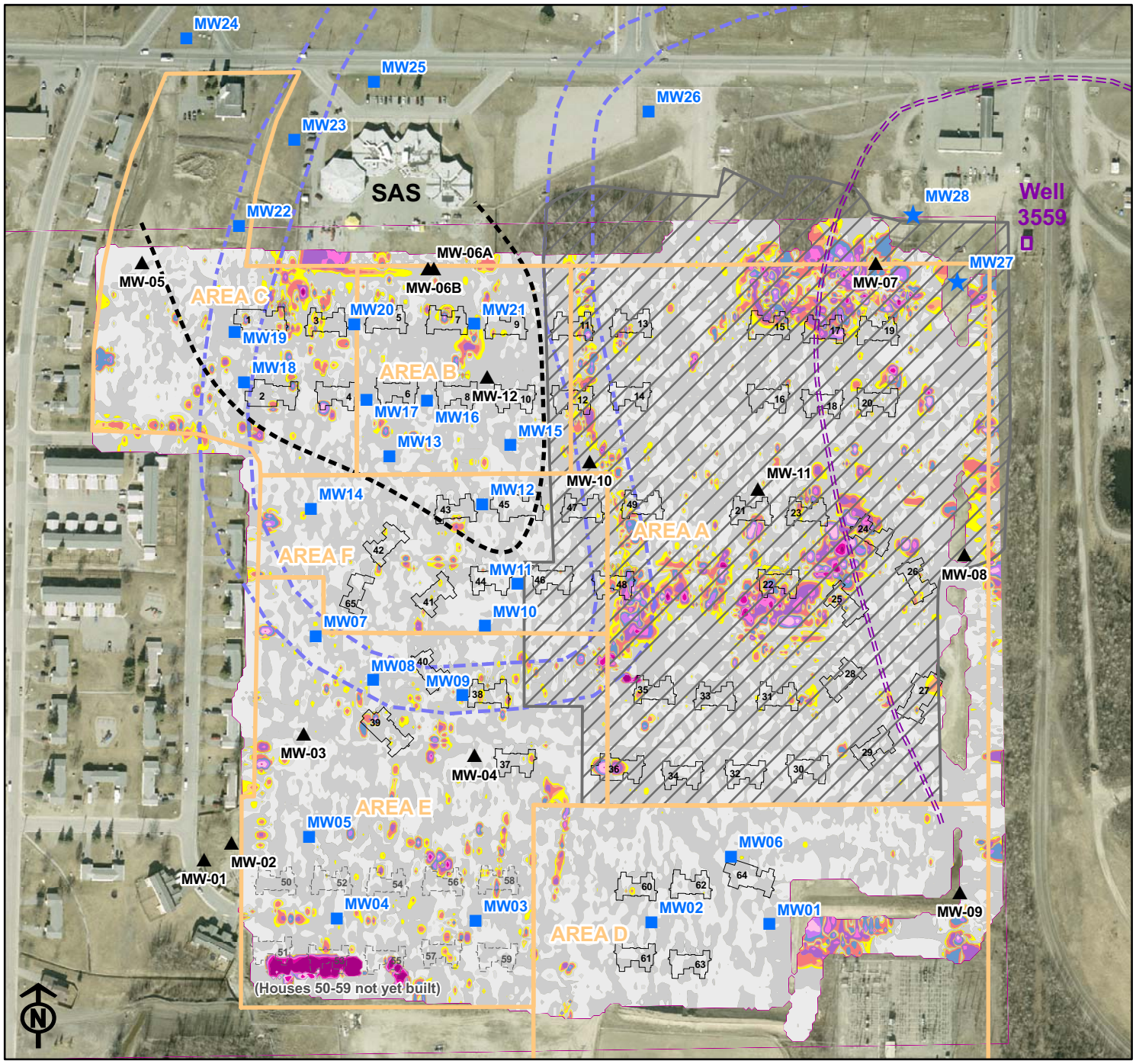


Figure 4-2
Former Communications Site
Fort Wainwright, Alaska
Monitoring Well Locations

Legend

- Moderate to High probability MEC area
- Former slough channel
- Area within elevated VOC/POL concentrations
- Capture Zone, Well 3559
- Existing monitoring well locations
- Proposed monitoring well locations
- Proposed deep monitoring locations Not addressed in Addendum 4

2004 Magnetic Data Vertical Gradient

- -4000
- -1000
- -500
- -200
- -100
- -75
- -50
- -20
- 0
- 40
- 75
- 100
- 200
- 500
- 1000
- 2000
- 4000

0 100 200 300 400 Feet

\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_4-2_MonWellsMagAnom2004.mxd 8/15/2007 15:25:50PM

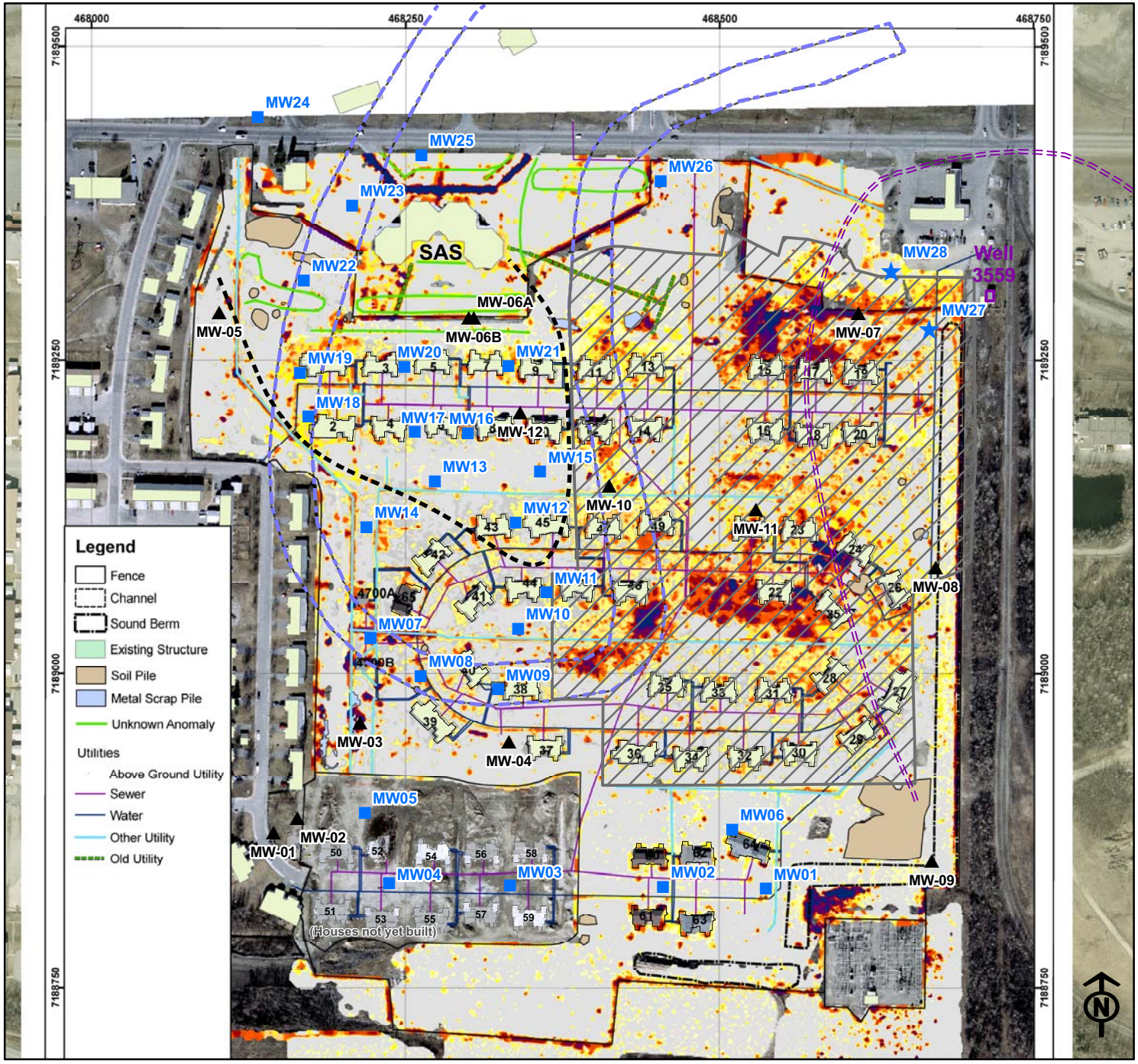


Figure 4-3

Former Communications Site
Fort Wainwright, Alaska
Monitoring Well Locations

Legend

- Moderate to High probability MEC area
- Former slough channel
- Area within elevated VOC/POL concentrations
- Capture Zone, Well 3559
- Existing monitoring well locations
- Proposed monitoring well locations
- Proposed deep monitoring locations Not addressed in Addendum 4

March 2007
Magnetic Data
EM61 Results (mV)

- No Data
- -1500
- -20
- 20
- 30
- 50
- 75
- 100
- 200
- 300
- 500
- 1000
- 2000

0 100 200 300 400 Feet

\\miner\proj\USACE\357465TakuGardens\GIS\MapFiles\Fig_4-3_MonWellsMagAnom2007.mxd 8/15/2007 15:42:50PM

Responses to Comments

REVIEW COMMENTS		PROJECT: Former Communications Site DOCUMENT: Draft WP Addendum 4; Ground Water Investigation LOCATION: Fort Wainwright, Alaska			
		DATE: 7/14/2007 REVIEWER: C. Fosbrook PHONE: 384-2713	Action taken on comment by: CH2M HILL		
Page No., Spec. Paragraph	**Item No.**	**Comments**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn**		**Back check by: _____ (Initials)**
Previous Sampling Results	1	Indicate on figure 4-2 previous soil gas probes.	Existing monitoring well locations will be included on Figure 4-2.		
DQOs	2	Screening values should be listed as Region 6 Risk Based Tables or 1/10 of ADEC Table C. In addition, the specific section in the RI Management Plan should be listed for a quick reference.	Agreed. Text will be modified to include these screening values. The DQO text will also be modified to include the specific objective listed in the RI Management Plan: "Collect groundwater samples to determine whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to the base drinking supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern."		
Sample Approach	3	Clarify that this plan is only for installation of wells in areas on non-mec as discussed in the "Area of Investigation". Note that a revised or second plan will be provided for work inside the MEC area. A brief discussion on the rational for the selection of each well by sub-area should be provided along with the PCOC that was discussed in the May meeting. This could easily be a short table by sub-area. Specific reference to the FSP section or RI Management plan would explain quickly to a reader the well installation protocols and sampling techniques.	The text will clarify that this addendum is only for groundwater investigation within the low probability of MEC area. Plans for installation of wells in the moderate to high MEC area will be included in the RI Management Plan. Rationale for selection of wells in each sub-area will be provided in Table 4-1with potential contaminants of concern. The decision at the 6/6-7 meeting was to go with the sitewide "grid" approach, with additional wells to characterize the POL area, and several deep wells to confirm protectiveness of the drinking water supply. Potential contaminants of concern will be the same for all sub-areas (fuels, metals, pesticides herbicides, VOCs and SVOCs) with the following exceptions: (1) PCBs will be sampled in water only at wells within the exclusion zone, (2) TICs will be collected only in areas not previously characterized (sub-areas A, C, and D). Justification will be provided. The text will refer to FSP Section 2.5 for installation protocols and sampling techniques.		

REVIEW COMMENTS		PROJECT: Former Communications Site DOCUMENT: Draft WP Addendum 4; Ground Water Investigation LOCATION: Fort Wainwright, Alaska			
		DATE: 7/14/2007 REVIEWER: C. Fosbrook PHONE: 384-2713	Action taken on comment by: CH2M HILL		
Page No., Spec. Paragraph	**Item No.**	**Comments**	**REVIEW CONFERENCE A - comment accepted W - comment withdrawn**		**Back check by: _____ (Initials)**
General		Comments and changes in WP #1 regarding MEC areas the MEC area and Non-MEC area should be carried to this plan	The following text will be added: "Delineation of the MEC boundary lines was accomplished by overlaying 2003, 2004, and 2007 geophysical data with 1949, 1956, 1982, and 2005 aerial photographs and digitizing polygons around areas that either had geophysical anomalies or surface debris. Locations of MEC found to date were from areas where historical photographs identify areas that were most likely to be where MEC disposal would occur. The boundary lines were conservatively expanded to the north of the tree line area and adjusted to the west to easily distinguish housing units in the MEC area and those in the non-MEC area."		
General		Without completion of the RI Management Plan from May, it appears there is not a rational for so many groundwater wells and analytical samples. The rational discussed in the May meeting should be shortly summarized in this plan as well as referenced to the FSP section. Details on the field techniques, drilling, logging, installation, sampling and analytical requirements need to be complete and agreed to by all parties before work begins.	The following rationale, as discussed at the 6/6-7 meeting, will be added to the text: 1. Sitewide coverage with approximately one monitoring well per .75 acre. 2. Monitoring wells in open areas to identify sources. 3. Additional monitoring wells in areas of known contamination to delineate extent of contamination. Table 4-1 with rational for well locations in each sub area has been added. The FSP will be referenced for installation and sampling details.		
Purpose		It should be stated better that this specifically outlines the Soil Gas Analysis work. The Army, EPA and ADEC agreed to conduct the RI/FS for FCS utilizing the tri-ad approach. A Management Plan addressing the methods of the overall site management, QAPP and sampling techniques has been prepared. This document is one of many workplans that provide detailed information to the specific task of the RII/FS. This approach was determined to be the most effective, efficient and appropriate method for investigating this site. (Something like this should be stated at the beginning of each Addendum)	The text will be amended to read: The U.S. Army, U.S. Environmental Protection Agency (EPA), and Alaska Department of Environmental Conservation (ADEC) have agreed to conduct the remedial investigation/feasibility study (RI/FS) for the FCS using the Triad approach. The RI Management Plan addresses this approach and overall site management and includes the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). This document is one of many addenda that provide detailed information about specific tasks of the RI/FS. This approach was determined to be the most effective, efficient, and appropriate method for investigating this site.		
Sample Location		Will the wells in the exclusion zone be installed prior to the removal action?	Installation of wells within the exclusion zone will be scheduled to follow the removal action. The text will be clarified.		

REVIEW COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addendum 4; Groundwater Investigation LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 7/6/07 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by: _____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
Previous Sampling Results	1	Thirteen (13) wells were sampled in 2006 during the PSE II: 10 were newly installed and sampled once, 3 were already on site near the B52 PCB hot spot, and were sampled both spring and fall 2006. Please revise text.	The text will be revised accordingly.		
DQOs	2	Not sure if this is something you want to add, but the GW stability parameters (dO, redox, conductivity, etc.) may be a useful set of information for future decisions- such as the possibility of monitored natural attenuation of groundwater in the Northern POL impacted area.	Agree that groundwater stability parameters are important and may be used to assess natural attenuation in the POL area. The DQO, "Collect groundwater samples to determine whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to the base drinking supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern" covers this. The groundwater stability parameters will be added to the Sample Collection and Analyses section, and reference to the FSP will be included.		
Sample Collection and Analysis	3	I thought we discussed and concurred that a minimum of 3, max. of 4 samples will be collected from each boring: one from near surface (2-3'? below present grade), 1 from the vadose zone, and one from the interval most likely to contain contamination, plus the option for one to be collected at the discretion of the geotechnical engineer/geologist to capture information about changes in site geology (clay lens, peat layer, etc). State that the soil sample will be homogenized prior to placing in the jar (post VOC-type sample collection). Add "PID response" to the last bullet detailing what will be recorded in the field log. Sentence immediately above Table 4-1: rephrase to read "….the sample collection summary for soil and groundwater samples to be collected from FCS during the groundwater investigation."	Correct, after careful review of the 6/6-7 meeting notes, I see that the additional (3rd) sample was added. At a minimum, three soil samples will be collected in each monitoring well boring at the following depths: near the ground surface (approximately 2-3' below existing grade), in middle of the vadose zone at a location likely to contain contamination (e.g. clay lens, between approximately 4 and 10 feet below existing grade), and in the smear zone at depth of approximately 11 to 13 feet. A fourth sample may be collected, at the rig geologist's discretion where visual, PID, or olfactory evidence of contamination is encountered. The field geologist or engineer will be responsible for directing activities, logging the lithology, and selecting the appropriate intervals for sampling. The text will be updated accordingly. Text will be changed to state that soil sample will be homogenized prior to placing in the jar, after sampling for VOCs. PID response will be added to the last bullet. The sentence immediately above Table 4-1 will be modified as suggested.		

REVIEW COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addendum 4; Groundwater Investigation LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE	DATE: 7/6/07 REVIEWER: Julie Sharp-Dahl PHONE: 753-5689	Action taken on comment by: _____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
Table 4-1	4	AK 102/103 method- change parameter "Motor Oil Range Organics" to "Residual Range Organics" – to Table 4-2 also. Will lab run BOTH 8270 & 8270SIM for all samples (to achieve the lower R.L.s for some of the more toxic PAHs?) or is this an "either or"? Add detail regarding when med/high level VOC (MeOH preserved) will be analyzed and when low level (bisulfate preserved) will be analyzed, or will you do both every time (concern is R.L.s once again). Add the 20 "TICs" for the 8260 and 8270 analyses for the appropriate samples 9those collected in areas previously uncharacterized).	This change will be made. Yes - both 8270 and 8270SIM will be analyzed on all samples to achieve lower RLs for the PAHs. Both low level and med/high level VOC will be analyzed every time in order to meet reporting limits. Tentatively Identified Compounds (TICs) will be added for 8260 and 8270 analyses in areas previously uncharacterized.		
Table 4-2	5	Please provide a bit of detail why both 8321 & 8330 will be used (POL interference with 8330?). Delete 2nd sentence of footnote d.	We will analyze for 8321 because it has less interference than 8330. The 2nd sentence of footnote d will be deleted.		
Figure 4-2	6	Please add the wells that are presently on site (to Legend also). Text at dark delineation around soil pile 13 (SE bottom corner of site near GVEA substation) is incorrect- no temporary wells are located here. Please clarify what you're trying to say. My recommendation, which will need team discussion and concurrence, is to add at least one more well closer to, but downgradient of the B52 PCB hot spot; unsure if pre-removal or post-removal is a better time to do so. Recommend adding a well at the NW corner of the GVEA substation.	Existing wells will be added to the figure and legend. The subject text will be deleted. Additional wells will be located as proposed.		

REVIEW COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addendum 4 Groundwater LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: Bob Brock PHONE: 753-5612	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
Area of Investigation	13	See Item 2 above (Explain how MEC was determined and that a conservative approach was used (see email from Beth Astley, CRREL). Consider squaring off the area for ease of locating in the field. Add that if site conditions change (i.e. debris is encountered in other areas) that the plan will be revisited and changed as needed. Add that UXO technicians (two reams) will be onsite to support Building 48/49 investigations and test pit installations and will be available to provide support as warranted by changed site conditions. Work below EXISTING grade in MEC area will require UXO support)	Explanation of the conservative approach used to delineate the MEC area will be included. The area was squared off for ease of locating in the field. Assume that details about the number of UXO technicians, etc. will be covered in the MEC Support Work Plan.		
DQOs	14	Validated using Level III or IV protocols? Explain	Data validation procedures are addressed in the QAPP. The subject text was removed from the addendum.		
Sampling Approach	15	Additional wells will be installed in the MEC area upon completion of test pit activities that will clear the areas where the wells will be installed.	This will be clarified in the text.		
Sample Collection	16	I thought three samples were to be collected from each boring with an option for a fourth based on discussions we had at the 6/7-June meeting in Fairbanks. Confirm or deny.	Confirmed, after careful review of the 6/6-7 meeting notes, I see that the additional (3rd) sample was added. At a minimum, three soil samples will be collected in each monitoring well boring at the following depths: near the ground surface (approximately 2-3' below existing grade), in middle of the vadose zone at a location likely to contain contamination (e.g. clay lens, between approximately 4 and 10 feet below existing grade), and in the smear zone at depth of approximately 11 to 13 feet. A fourth sample may be collected, at the rig geologist's discretion where visual, PID, or olfactory evidence of contamination is encountered. The field geologist or engineer will be responsible for directing activities, logging the lithology, and selecting the appropriate intervals for sampling. . The text will be updated accordingly.		

REVIEW COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addendum 4 Groundwater LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: Bob Brock PHONE: 753-5612	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: _____ (Initials)
Table 4-1, 4-2	17	I didn't think perchlorate was required fourth based on discussions we had at the 6/7-June meeting in Fairbanks. Confirm or deny. At the 6/7-June meeting in Fairbanks, I thought we decided that we did not need additional PCB data from soils and that PCBs in water would only be collected from wells down gradient of the PCB Exclusion Zone. Confirm or deny.	Confirmed. It was decided not to continue this analysis since perchlorate was not detected in earlier analysis of site wells. Confirmed. The 2005 soil data coverage appears to be sufficient to characterize the extent of PCB contamination. We are proposing to sample PCBs in water only from wells within or down gradient of the PCB Exclusion zone.		

REV COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: EPA PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
General– Field Health and Safety Concerns		EPA recommends the development of a geophysical anomaly/debris avoidance plan for use site-wide. Please see Specific Comment No. 1 for more detail.	Locations for proposed monitoring wells will be selected using available geophysics, as-built drawings, and anomaly avoidance/ location clearance using a magnetometer. Additional MEC support procedures are included in the MEC Support Work Plan.		
4-1, par 2, Sentence 1	1	The proposed subdivision of the FCS into “MEC” and “non-MEC” areas is based on a “preponderance of evidence” argument that incorporates four separate data sets 1) geophysical data, 2) historical/archival records, 3) 5 aerial photographs from a 60+ year period, and 4) observations made during recent construction activities. Because each data set differs in its quality and completeness, e.g. the geophysical data uncertainties are quantifiable and bounded whereas the aerial photos are “sparse” representing only five “samples”, the subdivision relies on a qualitative weighing of the four data sets. EPA feels that the geophysical data quality far exceeds that of the other sets and therefore should receive the highest weight in the integrated evaluation. Each of the data sets used are insufficient on their own to discriminate MEC from non-MEC debris, including the most quantifiable data from the geophysical surveys. Thus, adding sparse or otherwise lower quality data to the geophysics does not increase the amount of information that can be extracted by interpretation. More concisely, the discrimination capability of the combined data does not exceed the discrimination capability of its component parts. The geophysics has provided a high resolution image of potential buried metal site wide which should be interpreted within the context provided by the other three *a priori* data sets, but not constrained by them. EPA feels that the anomalies currently proposed as “not requiring MEC clearance” also deserve to be considered potentially hazardous, regardless of the presence or absence of MEC.	Figure 4-2 (2004) and 4-3 (2007) will be amended to include geophysical data. Anomalies in the Low Probability MEC Area will be avoided using the available geophysical data, and anomaly avoidance/ location clearance using a magnetometer. Additional MEC support procedures are included in the MEC Support Work Plan.		

REV COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: EPA PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
		EPA recommends that the Army develop an anomaly/debris avoidance plan for use site-wide during all intrusive activities. EPA further recommends that this avoidance plan consider the full range of potential hazards and develop contingency plans for their proper response. Some of the issues the debris avoidance plan might include are: details regarding how the location of the geophysical anomaly edges (laterally and with depth) will be made readily and immediately available to the field personnel who will be conducting, directing and/or overseeing the intrusive activities. For instance, will the anomaly edges be flagged, or will they be re-acquired prior to breaking ground? How will anomalies at depth be avoided? How will the technical lead decide how to determine step-out distances when intrusive activities are proposed immediately adjacent to a geophysical anomaly? Even non-MEC metallic debris presents immediate safety hazards to onsite workers and potential additional releases of contaminants to the environment if buried drums or small containers were to be inadvertently ruptured. The avoidance plan might also provide detailed methods that will be used to compare the field observations with the predictions made from the geophysical data. For example, the plan should identify who will be responsible for cross-checking the field observations with the geophysical results and what that person's responsibilities will include. The avoidance plan might additionally include contingency plans if observables deviate from the expectations (as noted in bullet b). The contingency details should include decision trees and action plans for circumstances such as, what will be the plan of action is a geophysical anomaly can not be re-acquired (a geophysical false positive) or, conversely, what should be done if debris is found where no geophysical anomaly was recorded (a geophysical false negative). If the "preponderance of evidence" approach were to fail at this site, the results may not only compromise the safety of workers in the vicinity, but could potentially release additional contaminants to the environment, as well as heighten public concerns beyond current levels. These factors should be considered important enough to warrant assigning the geophysical results considerably more weight in the evaluation than the photos, archives, or even construction field notes.			

REV COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: EPA PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
4-1, par 3, Sentence 1	2	A portion of this sentence reads "… work may require clearance and oversight measures." What criteria will be used to determine which circumstances that may require clearance? **Recommendation:** Clarify the "may require" aspect, either by adding a section in this addendum and citing that section here, or by developing a separate document (i.e. an avoidance plan) and citing that document instead.	Procedures for MEC support at the site will be presented in a separate document, the MEC Support Work Plan. The addendum will reference the MEC Support Work Plan		
4-1, par 4	3	An overview figure would be helpful here. **EPA recommends** developing a figure that indicates the locations of the existing wells on a detailed base map of the site, preferably using a high-resolution aerial photograph as the base layer with key site features labeled as necessary (i.e. building numbers, TSA location, etc.) This figure could then be used to indicate the locations of all proposed wells, current plume boundaries (e.g. POL plume), any groundwater level data available, etc.	A high-resolution figure showing locations of existing wells is provided: Figure 4-2 (2004) and 4-3 (2007).		
4-1, par 5	4	The first sentence states that "A DQO process was used to document the purpose of data to be collected…" The "purpose" is the Data Objective. The DQO process determines the accuracy and quality specifications that the data needs to meet in order to fill existing data gaps. **EPA recommends** expanding this discussion to identify both the purpose of the data as well as the quality requirements. EPA further suggests that this task may be easier if the section were moved "down", so that it follows the discussion of the specific tasks and activities proposed.	Text will be updated to clarify the DQO for groundwater: "Collect groundwater samples to determine whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to the base drinking supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern". Data quality requirements will be added.		
4-2, par 1, sentence 2	5	This sentence should be broadened in scope so that it is clear to the lay-reader that all drinking water wells (not just base drinking water wells) are being considered. **EPA recommends** slightly rewording this sentence to include the broader concerns	This sentence will be reworded to include the broader concerns.		
4-2, par 1, sentence 1	6	This sentence states that "approximately 46 temporary monitoring wells will be completed". **EPA recommends** adding a brief statement of exactly how many are proposed plus the number of contingency/optional wells that may be expected.	The text will be updated to include the proposed number of wells.		
4-2, par 2, sentence 1	7	This sentence appears to be missing a word of two just before the "(Figure 4-2)". **EPA recommends** a minor correction here.	This change will be made.		
4-2, par 2, sentence 2	8	This sentence includes the first occurrence of the acronym POL. **EPA recommends** spelling out the acronym on the first occurrence. Also, consider where an acronym list and a reference list will exist for these Addenda. Will there be a single acronym list in the MWP? What about a reference list?	Acronyms will be spelled out at their first occurrence. A full acronym list will be included with the RI Management Plan. A list of references will be added to the addendum.		

REV COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: EPA PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
4-2, par 2, sentence 3	9	**EPA suggests** replacing "school yard" with "School Age Services Facility".	This change will be made.		
4-2, par 2, sentence 4	10	This sentence states that "the well locations were demarcated after reviewing …" In what way were the wells demarcated? On a map? On the ground? **EPA suggests** clarifying the use of the term "demarcated".	The text was revised; see section titled "Geophysical Anomaly and Utility Avoidance". .		
4-2, par 2, sentence 5	11	EPA agrees with the objective to minimize potential disturbances of, or damage to, buried utilities or other underground structures, but suggests that the sentence should be expanded to include avoidance of geophysical anomalies as well. **EPA recommends** revising the text and adding figures indicating the proposed well locations relative to the geophysical data so that all known potential underground objects are clearly represented in this addendum.	Agreed. The plan is to avoid utilities AND geophysical anomalies. Figure 4-2 and Figure 4-3 will be amended to show proposed groundwater well locations in relation to, and staying away from, geophysical anomalies. The text will also be updated accordingly.		
4-2, par 3, sentence 2	12	Given the uncertain nature of the buried metallic debris and the existence of buried drums on site, will any extended contingency safety protocols be instituted? For instance, because any container contents could conceivably contain a range of military substances, will the drilling team be monitoring the breathing zone, and if so, how? Will PIDs with a range of lamp ratings be available for use? What level of PPE will be used? **EPA recommends** either briefly citing the HASP here (making sure that the HASP includes contingencies for a full range of anticipated contaminants near any geophysical anomaly site-wide) or including the special safety requirements directly in this Addendum.	The Health and Safety Plan and person protective equipment will be referenced in this section.		
4-2, par 4, sentence 2	13	**EPA recommends** briefly stating how the boring end-depth of 18 feet bgs was decided upon?	The text will discuss depth to groundwater, depth of screened interval, and total boring depth.		
4-2, par 4, sentence 4	14	EPA notes that if only one "mid depth" core sample is available for the logging geologist to select, then it would be necessary to evaluate all core samples simultaneously in order to select the best location for the one available sample. **EPA recommends** clarifying whether all cores will be pulled before selecting the mid-depth sample location or whether the geologist will have the option to select more than one mid-depth sample if the observations warrant it.	This text will be updated to state At a minimum, three soil samples will be collected in each monitoring well boring at the following depths: near the ground surface (approximately 2-3' below existing grade), in middle of the vadose zone at a location likely to contain contamination (e.g. clay lens, between approximately 4 and 10 feet below existing grade), and in the smear zone at depth of approximately 11 to 13 feet. A fourth sample may be collected, at the rig geologist's discretion where visual, PID, or olfactory evidence of contamination is encountered. The field geologist or engineer will be responsible for directing activities, logging the lithology, and selecting the appropriate intervals for sampling.		

REV COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: EPA PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
4-2, par 4, sentence 4	15	Given the uncertainty of what items may be the source of the geophysical anomalies, **EPA recommends** including here a statement that part of the geologists responsibilities will be to evaluate the core samples for evidence that supports or conflicts with the geophysical results, including noting whether the core materials are considered native or fill.	Good idea. This will be added to responsibilities of the geologist.		
4-2, par 5, bullet 1	16	**EPA recommends** repeating, as a new bullet, the use of a PID immediately upon opening the barrel sampler for the first time.	This will be added to the first bullet, as the first step when opening the split barrel sampler.		
4-2, par 5, bullet 2	17	**EPA suggests** revising the very end of the last sentence in this bullet to read "…to prevent potential contaminant migration from or to the sample"	This edit will be made.		
4-3, par 1, sentence 1	18	**EPA suggests** changing "2-foot of screen" to "2-feet of screen"	Discussion of screening depth was moved to an earlier section.		
4-3, par 1, sentence 1	19	This is the first occurrence of the acronym LNAPL**. EPA recommends** spell this out on the first occurrence and then use the acronym thereafter.	This sentence was deleted. Discussion of screening depth was moved to an earlier section.		
Table 4-1, Row 1, Column 4	20	Shouldn't the preservative for GRO be Methanol and 4°C, rather than just Methanol? **EPA suggests** revising as appropriate.	This will be corrected.		
Table 4-1, Row 3, Column 1	21	EPA notes that the method SW7000 (Atomic Absorption) specified for analysis of metals in the boring soils/sediments is different than the method specific in Addedum-2 for analysis of Soils from the Piles (there, the Method 7471A is referenced, which is a Mercury specific, cold-vapor method). EPA agrees that the soils from the core samples should be analyzed for a full range of metals, including Mercury; however, it would be helpful to know why the two Addenda analyze the soils differently. No text revisions are necessary to this Addendum-4 unless a specific error is identified here. However, if Addendum-2 is in error, corrections should be made there, as appropriate.	The soils will not be analyzed differently. The way the metals are listed in the QAPP is SW6010B/SW6020/SW7000. This gives the lab some flexibility to analyze samples for metals by a variety of methods. We don't care if they analyze Cu by 6010 or 6020 as long as they meet the screening level. SW7000 covers mercury and graphite furnace methods. When the methods are listed all together (metals + mercury) they are listed as SW6010B/SW6020/SW7000, otherwise you list out 15 different methods for the SW7000 methods because each analyte has its own method number under the SW7000 methods. If mercury is listed alone, it is listed as its discrete method number SW7470A for water and SW7471A for soil. SW7000 refers to a group of methods, which contains SW7471A…the only soil mercury method that exists in that forum.		
Table 4-1	22	EPA notes the absence of analysis of soils for explosives and EPH/VPH. **EPA recommends** analyzing soils for both explosives and EPH/VPH. Otherwise, include in the text why these two analyses are being excluded from the core soils but not from the soil samples collected from the soil piles	EPH/VPH and explosives will be included in the list of analytes.		

REV COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: EPA PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: ____ (Initials)
Table 4-1, Row 1, Column 8	23	Shouldn't the preservative for VOCs be Methanol and 4°C, rather than just Methanol? **EPA suggests** revising as appropriate.	The text will be corrected.		
Table 4-2, Footnote "d"	24	What will determine whether filtered samples will be collected? Dissolved metals are of interest at this site due to the existence of a drinking water supply wells down gradient. **EPA recommends** providing a more detailed description of what will determine whether filtered samples will be collected and/or why the Army does not consider them a priority for the FCS wells.	This footnote will be modified to reflect the decision NOT to filter metals samples. With low-flow sampling, filtering should not be necessary.		
Table 4-2, Acronym key	25	The numeral 3 in the formula for Nitric Acid should be subscripted.	This edit will be made.		
Figure 4-1	26	As discussed in EPA Specific Comment No. 1, this Figure under-values the information provided by the geophysical surveys. **EPA recommends** removing the MEC delineation boundaries and making Figure 4-1 a base map showing the location of existing and proposed wells (See EPA Specific Comment No. 3).	The figures will be updated. Geophysical anomalies and existing and proposed wells will be shown clearly on the figures.		
Figure 4-2	27	**:** This Figure is too small and the font too light for easy reading. It is unclear why this format was selected for well location illustrations rather than the Figure 4-1 style map. **EPA recommends** an alternative approach to this figure wherein the locations for proposed wells would be added to the geophysical survey results (separate maps for each methodology) so that the field personnel can make informed decisions regarding proximity to geophysical anomalies and the need for step-out locations and avoidance.	The figures will be updated. Geophysical anomalies and existing and proposed wells will be shown clearly on the figures.		
Figure 4-2, Legend Note 1	28	**EPA recommends** including avoidance of geophysical anomalies in this note.	Geophysical anomalies will be clearly added to figure legends.		
1-1, par 1, Sentences 1 & 2	29	These two sentences feel out of order. **EPA recommends** rewording slightly and changing the order.	The text will be edited for ordering and clarity.		

REVIEW COMMENTS	PROJECT: Former Communications Site DOCUMENT: Draft WP Addenda 1-4 LOCATION: Fort Wainwright, Alaska	
U.S. ARMY CORPS OF ENGINEERS CEPOA-PM-C	DATE: 6/30/07 REVIEWER: ADEC Sharon Richmond PHONE:	Action taken on comment by:_____

Page No., Spec. Paragraph	Item No.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn		Back check by: (Initials)
4-1	1	Area of Investigation. I recognize that the boundaries between areas with a low probability of encountering Munitions and Explosives of Concern (MEC) and a moderate to high probability of encountering MEC have yet to be resolved and that work in the munitions disposal area is not discussed in this document. Figure 1 is missing	Text will be added to explain the conservative approach used to determine the MEC area. The text will also refer to the MEC Support Work Plan. The figures will be updated.		
4-1	2	Previous Sampling Results. Monitoring well MW-12 is referenced but not shown on a figure. Not sure if MW-12 is on Figure 1.	Existing monitoring wells will be shown on a figure.		
4-1	3	Previous Sampling Results. Where were explosive compounds located? My understanding is that explosive compounds were mistakenly identified in MW-12. Please identify the volatile organic compound identified and the location where it was found.	The Final PSE II Report, page 2-49, includes a discussion on the explosive compounds reported in the groundwater. Explosive compounds were reported from MW-06A, MW-06B, and MW-12; nitrobenzene was reporting in MW-05. USACE review of raw analytical data determined that the elevated petroleum compounds present in MW-06A and B, and MW12 have the potential in interfere with analytical method used: EPA SW-846 Method 8330. Additional groundwater samples and different analytical method s are required to discern explosive s in the presence of petroleum compounds. In this addendum we proposed to use method SW8321 because this method is less susceptible to interferences.		
4-1, DQO, 1st sentence	4	Revise sentence to reflect that the nature and extent of contamination might or could possibly present unacceptable risk.	The DQO will be restated as follows “The objective of the groundwater sampling is to determine whether constituents present in site groundwater could migrate offsite at concentrations that pose a potential for unacceptable risks to base drinking supply wells, or impact offsite surface water, or cause an offsite vapor intrusion concern “		
4-2, Fig 2	5	Fig 2 is missing. We can’t agree or disagree on the proposed placement of wells without a figure to reference	The figures are being updated and will be included in the PDF version of the Addendum. [It is likely that you reviewed the Word version which did not contain the figures. The PDF version, also posted on the FTP site, did contain the figures.]		
4-3, Table 4-1	6	Methods SW8321 and SW8330 are not included in the Soil/Sediment Sample Collection Summary.	SW8321 will be added to the list of soil/sediment analyses. This method will be used for analysis of explosives, since it is less susceptible to interferences.		