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Mr. John Jent
U.S. Army Corps of Engineers
Louisville District
Attn.: CELRL
600 Martin Luther King, Jr. Place
Louisville, KY 40202

Reference: Contract No. DACA27-97-D-0025, Delivery Order No. 25: RCRA Field Investigations at Ravenna Army Ammunition Plant

Subject: Geophysical Survey Results, Possible Mustard Agent Burial Site (RVAAP-28)

Dear John,

SAIC is pleased to present herein the results of the evaluation of the possible Mustard Agent Burial Site at Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. This submittal includes the text that incorporates reviewer comments of 3 April 1998. Color figures have not changed since the last submittal, and are not included in this package.

BACKGROUND INFORMATION AND SITE SETTING

RVAAP records indicate that in 1969, the U.S. Army had excavated a possible mustard agent (dichlorodiethyl sulfide and thiodiglycol) burial site within the old demolition grounds, now known as Training Areas D and G. The burial of these containers was purportedly prior to 1950. One 50-gallon drum and seven small rusted cans were discovered. All recovered items were empty, and no contamination was discovered. Following the excavation to recover these objects, an unnamed and undocumented source reported that the site had not been correctly identified, and that the actual Mustard Agent site was in an area adjacent to the excavation.

This second proposed site for the mustard agent burial is located in the wooded area approximately 152 m (500 ft) south of Hinkley Creek along an abandoned power line. The site, measuring approximately 4.5 x 5.5 m (approximately 15 x 18 ft), was reportedly enclosed by a cyclone fence. The fence had collapsed before this investigation. It is not known if this is the exact location of the possible mustard agent burial.

PURPOSE AND SCOPE

The U.S. Army Corps of Engineers (USACE) undertook a non-intrusive investigation to identify the location of the possible mustard agent burial site. SAIC performed a two-part geophysical investigation in order to delineate the boundaries of the possible burial site, and to identify anomalies that potentially represent buried containers. SAIC used an EM-61 high-sensitivity metal detector (capable of detecting targets at depths of 10 ft) and an EM-31 conductivity meter (capable of detecting targets at a maximum depth of ~ 15 ft) in the investigation. Both instruments are manufactured by Geonics, Ltd., of Mississauga, Ontario, Canada. Near-surface drainage variations, disturbed soils, or an inverted soil column, as well as surficial metal objects, may cause anomalous readings on these instruments.

SURVEY GRID SETUP/SITE PREPARATION

SAIC prepared a land position survey in the area to be investigated. Wooden reference stakes were placed at the corners of a 48-meter by 48-meter (137.5 by 137.5 ft) area centered on the cyclone fence. Reference points were marked by flagging at one-meter (3.28-ft) intervals along the north and south boundaries of the study area. These reference flags were the basis for the site-wide grid.

The cyclone fence and remaining fence posts posed a potential source of interference to the EM-31 and EM-61 instruments. These were removed, wherever possible, by site personnel. However, portions of the fence that had been embedded in growing trees could not be removed. Also, the base of the chain-link fence had been partially buried, and the buried portion had decomposed in the soil, leaving many links protruding from the ground. Many of these were removed from the survey area. Fragments of metal sheets were also found on the ground.

SAIC surveyed the corners of the study area and cultural features with a PRO-XR global positioning system (GPS) rover. The GPS used for this effort has an accuracy < 1m because it calculates corrected position every second. The GPS data were compared with data from the USACE's temporary on-site base station, which calculates corrected positions every 30 seconds, and has an accuracy +/- 1 to 5 m. These position data were incorporated into the EM-31 and EM-61 output maps.

EM-61 DATA COLLECTION

The survey parameters included measurements every 0.61 m (2 ft) inline, with the lines spaced at 1-m (3.28-ft) intervals. Fifty north-south trending traverses were investigated. A total of 3,996 survey points, representing 7,992 linear feet of data, were collected. Inline positioning was maintained through a hip-chain measuring device and reconciled with the processed GPS data for final mapping.

The EM-61 results are present in map view in Figure 1. Several anomalies were identified, particularly within the formerly fenced area. Some of these features may be related to the metal fencing embedded in trees or a nearby metal fence post, fallen and buried in leaves, that was discovered after the survey was completed.

Several other anomalies were also identified using EM-61, some of which appear to be evenly spaced in a linear pattern. Based on presence of at least three fence posts in the field (as noted in Figure 1), some, if not all, of the anomalies in this feature may result from a former barbed wire fence that trended north-south across the area.

EM-31 DATA COLLECTION

The vertical dipole data was used for this survey, because it has a greater depth penetration than the horizontal dipole. Depths of burial of potential containers were not known, so it was decided to investigate to the greatest depth capability of the instrument.

For this survey, the parameters included measurements every 0.61 m (2 ft) inline, with lines spaced at 3-m (9.84-ft) intervals. Seventeen north-south trending survey lines were traversed. A total of 1,360 survey points, representing 2,720 linear feet of data, were collected. Inline positioning was maintained through a hip-chain measuring device and reconciled with the processed GPS data for final mapping.

The EM-31 survey results are presented in map view in Figure 2. The in-phase data represents those anomalies related to ferrous iron. Only one anomaly was identified with a metallic response. This anomaly appears to be positioned between a fence post and a nearby tree that had grown through a portion of the former cyclone fence. It appears that this anomaly is a better conductor than either the fence post or the tree. It is not known at what depth this anomaly occurs; however, typically the depth range of this instrument is approximately 10 ft.

CONCLUSIONS

Based on the results of the EM-31 and EM-61 geophysical surveys, several anomalies were identfied which may have been caused by metallic objects being present. Some, if not all, may be related to surface cultural features at or near the ground surface. Given the site conditions, it is difficult to discriminate these interferences from any potential buried waste containers. There was no signature of disturbed soils or numerous buried metallic objects that would indicate a former burial site. However, the possibility that one anomaly shown on Figure 2 may represent a buried container cannot be ruled out.

All of the aforementioned anomalies can be relocated on the ground to an accuracy of +/- 1 to 5 m, using a GPS and a hand-held metal detector without a base station, should that become necessary.

If you have any questions regarding these findings, please do not hesitate to contact either Jeff Warren, at 717-944-5501, or me, at 937-431-2239.

Respectfully submitted,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
Kathryn L. Dominic

(no attachments)