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GEOPHYSICAL SURVEY AND ADDITIONAL SUBSURFACE SOIL SAMPLING TECHNICAL MEMORANDUM WORK PLAN FOR SOLID WASTE MANAGEMENT UNIT (SWMU) 67 FORMER GAS STATION NAVAL ACTIVITY PUERTO RICO

10/1/2013

CH2M HILL

Geophysical Survey and Additional Subsurface Soil Sampling Technical Memorandum Work Plan, Solid Waste Management Unit (SWMU) 67—Former Gas Station Naval Activity Puerto Rico, Ceiba, Puerto Rico

I. Objective

SWMU 67 is located at the former Naval Station Roosevelt Roads located in Ceiba, Puerto Rico; currently referred to as Naval Activity Puerto Rico (NAPR). In response to comments received by Puerto Rico Environmental Quality Board (PREQB) and EPA Region II on the Phase I RCRA Facilities Investigation Report, a geophysical field investigation will be conducted to determine if there is an underground storage tank(s) (UST(s)) at SWMU 67 and verify that the outlet pipe observed during a recent visit to SWMU 67 is, in fact, the discharge point of the pipe leading from the former vehicle service bay.

In addition to the above, cobalt was detected above the Regional Screening Level (RSL) in subsurface soil collected adjacent to the former maintenance building at the location of the outlet pipe from the former maintenance pit. An estimated six subsurface soil samples will be collected in the vicinity of the sample collected during the Phase I RFI to refine the extent of elevated cobalt.

A caveat to the planned soil sampling is that if a UST(s) is identified at the site, the additional subsurface soil samples will not be collected at this time. Because the presence of a UST(s) would necessitate additional investigation, the soil samples planned around the pipe penetration would be included with the additional investigation associated with the UST(s), which would be detailed in a Sampling and Analysis Plan (SAP).

II. Site Description

As shown in **Figure 1**, SWMU 67 is approximately 1.5 acres in size and is bordered to the east by a marsh. A small section of the SWMU crosses Langley Drive. The site also includes abandoned tennis courts. The site is moderately wooded, although ground cover and vegetation appear conducive to site access without extensive vegetation clearance or brush cutting. The site reportedly coincides with the location of a former gas station, although it is not clear from historical documents whether the site historically served as a filling station or just as a vehicle maintenance facility. There is also no record of USTs at the site. No evidence (e.g. fill port, vent pipe) has been found to-date at the site that would indicate the presence of a UST, nor has contamination been detected in site media indicative of UST releases.

A former vehicle maintenance pit remains at the site, where the floor of the pit is approximately 8 feet below ground surface in order to permit mechanics to work under vehicles while standing upright. An 8-inch drain pipe was observed at the base of the pit's northern wall, suggesting that drainage from the pit may have traveled toward the drainage ditch to the north (**Figure 1**).

III. Geophysical Survey Technical Approach

The geophysical investigation includes both a metal detection survey and ground-penetrating radar (GPR) survey to assess whether USTs are present at the site. The survey will be augmented by the use of conductive pipe and cable locators in an attempt to confirm if the outfall location of the 8-inch drain pipe observed in the bottom of the former maintenance pit is that observed in the drainage ditch to the north during a recent site visit. Confirming the location of the outfall will help confirm the samples within the drainage ditch that were used to characterize the drainage ditch media were appropriately located.

The metal detection survey will be conducted using a handheld Fisher Laboratories TW-6 all-metals detector (or an equivalent instrument). The TW-6 is an analog instrument that utilizes a transmitter and receiver (separated by a non-conductive pole) to produce an electromagnetic (EM) field. When carried in the presence of metallic objects, the field becomes distorted and an audible tone alerts the operator to the presence of the metal. Under ideal conditions, the instrument is capable of locating an object comparable in size to a 55-gallon steel drum to depths of around 10 feet.

The TW-6 can be maneuvered around trees and obstructions and is generally immune to geologic effects and small, isolated pieces of metal at the surface. It does not require contact with the ground surface, but is instead hand-carried at a height of about 18 to 24 inches above the ground surface. Prior to use, the operator will adjust the gain settings by tuning the instrument at an on-site location that is relatively free of surface and subsurface metal. The settings can be refined and the instrument response can be tested at known, visible metallic features such as a manhole or metal drainage culvert to ensure it is operating properly. The TW-6 is well-suited for locating metallic USTs, regardless of whether they are intact, crushed, or abandoned-in-place. Metallic anomalies characteristic of potential USTs will be marked in the field using semi-permanent marking paint and pin flags. Measurements to anomalies of interest will be referenced to permanent, fixed site features in order to facilitate re-location in the field.

The TW6 will also be used in an attempt to locate the outfall of the drain pipe observed in the former maintenance pit. However, detection of an 8-inch pipe at 8 feet deep may be beyond the detection capability of the TW6. As a result, CH2M HILL intends to have on-site a pipe and cable locator (Radiodetection RD4000 or similar system) with the capability of inducing a traceable current on the pipe either at the exposed section in the base of the former maintenance pit or on a metal fish tape or push rod inserted into the pipe. The operator will tune the receiver to the frequency of the transmitted current and trace the signal at the ground surface along the pipe alignment.

The GPR survey will be conducted using a Geophysical Survey Systems, Inc. (GSSI) SIR-3000 system with a 400 MHz antenna. Under optimal conditions, the 400 MHz antenna has a maximum detection depth of around 12 feet. However, the effectiveness of GPR is influenced by site-specific conditions, such as clay content of soils, groundwater table, groundwater and soil conductivity, and antenna coupling with the ground surface.

The GPR survey will be conducted primarily as a follow-up to the other surveys. GPR surveying will be performed across anomalies detected with the TW6 and RD4000 that appear to indicate the presence of a UST or the drain pipe. The intent of the follow-up GPR survey is to provide enhanced characterization of the metallic anomalies and to evaluate depth below ground surface. In addition, the GPR survey will be conducted across concrete pads that may be determined to be reinforced during the metal detection survey in an attempt to assess whether a UST may be located under the pads. Lastly, because the 400 MHz antenna is relatively compact and can be used in relatively restricted places, it will be used to search the floor of the maintenance pit and around the perimeter of the concrete walls if they in turn happen to be reinforced and prevent TW6 surveying within a few feet of the walls.

CH2M HILL will create a detailed site sketch and photo log of identified anomalies and relevant site features. Measurements to anomalies of interest will be referenced to permanent, fixed site features in order to facilitate re-location in the field by others. Relevant GPR cross-section images will be recorded and presented as part of a report that summarizes the geophysical survey findings.

IV. Subsurface Soil Sampling Technical Approach

As noted in Section I, subsurface soil samples will be collected if a UST is not identified at SWMU 67 during the geophysical survey. If a UST is identified during the geophysical survey, further site characterization would be warranted and the subsurface soil samples for cobalt will be planned as part of the future investigation efforts.

Field sampling will be conducted in accordance with the Final Work Plan for SWMU 67 (Baker, 2007). An estimated six subsurface soil samples will be collected from 5 to 7 ft below ground surface (bgs) in the vicinity of subsurface soil sample 67SB01-03 (**Figure 2**). One sample will also be collected from 7 to 9 ft bgs. All samples will be analyzed for cobalt via SW-846 6020A. The subsurface soil sample locations are presented on **Figure 2**, and were chosen based on the site history and previous investigations conducted at SWMU 67. The sampling design and rationale is summarized in **Table 1**. **Table 2** provides the location specific sample details and quality control.

The subsurface soil samples will be collected using a split spoon sampler. Each sample interval will be homogenized using a disposable plastic spoon and aluminum dish and then transferred into the appropriate laboratory-supplied sample containers. The sampler shall be decontaminated prior between stations in accordance with applicable SOPs (**Baker, 2007**).

TABLE 1
Sampling Design and Rationale

Matrix	Depth Interval of Samples	Analytes	Analytical Method	Number of Samples	Rationale	Sampling Strategy
Subsurface Soil	5-7 ft bgs	Cobalt	SW-846 6020A	6	During the Phase I RFI (Baker, 2007) one sample at SB01, taken from 5-7 feet deep, contained elevated levels of cobalt (472 mg/kg). Additional subsurface soil samples will be collected in the vicinity of SB01 to determine the extent of elevated cobalt and to evaluate the potential for the former vehicle maintenance pit to act as a potential point source.	Proposed sample locations are shown on **Figure 2.**
	7-9 ft bgs	Cobalt	SW-846 6020A	1	A sample will be collected at the depth of the drain pipe.	

TABLE 2
Location-specific Sampling Methods / Requirements Table

Sampling Location / ID Number	Matrix	Depth	Analytical Group	Number of Samples
NAPR-W67-SO09 / NAPR-W67W67-SB09-05070507; NAPR-W67-SB09P-0507	Subsurface Soil	5 – 7 ft bgs	METAL (Cobalt only)	2 (includes field duplicate)
NAPR-W67-SO10 / NAPR-W67-SB10-0507				1
NAPR-W67-SO11 / NAPR-W67-SB11-0507				1
NAPR-W67-SO12 / NAPR-W67-SB12-0507				1
NAPR-W67-SO12 / NAPR-W67-SB12-0709		7 – 9 ft bgs		1
NAPR-W67-SO13 / NAPR-W67-SB13-0507		5 – 7 ft bgs		1
NAPR-W67-SO14 / NAPR-W67-SB14-0507; NAPR-W67-SB14-0507MS; NAPR-W67-SB14-0507SD				3 (includes MS/MSD)
NAPR-W67-QC / NAPR-W67-EB01-MMDDYY1	Aqueous	N/A	METAL (Cobalt only)	2 (one per day; represents hand auger)

[1]The number of blanks is based on a fundamental assumption of the number of days during which sampling occurs. It was assumed that the sampling could be completed in 2 days.

Soil samples shall be placed into a 4oz (or larger) clear wide-mouth jar. Samples shall be placed onto ice at time of collection and the holding time (to analysis) is 6 months. After all samples are collected, they shall be shipped to Katahdin Analytical Services, Inc., of Scarborough, ME, for analysis of cobalt via SW-846 6020A. The project action levels are the screening levels consistent with the RFI work plan (Baker 2007) and are provided on **Table 3**. Katahdin is DoD ELAP-accredited for analysis of cobalt in soil samples via SW-846 6020A. Analysis will conform to DoD QSM v. 4.2 or later. Standard (28 calendar-day) turnaround time is required. The Level IV data packages will receive sign-off by a Puerto Rico certified chemist.

After reporting, the data packages shall undergo validation by DataQual Environmental Services, LLC. Level IV data validation includes recalculation of 10% of results from the raw data. Validation is done against DoD QSM v. 4.2 limits and guidance and qualifiers are taken from "ICP-MS Data Validation"; HW-2b; rev. 15 (EPA, 2012).

TABLE 3
Reference Limits and Evaluation Table

Matrix: Subsurface Soil
Analytical Group: METAL (Co-only)
Units: mg/kg

Analyte	CAS Number	Adjusted Residential Soil RSL (May, 2013)	Adjusted Industrial Soil RSL (May 2013)	Risk-Based SSL (May 2013)	NAPR Background[1]	PQL Goal[2] (mg/kg)	Laboratory-specific Limits		
							LOQ	LOD	DL
Cobalt	7440-48-4	2.3	30	0.21	26.9	0.105	0.10	0.030	0.0054

Note:
[1] In addition, to the screening criteria listed in the work plan, results will be compared to the NAPR arithmetic mean +2x standard deviation of subsurface soil background - clay (Baker, 2010)
[2] The PQL goal is one-half of the PAL. The PAL is the greater of NAPR Background and [the lesser of applicable screening levels].

V. Schedule and Reporting

CH2M HILL anticipates that field work would be completed in approximately 1 week. The project quality objectives in the form of if/then qualitative and quantitative statements are as follows.

- If a potential UST is located during the geophysical survey, the planned additional subsurface soil samples will not be collected at this time. Instead, a scoping session will be held with the partnering team and a SAP prepared for an expanded investigation, including collection of the additional subsurface soil samples around the pipe penetration.
- If a potential UST is not located during the geophysical investigation, the additional subsurface soil samples around the pipe penetration will be collected and analyzed for cobalt, and the data will be included and evaluated in the Revised Phase I RFI Report.
  - If the cobalt results are below screening levels, then the Final Revised Draft Phase I RFI Report will be subsequently submitted to the PREQB and EPA summarizing the results of the field investigation, and NFA will be recommended for SWMU 67.
  - If additional subsurface samples are collected and analyzed for cobalt, and the results are not below screening criteria, the partnering team will reconvene to determine the path forward.

VI. References

Michael Baker Jr., Inc. (Baker). 2007. Final Phase I RCRA Facility Investigation Work Plan- SWMU 67 Former Gas Station, Naval Activity Puerto Rico, Ceiba, Puerto Rico. December.

CH2M HILL. 2012. Draft Revised Final Phase I RCRA Facility Investigation Report- SWMU 67 Former Gas Station, Naval Activity Puerto Rico, Ceiba, Puerto Rico. May.

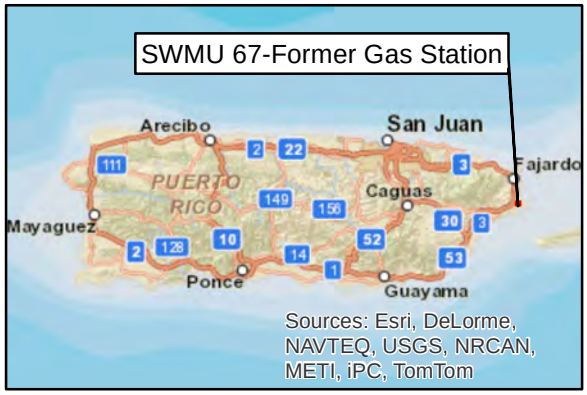
Figures

Note:
Imagery 2010 Esri ArcGIS Streaming Map Service

LEGEND

- Earthen Drainage Feature
- Approximate Location of 8" Maintenance Pit Drainage Pipe
- Ditch/Swale
- Storm Sewer Line
- Concrete Pad/Building Foundation
- Former Vehicle Maintenance Pit
- SWMU 67 Boundary as Defined in Phase I ECP

VICINITY MAP



0 25 50 100
Feet

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FIGURE 1 - Site Layout
SWMU 67 - Former Gas Station
Geophysical Survey & Additional Subsurface Soil Sampling Work Plan
Naval Activity Puerto Rico

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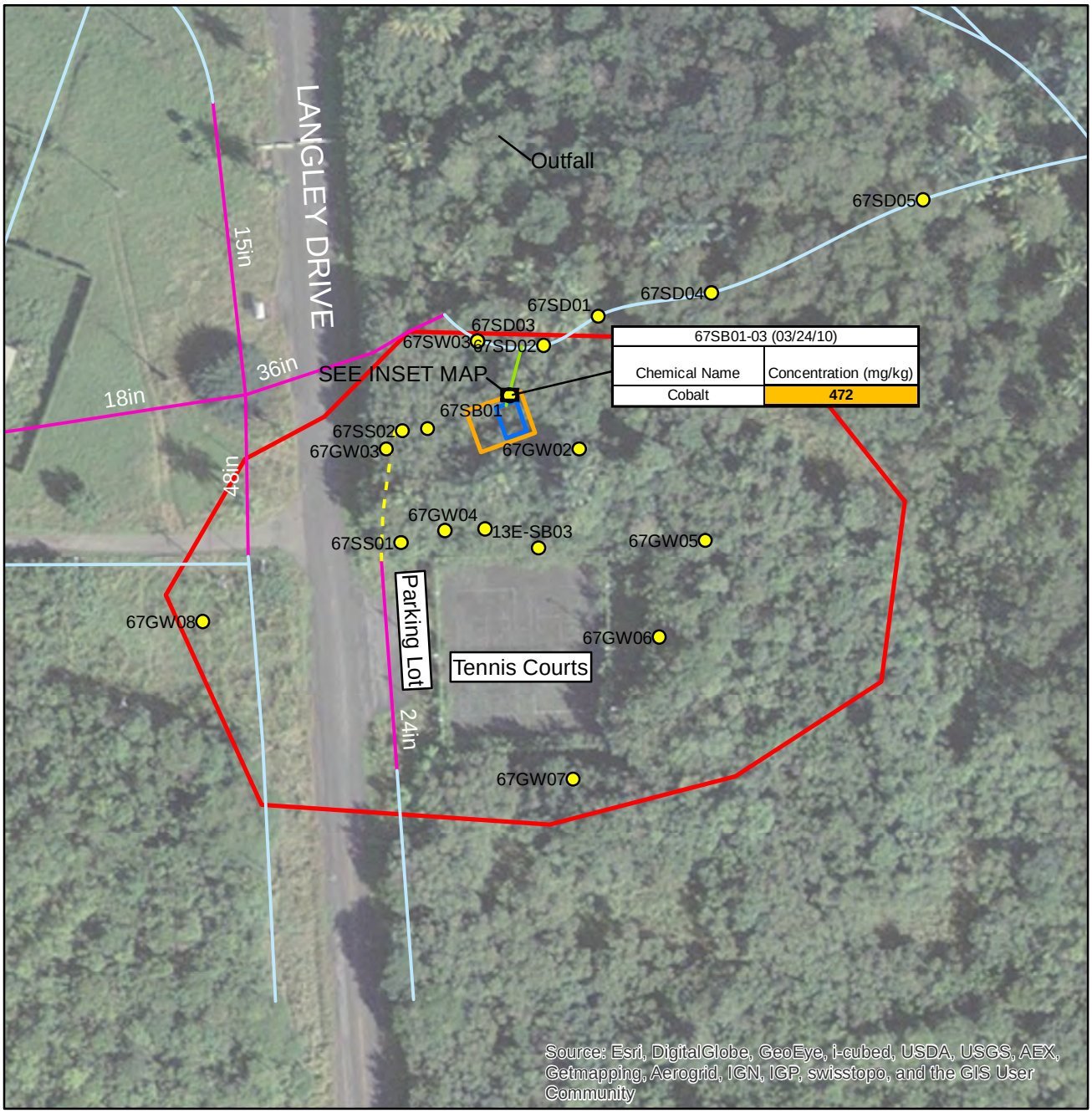


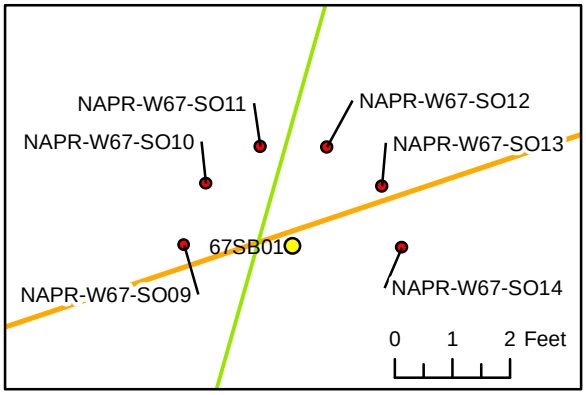
67SB01-03 (03/24/10)	
Chemical Name	Concentration (mg/kg)
Cobalt	**472**

LEGEND

- Proposed Sample Location
- Previous Sample Location
- Earthen Drainage Feature
- Approximate Location of 8" Maintenance Pit Drainage Pipe
- Ditch/Swale
- Storm Sewer Line
- Concrete Pad/Building Foundation
- Former Vehicle Maintenance Pit
- SWMU 67 Boundary as Defined in Phase I ECP

Note:
Imagery 2010 Esri ArcGIS Streaming Map Service

INSET MAP



0 25 50 100
Feet

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FIGURE 2 - Proposed Subsurface Sample Locations
SWMU 67 - Former Gas Station
Geophysical Survey & Additional Subsurface Soil Sampling Work Plan
Naval Activity Puerto Rico

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