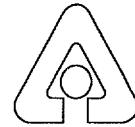


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**Contamination Source Review for Building E7995,
Edgewood Area, Aberdeen Proving Ground, Maryland**

**Energy Systems Division
Argonne National Laboratory**



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Contamination Source Review for Building E7995, Edgewood Area, Aberdeen Proving Ground, Maryland

M.N. Booher, G.A. Miller, A.K. Draugelis, M.A. Glennon, J. Rueda, and R.E. Zimmerman

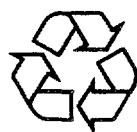
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**Contamination Source Review
for Building E7995, Edgewood Area,
Aberdeen Proving Ground, Maryland**

by

M.N. Booher, G.A. Miller, A.K. Draugelis,
M.A. Glennon, J. Rueda, and R.E. Zimmerman

Summary

This report was prepared by Argonne National Laboratory (ANL) to document the results of a contamination source review of Building E7995 at the Aberdeen Proving Ground (APG) in Maryland. This report may be used to assist the U.S. Army in planning for the future use or disposition of this building. The review included a historical records search, physical inspection, photographic documentation, geophysical investigation, investigation of hazardous materials facilities, and review of available records regarding underground storage tanks associated with Building E7995. The field investigations were performed by ANL during 1994 and 1995.

Building E7995 (APG designation) is located on Carroll Island in APG's Edgewood Area. The building was used as an enclosed, semi-permanent, controlled velocity test chamber. Building E7995 was constructed in 1953 and placed on inactive status in 1973; it has been unoccupied since that time.

The physical inspection and photographic documentation of Building E7995 were completed in November 1994. At the time of the inspection, the building had been removed; only the concrete floor slab and foundation were still present.

In December 1994, ANL staff conducted geophysical surveys in the immediate vicinity of Building E7995 by using several nonintrusive methods. Survey results suggest the presence of some underground objects near Building E7995, but they do not provide conclusive evidence of the source of geophysical anomalies observed during the survey.

No information regarding air quality associated with Building E7995 was available.

One hazardous materials facility, a 500-gal-capacity underground storage tank, is associated with Building E7995.

On the basis of information collected and reviewed for Building E7995, it is the authors' judgment that the anomalies identified in the vicinity of Building E7995 during the geophysical surveys warrant further investigation and evaluation. The concrete floor and foundation appeared to pose no potential environmental concern. The underground storage tank identified during the

investigation should be evaluated under the guidance of the Comprehensive Environmental Response, Compensation, and Liability Act.

1 Introduction

The U.S. Army Aberdeen Proving Ground (APG) commissioned Argonne National Laboratory (ANL) to conduct a contamination source review to identify and define areas of toxic or hazardous contaminants and to assess the physical condition and accessibility of APG buildings (Brubaker et al. 1994). The information obtained from the review may be used to assist the U.S. Army in planning for the future use or disposition of the buildings. The source contamination review consisted of the following tasks: historical records search, physical inspection, photographic documentation, geophysical investigation, investigation of potential hazardous materials facilities (HMFs), and review of available records regarding underground storage tanks. This report provides the results of the contamination source review for Building E7995.

Located on Chesapeake Bay in Harford and Baltimore counties, Maryland, APG occupies approximately 30,000 acres. The facility is divided into the Aberdeen and Edgewood areas (Figure 1). The primary mission at APG has been the testing and evaluation of U.S. Army warfare materials. Since its beginning in 1917, the Edgewood Area of APG has been the principal location for chemical warfare agent research, development, and testing in the United States. APG was also used for producing chemical warfare agents during both world wars and has been a center for the storage of chemical warfare material (Nemeth 1989).

Many of the APG facilities constructed between 1917 and the 1960s are no longer used because of obsolescence and their poor state of repair. Because many of these buildings were used for research, development, testing, and/or pilot-scale production of chemical warfare agents and other military substances (such as incendiary materials or munitions containing these materials), the potential exists for portions of the buildings to be contaminated with these substances, their degradation products, and other laboratory or industrial chemicals. These buildings, and associated structures or appurtenances (e.g., underground or aboveground storage tanks, pipes, sumps), may contribute to environmental concerns at APG.

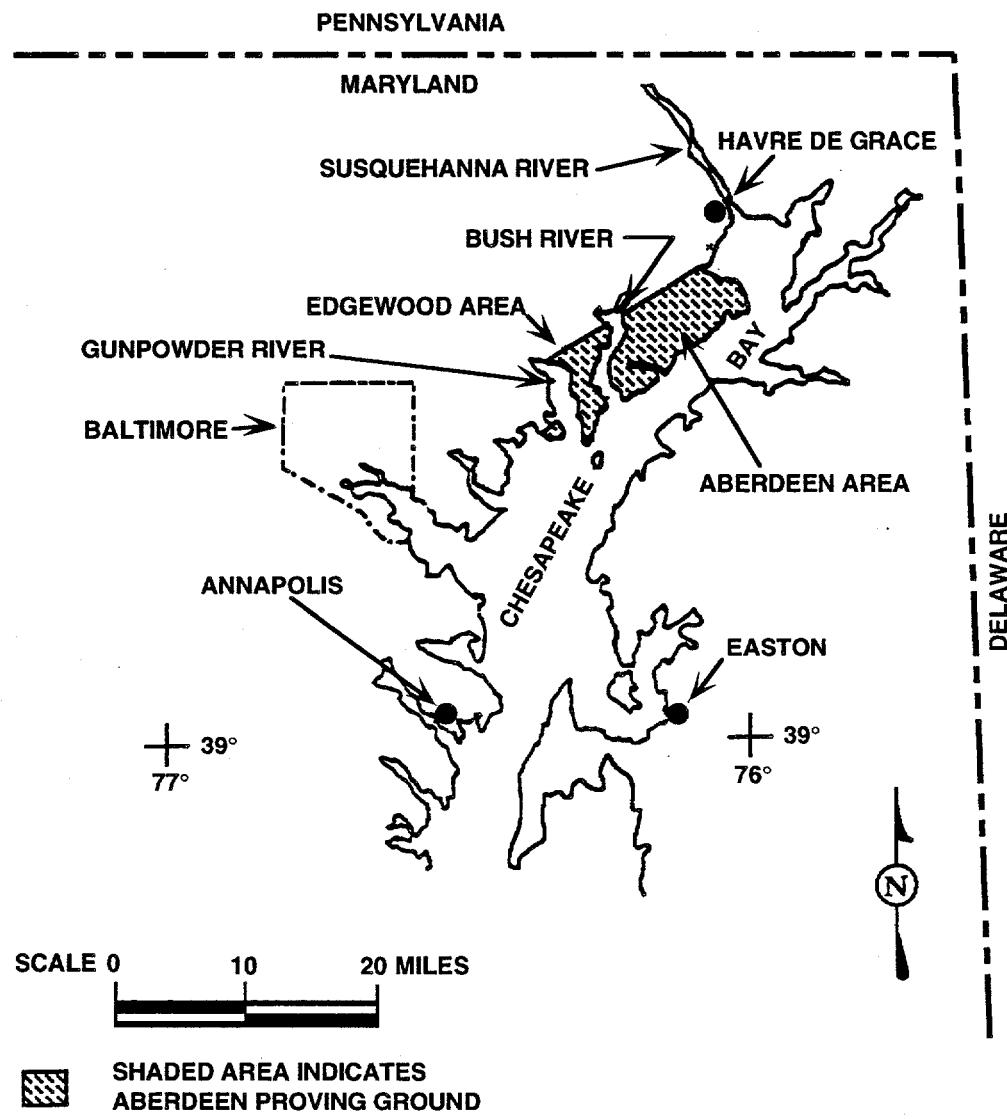


FIGURE 1 Map of Aberdeen Proving Ground Location

2 Methodology

Before the detailed building inspection, ANL personnel made a preliminary site visit to locate the building foundation and obtain building records from APG, identify potential issues to be addressed in the health and safety plan, resolve any access restriction issues, and identify required support services.

Photographs were taken of the building's foundation during the building inspection in November 1994. The area around Building E7995 was examined during December 1994 by using several nonintrusive geophysical survey methods, including total field magnetics, electrical conductivity (EM-31), time-domain electrical induction (EMF or EM-61), and ground-penetrating radar (GPR) techniques.

No air quality information for Building E7995 was collected during this investigation.

ANL conducted field investigations of HMFs located in and around buildings at APG, including Building E7995 (Cobo 1994). The field investigations consisted of reviewing historical descriptions of HMFs, identifying HMF locations, and sampling liquids present in the HMFs for each of the buildings included in the survey.

Detailed descriptions of the methodologies used for the geophysical and HMF investigations are provided in the appendices to this report.

3 Historical Record Search

Building E7995 was constructed in 1953 on Carroll Island and was used as an enclosed, semi-permanent, controlled velocity test chamber (wind tunnel) until 1973 (EAI Corporation 1989).

The type of operations conducted at the building included the following: research and development, evaluation of the functional efficiency of munitions, protective ensemble evaluation, alarm evaluation, animal kill rate, aerosol behavior studies, determination of the efficiency of thermoregulation devices, calibration of new sampling equipment, testing of the vapor effectiveness of agents, static diffusion chamber studies, protective mask studies, and controlled exposure of animals to chemical agents (EAI Corporation 1989).

The types of potential contaminants associated with Building E7995 include mustard, bis (2-chloroethyl) sulfide, ethyl n, n-dimethyl phosphoramidocyanide, isopropyl methyl phosphonofluoridate, pinacolyl methyl phosphonofluoridate, GF, o-ethyl s-(2-diisopropylaminoethyl) methylphosphonothiolate, EA 3995, EA 3834, 3-quinuclidinyl benzilate, and o-chlorobenzylidene malononitrile (EAI Corporation 1989).

A 500-gal-capacity underground tank containing ethylene glycol and water is located on the west side of the building. The ethylene glycol and water solution was used to cool the vacuum pump (Cobo 1994, EAI Corporation 1989). This tank was formerly used to store regulated hazardous substances that may have been contaminated with CS material (Cobo 1994).

Since the test site was closed (approximately 22 years ago), Building E7995 has been removed. At the time of ANL's field investigation, all that remained of the building were the concrete floor slabs and the foundation.

4 Site Description

Building E7995 has been removed; all that remains are the three concrete slabs that formed the building's floor and the associated foundation. Slab 1 measures 90 ft 2 in. long by 18 ft 8 in. wide and is 1 ft above the ground. Slab 2, located on top of slab 1, measures 74 ft 2 in. long by 9 ft 2 in. wide and 6 in. thick. Slab 3, located 16 ft from the southwest corner of slab 1, measures 18 ft long by 12 ft wide and is 1 ft above ground level.

The building site also includes seven free-standing concrete structures. One, on top of slab 3, measures 5 ft long by 1 ft 9 in. wide and 6 in. thick. The remaining six free-standing concrete structures are located on the northeast end of slab 1. Two of the structures measure 5 ft long by 2 ft wide and 2 ft high. Each of the remaining four structures measures 8 ft long by 1 ft wide. Their heights are 2 ft 6 in., 3 ft, 3 ft 6 in., and 4 ft 6 in.

4.1 Location

Building E7995 is located on Carroll Island in the Edgewood Area of APG (Figure 2).

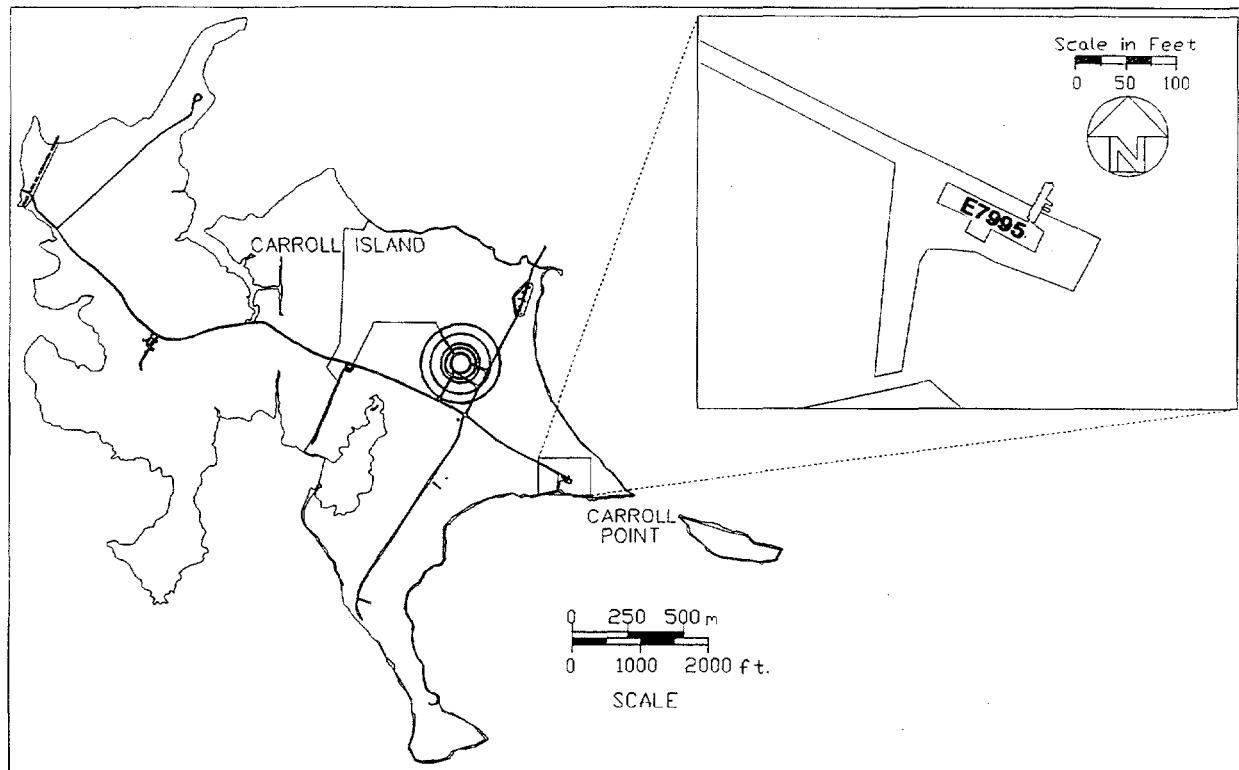


FIGURE 2 Location Map of Building E7995

4.2 Proximity to Other Buildings

No other buildings are located nearby.

4.3 Building Structure

Building E7995 has been removed. At the time of this investigation, all that remains of Building E7995 is the concrete floor slab and, possibly, underground foundations. Figure 3 presents a building floor slab plan, as surveyed at the time of ANL's inspection. Figures 4 and 5 provide photographs of the building slabs.

4.4 Exterior Dimensions

The concrete slabs measure 90 ft 2 in. long on the north and south sides. The east and west sides measure 18 ft 8 in. long. A connected concrete slab on the south side of the foundation, 16 ft from the southwest corner, measures 12 ft wide by 18 ft long.

4.5 Topography

The area directly surrounding Building E7995 is flat and dry. The building is near the shoreline on Carroll Island.

4.6 Vegetation in the Immediate Vicinity

The area directly surrounding Building E7995 consists of thick vegetation, including tall grasses, weeds, and various trees.

4.7 External Aboveground Structures or Equipment

None.

4.8 Connections with Adjacent Buildings

None.

FIGURE 3 Building E7995 Floor Plan

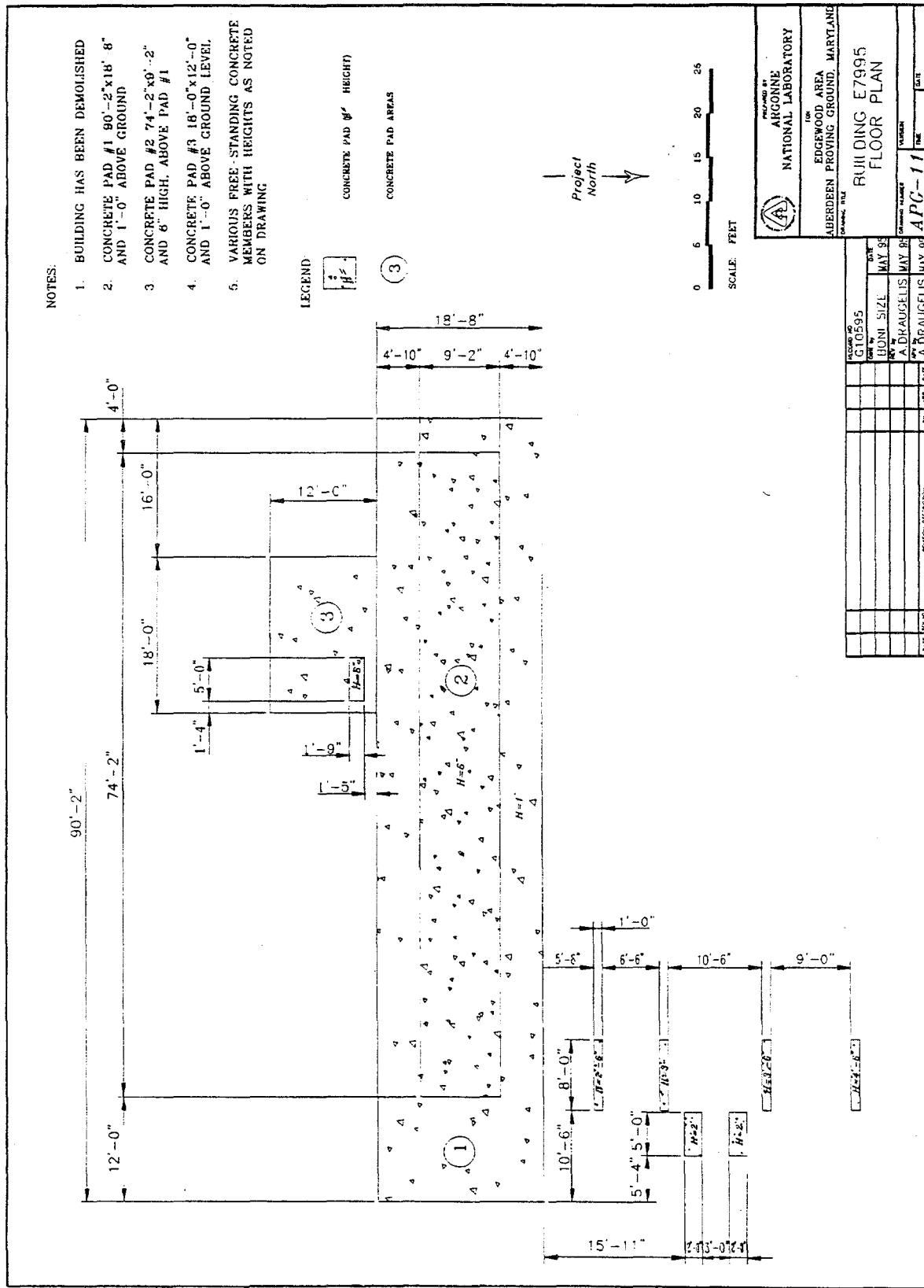






FIGURE 5 Photographs of Building Foundation — North, West, and East Views

4.9 Underground Structures

None.

4.10 Surface Drainage System

None.

4.11 Utility Access Points

None.

4.12 Exterior Piping

None.

4.13 Nearby Roads and Sidewalks

None.

5 Geophysical Investigation

ANL geophysical staff surveyed the area around Building E7995 by using several nonintrusive geophysical survey methods (see Section 2).

Results of the geophysical surveys revealed the following:

- Linear magnetic, EMF, and conductivity anomalies observed between (90, 200) and (135, 138) are probably caused by a buried metal pipe or utility. Isolated GPR hyperbolas, detected along this lineation at at least two transects, suggest that this feature is shallowly buried.
- Linear magnetic, EMF, and conductivity anomalies were observed along the road at $y=160$, between the edge of the slab and the northeastern limits of the geophysical survey area. GPR anomalies, EMF lower coil positives, and EMF coil difference positives also occurred along $y=160$ beneath the slab. The source depth, estimated from EMF and magnetic observations, is less than 2 ft. The sources of these anomalies are a buried metal pipe and, to a lesser extent, amphibolitic road bed material.
- Two linear EMF lower-coil positives extend from the edge of the slab along $x=140$ and $x=200$. These anomalies are caused by buried metal.
- Magnetic, EMF, and GPR anomalies correlate with drains and cleanouts within the main slab. Anchor bolts along the periphery of the slab may account for some observed anomalies. However, sources for the other anomalies observed beneath the slab are unknown.
- EMF, conductivity, and GPR anomalies beneath the addition to Building E7995 suggest that the concrete is either reinforced by rebar, or is underlain by a large metal object.
- Sources of the point magnetic, EMF, and GPR anomalies observed throughout the geophysical survey area are unknown.
- Positive magnetic and lower-coil EMF anomalies and GPR hyperbolas were observed above the underground storage tank identified during an earlier geophysical survey. Geophysical anomalies were associated with known anthropogenic structures, such as wells and metal signs.

The geophysical surveys suggest the presence of some underground objects near the remains of Building E7995, but do not provide conclusive evidence of the sources of the anomalies detected.

6 Air Quality Monitoring

No air quality monitoring information is available for Building E7995.

7 Underground Storage Tanks

One hazardous materials facility (HMF) associated with Building E7995 has been identified (Cobo 1994). The HMF, located on the south side of the building adjacent to the concrete pad, was identified as a 500-gal-capacity underground storage tank (Cobo 1994). The location of the HMF is marked by two 2-in.-diameter pipes at ground level, just east of the concrete pad. A comparison of the analytical results of samples collected from the tank with characteristics for RCRA hazardous waste revealed that the contents of the HMF were not hazardous. No subsurface investigation was performed at Building E7995 because Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities are planned as part of the overall investigation strategy for the Edgewood Area.

On the basis of our review of historical records and HMF-content analytical results, it was determined that the HMF located at Building E7995 is not regulated under the Underground Storage Tank Program directed by the Maryland Department of Environment (MDE) (Cobo 1994). All HMFs at Carroll Island will be investigated under CERCLA guidance, as agreed by the MDE in its November 4, 1993, letter to APG (Cobo 1994).

8 Conclusions

On the basis of information collected and reviewed for Building E7995, it is the authors' judgment that the anomalies identified in the vicinity of Building E7995 during the geophysical surveys warrant further investigation and evaluation. The concrete floor and foundation appeared to pose no potential environmental concern. One HMF, a 500-gal-capacity underground storage tank associated with Building E7995, should be investigated under CERCLA guidance.

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Appendix A:

**Final Report —
Environmental Geophysics:
Building E7995 Decommissioning,
Aberdeen Proving Ground**

**Final Report —
Environmental Geophysics:
Building E7995 Decommissioning,
Aberdeen Proving Ground**

Prepared by

M.A. Glennon, J.E. Stefanov, G. Keucher,
M.D. Thompson, and C.R. Daudt, M.A. Benson,

August 1995

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**Final Report — Environmental Geophysics:
Building E7995 Decommissioning,
Aberdeen Proving Ground**

Abstract

The former site of Building E7995 is a potentially contaminated area on Carroll Island, Aberdeen Proving Ground. The site was examined using several nonintrusive, geophysical surveys, including total-field magnetic, electrical conductivity (EM-31), time-domain electrical induction (EMF or EM-61), and ground-penetrating radar (GPR) techniques. All geophysical techniques detected a lineation between (90, 200) and the southwestern corner of E7995 at (135, 138). This anomaly is sourced by an underground metal pipe or utility. Linear magnetic, conductivity and EMF anomalies are detected along the amphibolitic road bed at Y=160 between the northeastern edge of E7995 and the northeastern edge of the geophysical survey area. EMF anomalies continue beneath the slab, where GPR hyperbolas are also observed, indicating that a metal pipeline exists beneath E7995. This pipeline extends beneath the road, draining into the wetlands to the east. Two linear EMF anomalies extend outward from the edge of the slab along X=140 and X=200 which could be sourced by metal drainage pipes. EMF, magnetic and GPR anomalies are observed above the locations of drains and cleanouts on E7995. Other anomalies are detected beneath the slab, however, their sources are unknown. Geophysical anomalies are observed at known anthropogenic sources, however, point magnetic, EMF and GPR anomalies with unknown sources are detected throughout the entire geophysical survey area.

1 Introduction

Environmental geophysics studies have been conducted at Building E7995, located on Carroll Island, Aberdeen Proving Ground (Figure 1). These studies were conducted by ANL staff in mid-December 1994.

According to the report by EAI Corp. (1989), Building E7995 was constructed in approximately 1953 as a controlled velocity test chamber (wind tunnel) for testing chemical agents. The facility was closed in 1973. The main building was constructed on a concrete foundation measuring 18 ft 8 in. \times 90 ft 2 in. Five drains and one cleanout are shown on this section of Building E7995. EAI Corp. lists one 12 ft 1 in. \times 18 ft 2 in. addition located on the southwest side of the main building which housed the control and equipment room. A scrubber was installed on northeast side of the wind tunnel building near the end of operation of the building. The location of an underground tank near the vertical pipes on the southwest side of the building was defined with a ground-penetrating radar survey conducted in 1993 (ANL 1994). At that time, chemical analysis of the tank's contents indicated that it was probably filled with

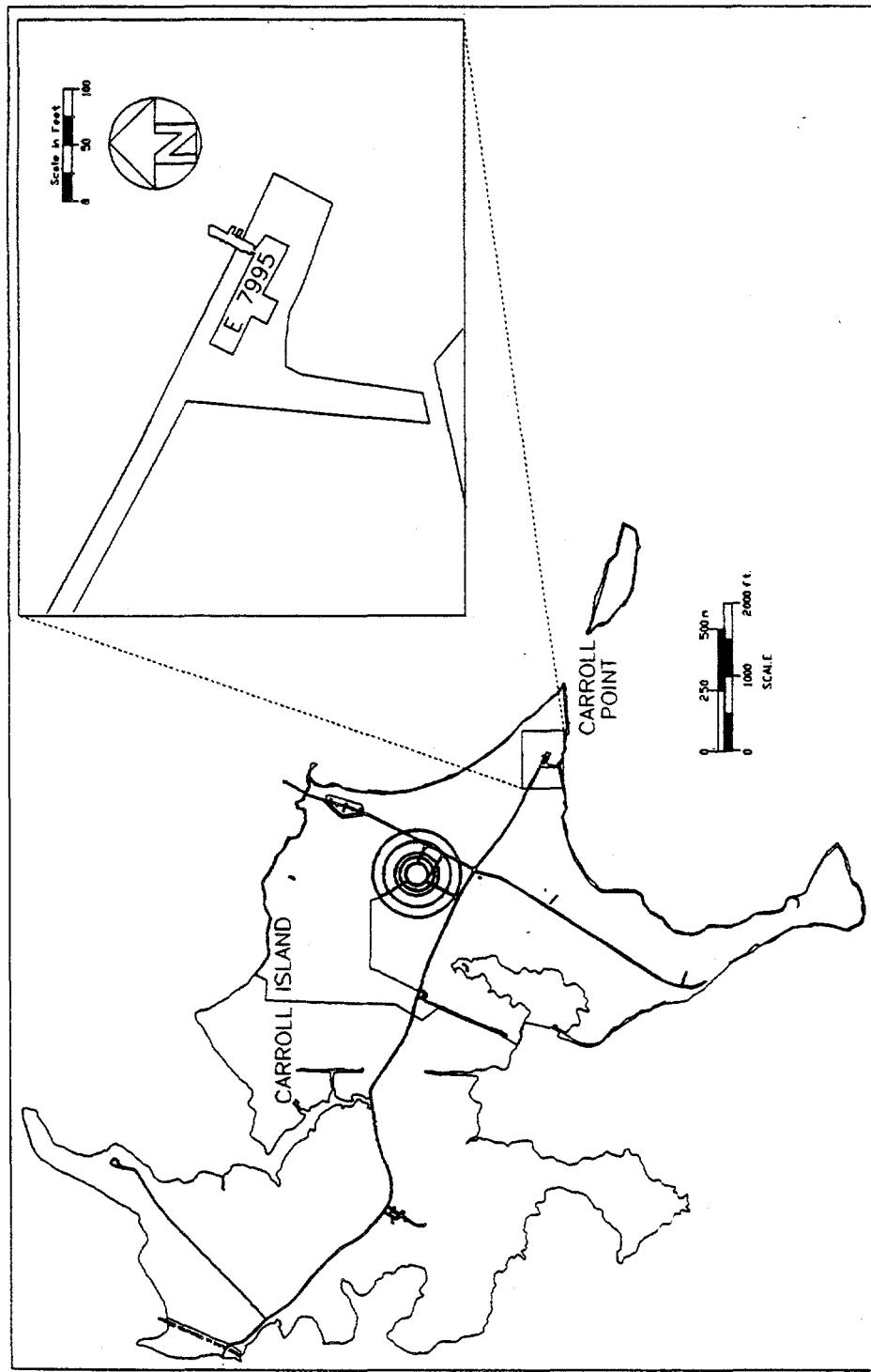


FIGURE 1 General Site Map of the Kings Creek Area, Aberdeen Proving Ground, Md

surface water or ground water by infiltration. However, during operation of the wind-tunnel, the tank was filled with ethylene glycol and water which was used to cool the vacuum pump. A natural drain and a sewer pipe serviced E7995 (EAI Corporation 1989).

Building operations included; R&D test facility, evaluation of munitions functional efficiency, protective ensemble evaluation, alarm evaluation, animal kill rate, aerosol behavior studies, determination of efficiency of thermoregulation devices, calibration of new sampling equipment, vapor effectiveness of agents, static diffusion chamber, protective mask studies, and controlled agent exposures of animals (EAI Corporation 1989). Between July 1964 and June 1973, 6557 trials were conducted. 1203.5 lbs of irritants, 30.6 lbs of anticholinesterase agents and 166.1 lbs of incapacitants were disseminated during this time window. The building was listed as potentially contaminated.

Immediately prior to the geophysical surveys, the building, addition and scrubber were demolished, leaving behind a concrete foundation and a series of six concrete footings that formerly housed the scrubber. A second concrete slab lies on top of the main building foundation. The drains within the foundation listed by EAI Corp. (1989) were not observed by ANL personnel, however, metal anchors were noted along the edge of the main building. Rebar was visible on the scrubber footings. The area directly surrounding Building E7995 is flat and is covered with thick vegetation, consisting of tall grasses, weeds, and various trees.

2 Instrumentation

A grid was positioned so that it's western grid corner was located at coordinates X=100, Y=100, and was oriented so that its axes were parallel to the edges of the building (Figure 2). Positive X and Y coordinates are measured approximately southeast and northeast of the starting coordinate (Figure 2). For convenience, a location of X=100, Y=150 will be represented as (100, 150). Within the geophysical survey area, physical properties of the subsurface were measured with four instruments along transects parallel to the X and Y axes. Instruments and transects include:

1. Continuously recording, total-field magnetometer (EG&G Geometrics G822L), with Y transects spaced 5 ft apart and X tie lines spaced 20 ft apart.
2. Geonics EM conductivity meter (EM-31), with Y transects spaced 5 ft apart and X transects spaced 20 ft apart.
3. Time-Domain Geonics EM (EM-61), designed for detection of metals, with Y transects spaced 5 ft apart and X tie lines spaced 20 ft apart.
4. Ground-Penetrating radar GSSI, with Y transects spaced 10 ft apart and X tie lines spaced 10 ft apart. The locations of GPR profiles and their assigned reference numbers are shown as dashed lines in Figure 3.

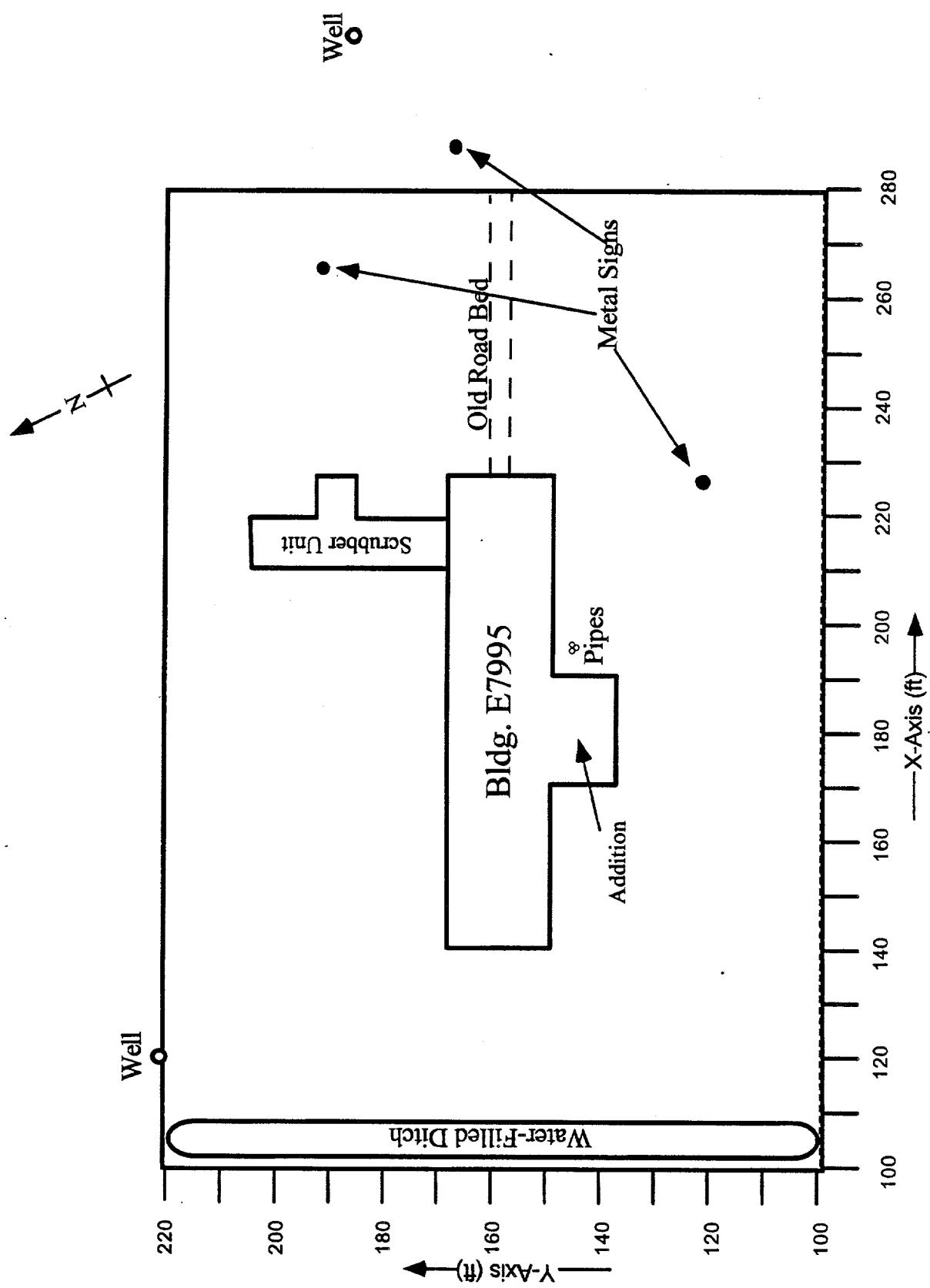


FIGURE 2 Detailed Location Map of Building E7995

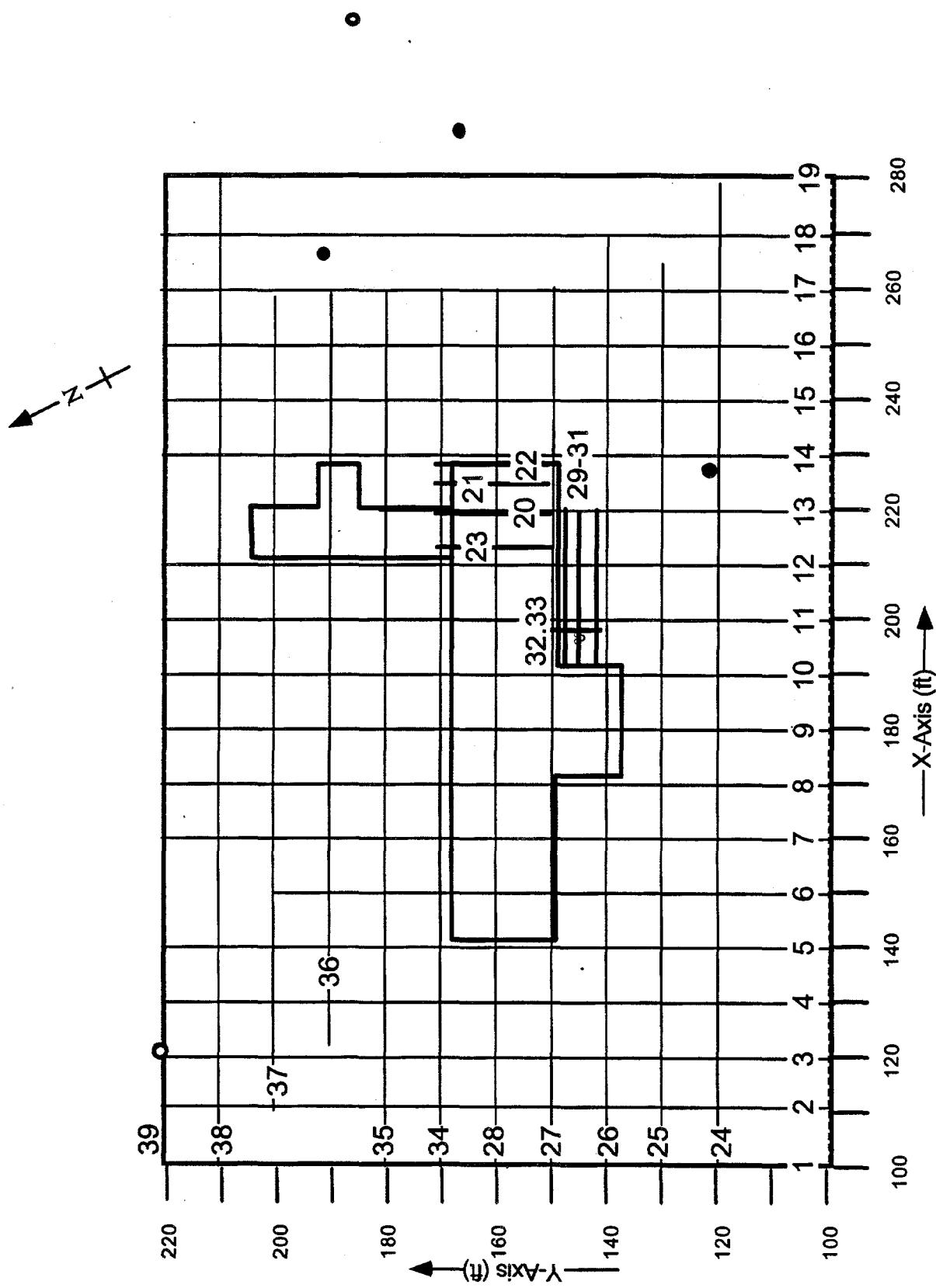


FIGURE 3 Map of GPR transects conducted near Building E7995

3 Total Field Magnetics: G-822L

The magnetic field measured around Building E7995 is shown in Figure 4 using a 100 nT contour interval. A diagonal magnetic high between (150, 140) and (130, 145) is parallel to and collinear with the magnetic anomaly near (90, 200). Along a similar trend, between these two clear anomalies, lies a series of small diameter magnetic highs and lows. The source of these anomalies are unknown.

Another lineation is defined by a series of high/low magnetic pairs along line Y=160 starting near the northeast side of the main building. Although this anomaly extends along an old road bed made of amphibolitic fill material, its amplitude (~1400 nT) is too large to be sourced by road fill alone (Figure 4). Therefore, a buried iron-rich source, such as a pipeline, must cause this anomaly.

Point magnetic anomalies are observed throughout the entire geophysical survey area. Several are caused by known anthropogenic sources such as metal signs at (260, 190), (290, 172), and (230, 120) and wells at (120, 220) and (310, 185). The positive anomalies on either side of the well at (310, 185) are gridding artifacts. High gradients cause the minimum curvature algorithm to overshoot. Magnetic anomalies larger than 5' in diameter are observed at (242, 115), (281, 185), (245, 200), (228, 210), (206, 210) and (162, 205). Other smaller-diameter point magnetic anomalies are listed in Table 2. The sources of these anomalies are unknown.

A complicated set of magnetic anomalies is observed on the foundation of E7995 (Figure 5). Magnetic highs and lows are observed on, or near each drain shown by EAI Corp. (1989). The cleanout is located on a linear magnetic high on the northwest edge of the slab. Metal anchor bolts were noted by ANL personnel along edges of the main slab. Although the exact locations of each bolt were not specified, these metal spikes could cause some of the magnetic anomalies along the periphery of the slab. Other magnetic anomalies with unknown sources are also observed on the foundation. The buried tank identified from an earlier geophysical survey near (195, 145) probably caused the observed magnetic high.

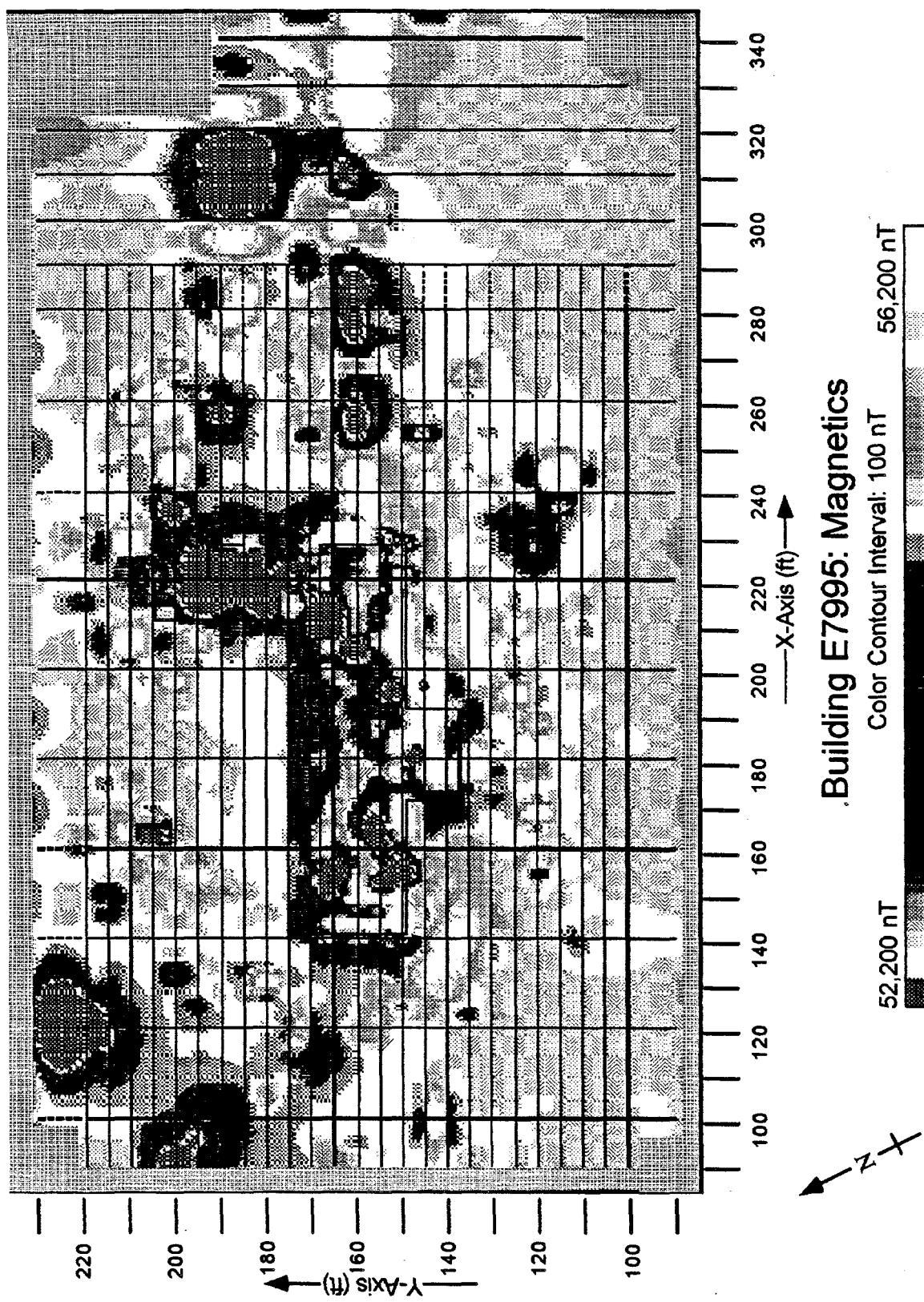


FIGURE 4 Total Magnetic Field Anomaly Map. Also depicted are the positions of data points collected along the geophysical profiles

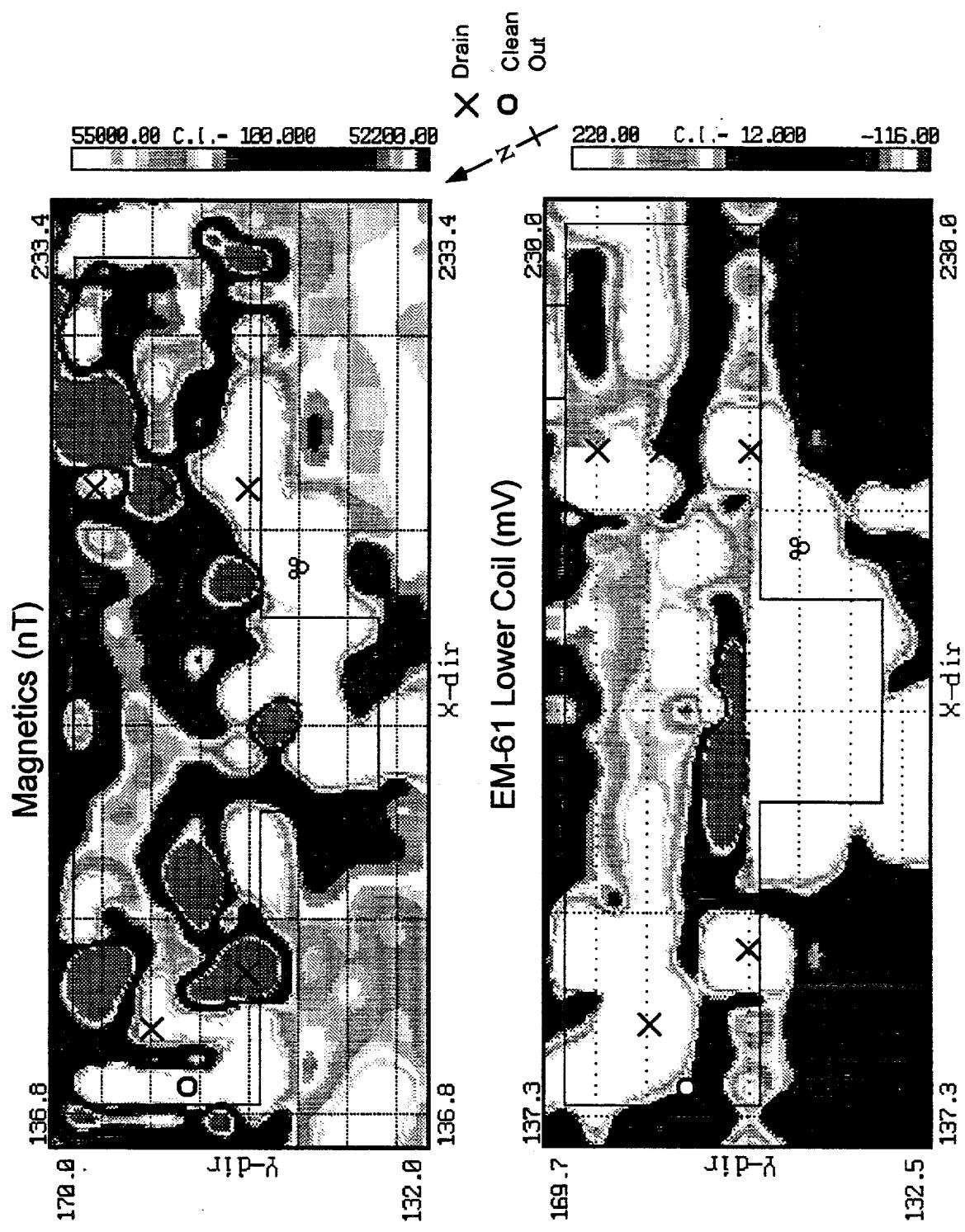


FIGURE 5 A. Total magnetic field anomaly and B. EM-61 Lower Coil Millivolt Anomaly map of the foundation of E7995

4 Terrain Conductivity Measurements: EM-31

Two illustrations (Figures 6 and 7) using orthogonal data sets are used to define conductivity anomalies because of the azimuthal bias inherent in the EM-31. Although metals are good conductors, their shape and orientation in relation to the azimuth of the EM-31 transmitter and receiver can result in an electromagnetic field in which the apparent conductivity, as read by the EM-31, is negative. Negative conductivities are an artifact of crossing high-conductivity gradients with the EM-31 boom. When crossed at right angles by the EM-31, an elongated piece of metal (such as a buried pipe or wire) will produce three banded anomaly lineaments. The lineaments will consist of a central minimum bounded by two maxima (Geonics Limited 1992).

The most likely source for the three-banded anomaly along a diagonal between (90, 200) and (140, 140) is a buried metal pipeline or utility (Figure 6). Other three-banded anomalies are observed beneath the slab of the addition at the southwest end of the wind-tunnel building and beneath the footings for the scrubber at the northeast end of the building (Figures 6 and 7). These anomalies could be sourced by reinforced concrete or unidentified buried metal. A conductivity low is detected along the amphibolitic road bed at Y=160 (Figure 7).

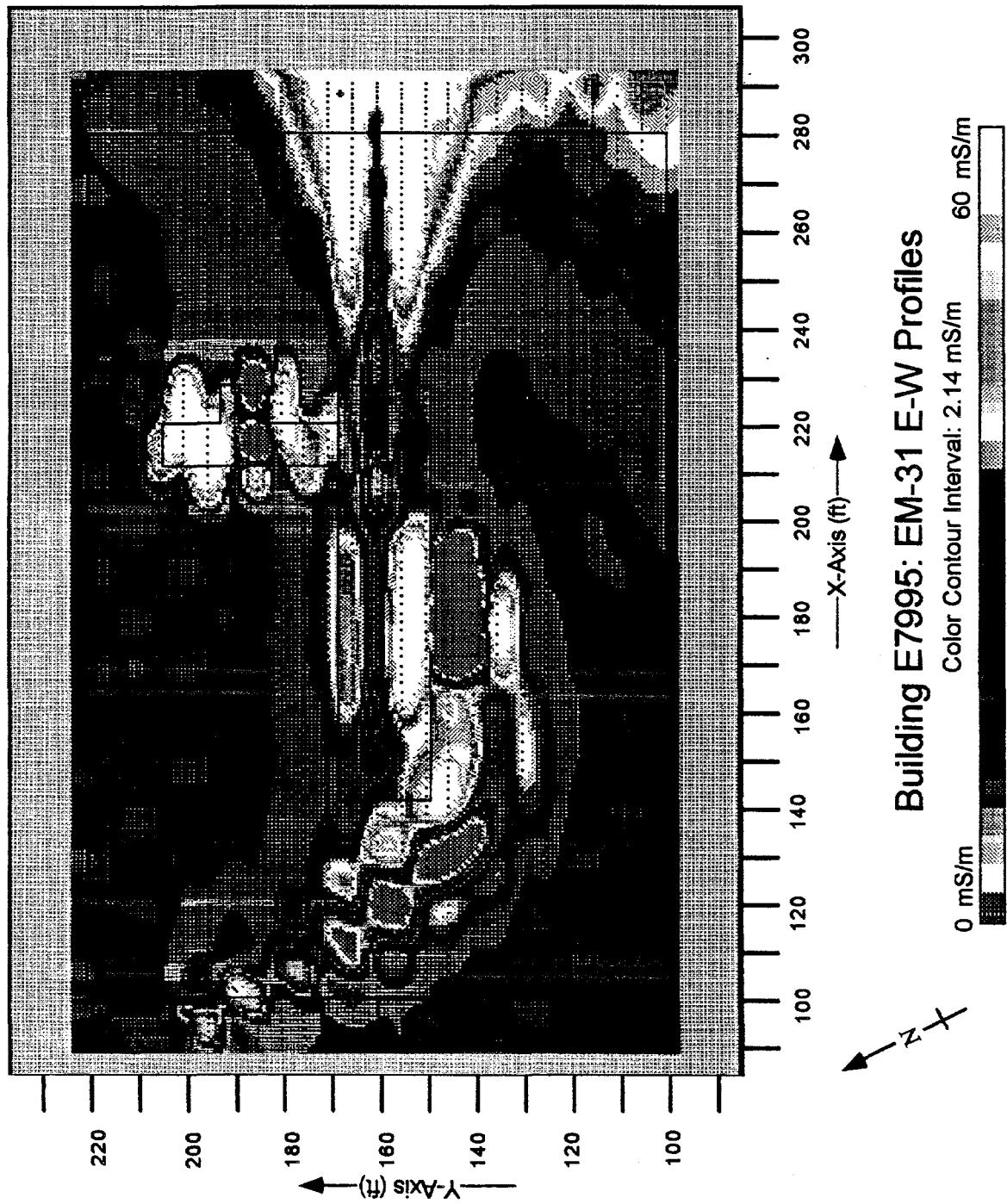


FIGURE 6 E-W EM-31 transects. Also depicted are the positions of data points collected along the geophysical profiles

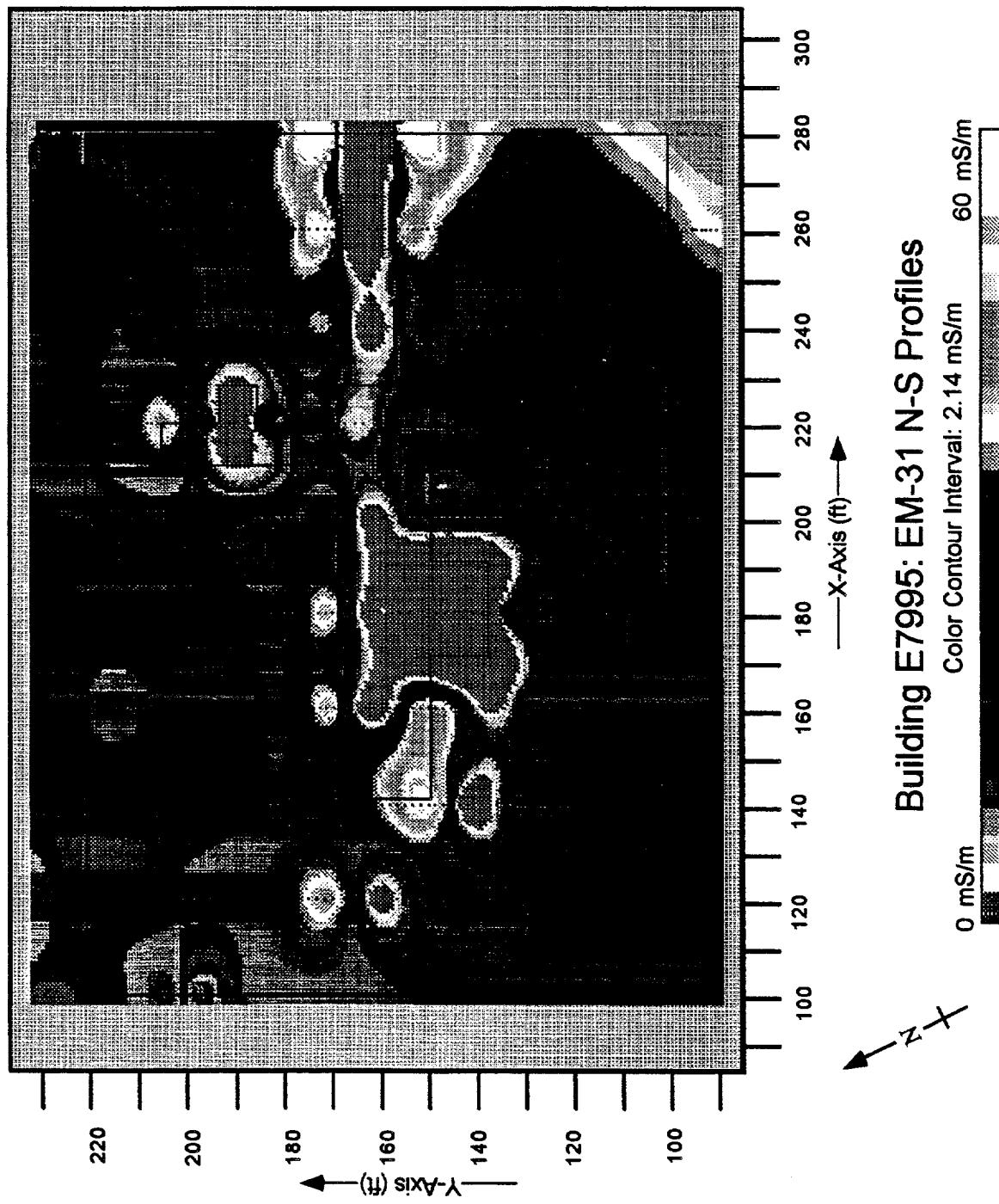


FIGURE 7 N-S EM-31 transects. Also depicted are the positions of data points collected along the geophysical profiles

5 Induced EMF Measurements: EM-61

An EM-61 electrical induction instrument transmits an electrical pulse into the ground and measures secondary EMFs caused by metallic objects beneath the instrument. As a consequence of its coil arrangement, it is relatively insensitive to surface interference and is more sensitive to deeply buried metallic targets. Data are recorded on three channels including a response from an upper coil, lower coil, and a coil difference. Because of its spatial positioning, the lower coil responds to signals from all depths within the instrument range. Data recorded on the coil difference channel are less sensitive to surficial debris. Negative values on the difference channel are often associated with metallic objects located above the surface (such as overhead steam pipes). A color-contour map constructed from EM-61 lower coil data is shown in Figure 8 and from EM-61 coil difference data in Figure 9.

Two prominent lineations dominate the observed EMF (lower coil) near Building E7995 (Figure 8). The narrow EMF positive anomaly observed along the diagonal between (200, 90) and (140, 140), near the western corner of the building is sourced by a buried metal pipeline or utility. Along Y=160, another lower coil EMF positive follows the old road made of amphibolitic fill, which typically produces an EMF positive. However, along Y=160 a positive EM-61 coil difference is observed from the northwestern edge of the slab to the northeastern edge of the survey area at X=300 (Figure 9). If buried metal is causing the signal along Y=160 beneath the slab, then buried metal, such as a pipeline, may also contribute to the observed signal along Y=160 northeast of the building.

A complex pattern of EMF anomalies covers the foundation of E7995 (Figure 5). The five drains listed by EAI Corp. (1989) correlate with EMF lower coil positive anomalies. Metal within or buried beneath the concrete probably cause these anomalies. Other EMF lower coil anomalies are observed beneath the slab. Metal anchors along the edge of the slab may explain some of these EMF positive anomalies. An EMF positive is observed at (195, 145), near the buried tank identified by an earlier geophysical survey.

Along X=140 between Y=170-190 and along X=200 between Y=114-140, linear positive EMF anomalies are observed on both the lower coil (Figure 8) and the coil difference (Figure 9) channels. These anomalies are sourced by buried metal. Notice that they adjoin the slab near the drains listed by EAI Corp. (1989) and could be sourced by metal drainage pipes.

Point EMF anomalies (lower coil, in Figure 8) are associated with the three metal signs in the survey area and the well at (120, 220). Other point EMF anomalies are observed throughout the geophysical survey and are summarized in Table 1. These anomalies are probably sourced by shallowly buried metal.

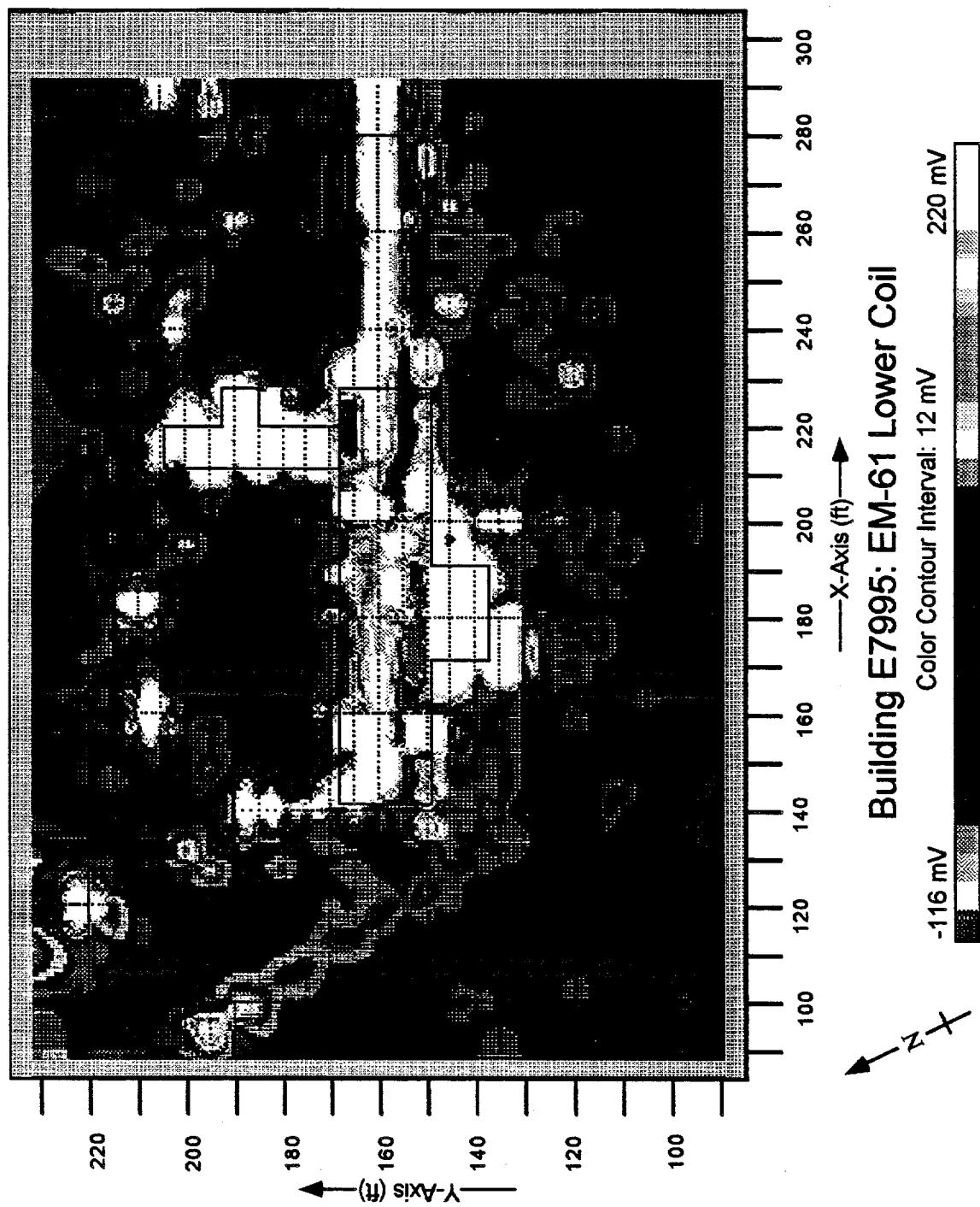


FIGURE 8 EM-61 Lower Coil Millivolt Anomaly Map. Also depicted are the positions of data points collected along the geophysical profiles

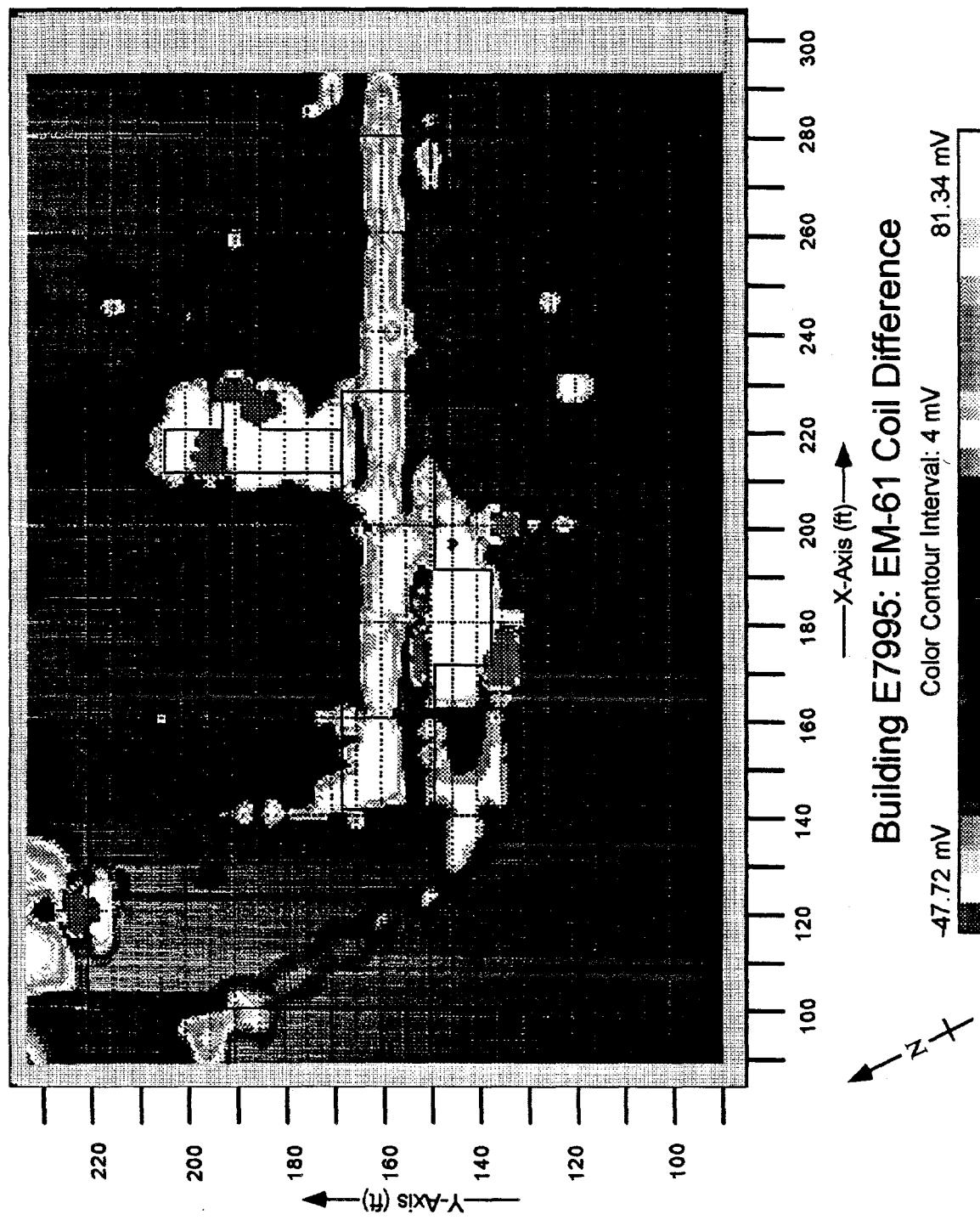


FIGURE 9 EM-61 Coil Difference Millivolt Anomaly Map. Also depicted are the positions of data points collected along the geophysical profiles

TABLE 1 List of anomalies observed near Building E7995

Coordinates		Geophysical Instrument*				Possible Origin
X	Y	MAG	EM-31	EM-61	GPR	
85-135	200-138	✓	✓	✓	✓	Source Unknown, possible metal pipe or utility
125-135	195-200			✓	✓	Source Unknown
262-275	145-150			✓		Source Unknown
140	170-190			✓	✓	Source Unknown, possible metal pipe
200	115-140			✓		Source Unknown, possible metal pipe
230-320	160	✓	✓	✓	✓	Source Unknown
100	142	✓		✓		Source Unknown
120	220	✓		✓		Well
130	180	✓		✓	✓	Source Unknown
140	110			✓		Source Unknown
148	195			✓	✓	Source Unknown
158	195			✓		Source Unknown
157	120	✓				Source Unknown
162	205	✓		✓	✓	Source Unknown
167	120	✓		✓	✓	Source Unknown
178	120	✓		✓		Source Unknown
185	210			✓		Source Unknown
188	120	✓				Source Unknown
194	110			✓		Source Unknown
194	125	✓				Source Unknown
197	200	✓		✓		Source Unknown
206	210	✓				Source Unknown
207	195	✓				Source Unknown
213	125	✓				Source Unknown
228	210	✓		✓		Source Unknown
228	120	✓		✓		Metal sign
235	150			✓		Source Unknown
242	115	✓		✓		Source Unknown
245	125			✓		Source Unknown
245	200	✓		✓	✓	Source Unknown
245	145	✓		✓		Source Unknown
254	170	✓				Source Unknown
260	190	✓		✓	✓	Source Unknown
257	210	✓			✓	Source Unknown
265	135	✓				Source Unknown
265	190	✓		✓		Metal sign
268	200	✓				Source Unknown
281	185	✓		✓		Source Unknown
285	195			✓		Source Unknown
290	172	✓				
288	205			✓		Source Unknown
310	185	✓				Well

* Shaded field indicates data were not collected at the location.

6 Ground-Penetrating Radar Measurements

Good penetration was observed over most of the site. Wave-velocity characteristics of near-surface materials were derived from tables of travel-time conversion to depth for various earth materials (Geophysical Survey Systems Inc. 1987). For example, the two-way conversion to depth for average soil is 7-9 ns/ft. As the degree of soil saturation increases, the two-way conversion to depth also increases which, in effect, decreases the maximum penetration depth. Clay also tends to decrease the maximum penetration depth. At Building E7995, a range setting of 80 ns was used for the entire survey. Due to unknown saturation conditions and subsurface heterogeneities, the depth of penetration with GPR at E7995 can range between 8 and 12 ft below the ground surface. For the purposes of this report, a maximum penetration depth of 10 ft was assumed.

The GPR transect along Y=150 outlines the foundation of E7995, in addition to several isolated GPR anomalies beneath the foundation of E7995. At about (205, 150), a large hyperbola correlates with the location of a known drain (Figure 10). Another smaller hyperbola at (158, 150) is observed near another drain listed by EAI Corp. (1989). On the other hand, strong GPR reflections are uniformly observed beneath the entire control room foundation, suggesting that either the control room's concrete slab is constructed of different material than the main slab, perhaps reinforced with rebar, or is underlain by a large object.

Isolated hyperbolas are observed near Y=160 at a depth of less than 2 ft along four of the five short GPR transects conducted over the northeastern edge of the foundation for E7995, forming an apparent lineation (Figure 11). This lineation has a magnetic, conductivity and EMF counterparts and must be sourced by buried metal. A hyperbola was also detected near (195, 145), above the location of the underground storage tank.

GPR anomalies are observed near the well and the metal signs. Strong GPR reflections are observed over the water-filled ditch on the northwest edge of the survey area.

Isolated hyperbolas are observed along GPR transects throughout the survey area. Without verification by another technique or by passing the antenna over an object of known depth, characteristics of radar anomalies may only be inferred. However, where anomalies are also seen with magnetic or resistivity profiling, a diagnostic interpretation of the radar anomaly is possible. Correlation of anomalies observed with GPR and with potential field methods will be discussed in the next section.

Y=150, File 27

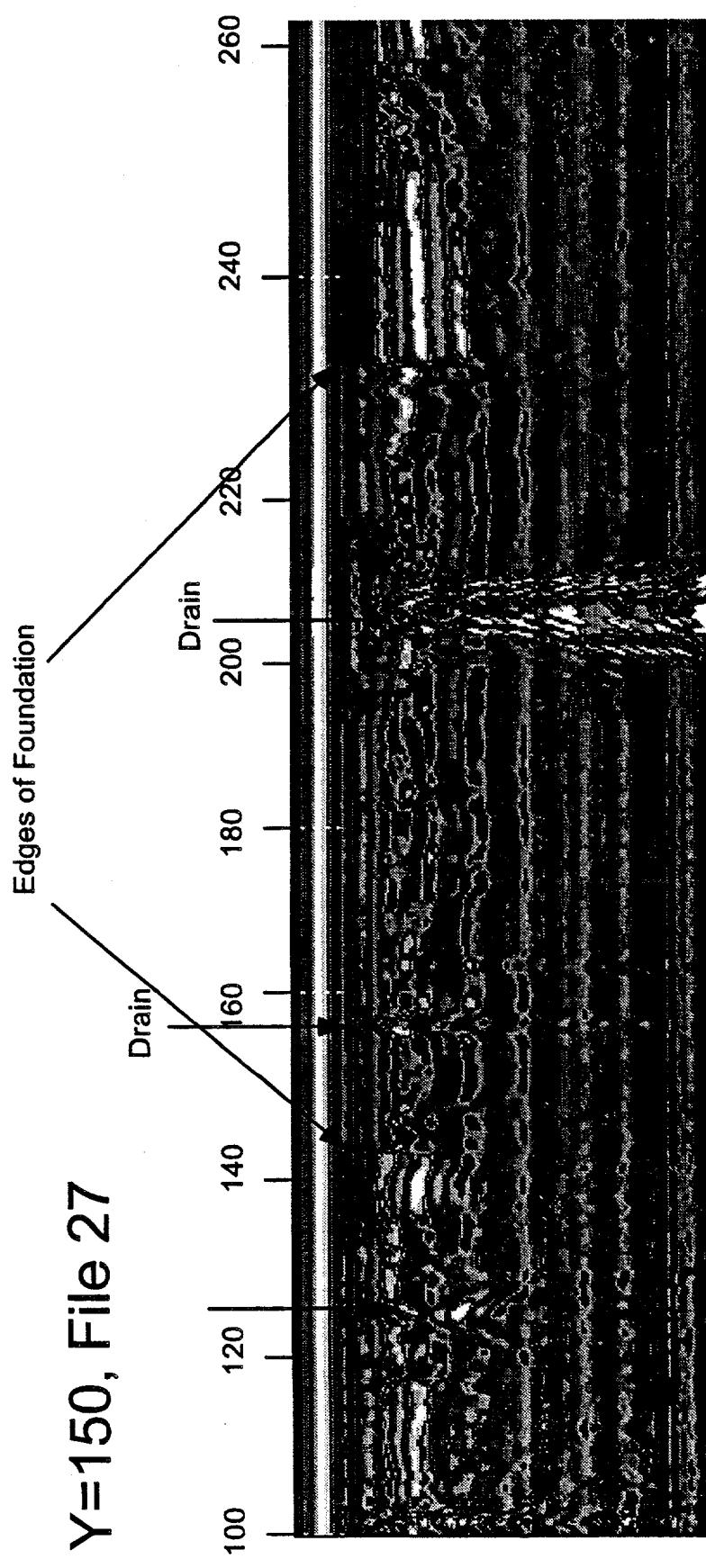


FIGURE 10 Ground Penetrating Radar Profile along Y=150

Line 21, X=225

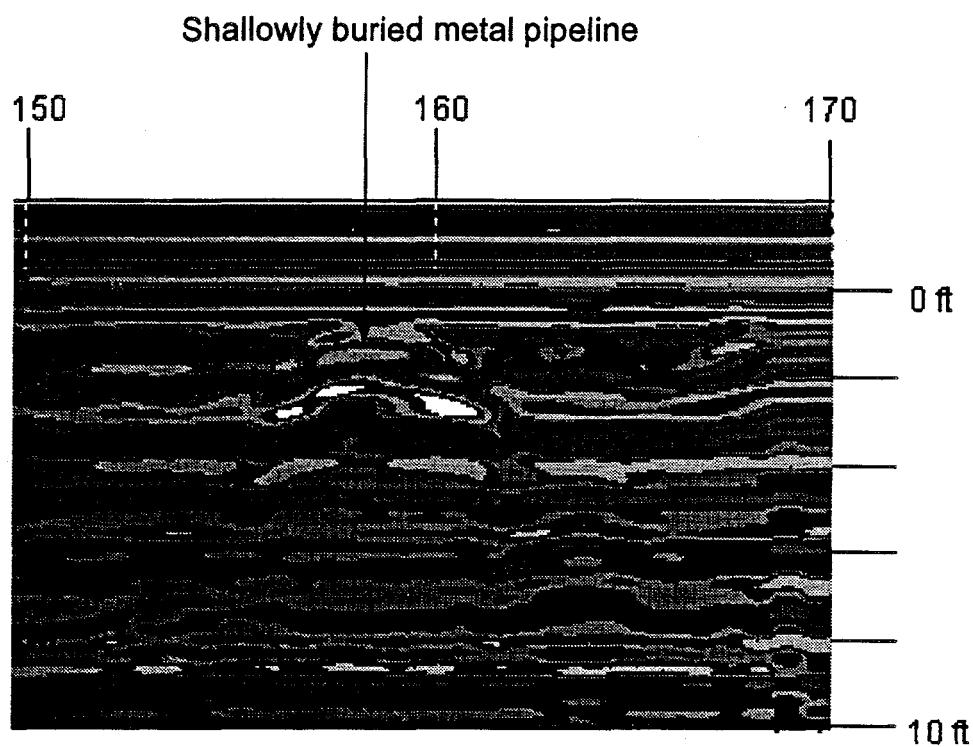


FIGURE 11 Ground Penetrating Radar Profile along X=225

7 Discussion

A list of the significant geophysical anomalies and their corresponding grid locations is given in Table 1. Not included are the anomalies observed on the foundation of E7995. Two lineations of significant length are observed within the geophysical survey area. Between (90, 200) and (135, 138), all geophysical methods detected a narrow linear anomaly. Isolated hyperbolas are observed along this diagonal lineation on at least two GPR profiles. This anomaly could be sourced by a buried metal pipe, or utility.

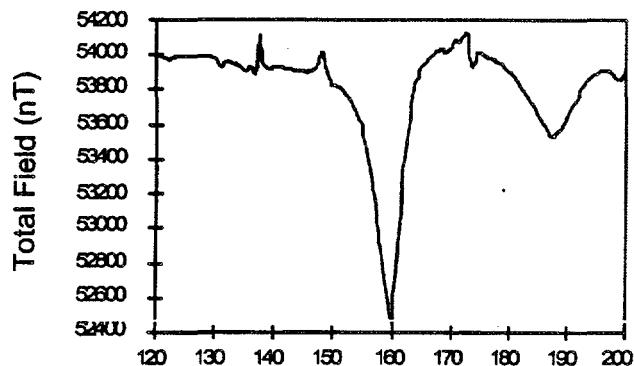
The second linear anomaly is observed along an old road made of amphibolite road fill along Y=160. Although small geophysical anomalies can be caused by the road, high amplitude magnetic anomalies, conductivity anomalies, EMF lower coil anomalies and EM-61 coil difference positive anomalies are observed along Y=160, suggesting a buried metallic source. In addition, positive EM-61 coil difference anomalies and isolated GPR hyperbolas are also observed within the slab, again suggesting a buried (metallic) source. Apparent depths, estimated from EM-61 profiles (Figure 12) conducted parallel to the X-axis, range between 1.0 and 1.7 ft (Pawlowski et al. 1995). GPR profiles yield similar results (Figure 11). Apparent depths to the center of the target estimated from magnetic profiles data are greater than 2 ft (Figure 12). This anomaly is probably sourced by a shallowly buried pipe draining into the wetlands to the east.

The locations of known drains and cleanouts within E7995 are superimposed on the magnetic and EMF anomaly maps. Argonne personnel did not notice these features on the slab during the geophysical survey and it is not known if these drains were removed with the building. However, magnetic, EMF and GPR anomalies correlate with the locations of both the drains and the cleanout. In addition, linear EMF anomalies extend from the building near drains along X=140 and X=200, suggesting metal drainage pipes occur in this area. Metal anchor bolts were observed along the edges of the slab and could explain some of the other geophysical anomalies. However, the sources of many magnetic and EMF anomalies observed on the slab remain unknown. Magnetic, EMF and conductivity highs are observed near (195, 145), where a UST was identified by an earlier GPR survey.

On the other hand, EMF positives, three-banded conductivity anomalies and strong GPR reflections are observed beneath the slab of the addition at the southwest end of the wind-tunnel building. These anomalies could be sourced by reinforced concrete or by a large buried metal object. Rebar, noted by ANL personnel on the scrubber fittings, probably cause the observed EM-31, EM-61 and magnetic anomalies. Geophysical anomalies are also observed near wells and metal signs.

Isolated geophysical anomalies are scattered throughout the geophysical survey area and are too numerous to discuss each one. Many of these anomalies were detected by more than one geophysical technique and can not be ignored. Nevertheless, the sources of these anomalies are unknown.

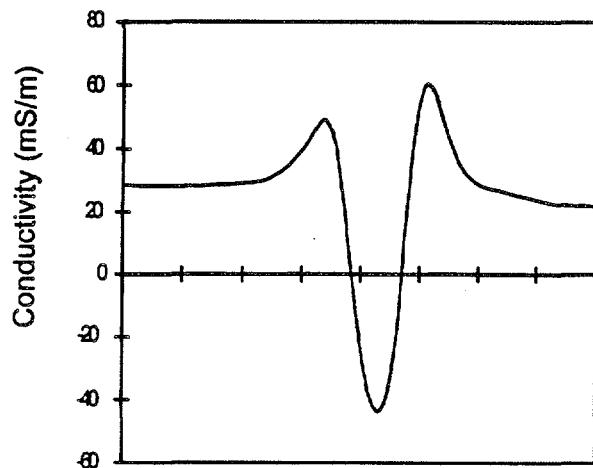
Bldg. E7995, Carroll Island Wind Tunnel

**Total Field Magnetics (nT)**

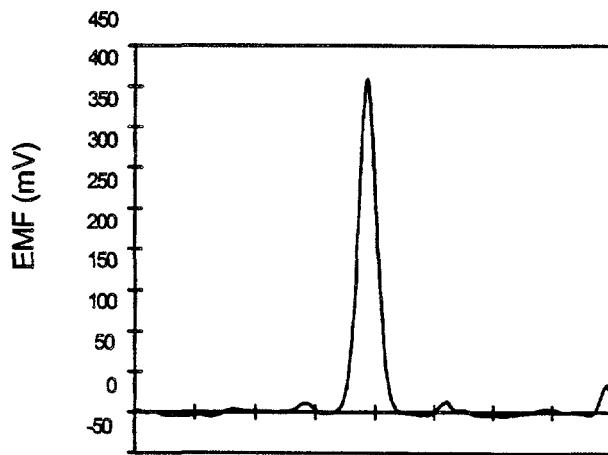
$$1.5 < x_{1/2} > 2.3$$

$$2 < z_C > 3$$

$z_C = x_{1/2} / 0.768$, assuming point anomaly and source magnetized in direction of current magnetic field.

**EM-31 (Conductivity mS/m)**

Can not predict

**EM-61 (EMF mV)**

Apparent depth~1.0-1.7 ft
(Pawlowski and others 1995)

FIGURE 12 Geophysical profiles along X=260 showing widths of the linear anomaly along Y=160

8 Conclusions

Site geophysical surveys consisting of total field magnetics, EM-31 conductivity, EM-61 millivolt, and ground-penetrating radar around Building E7995 permit the following conclusions:

- Linear magnetic, EMF and conductivity anomalies observed between (90, 200) and (135, 138) are probably sourced by a buried metal pipe or utility. Isolated GPR hyperbolas, detected along this lineation by at least two transects, suggest that this feature is shallowly buried.
- Linear magnetic, EMF and conductivity anomalies are observed along the road at Y=160 between the edge of the slab and the northeastern limits of the geophysical survey area. GPR anomalies, EMF lower coil positives and EMF coil difference positives also occur along Y=160 beneath the slab. The source depth, estimated from EMF and magnetic observations, is less than 2 ft. These anomalies are sourced in large part by a buried metal pipe, however, a contribution from the amphibolitic road bed material is also present.
- Two linear EMF lower coil positives extend from the edge of the slab along X=140 and X=200. These anomalies are sourced by buried metal.
- Magnetic, EMF and GPR anomalies correlate with drains and cleanouts within the main slab. Anchor bolts along the periphery of the slab may account for some observed anomalies. However, other anomalies are observed beneath the slab with no known source.
- EMF, conductivity and GPR anomalies beneath the addition to E7995 suggest that the concrete is either reinforced by rebar, or is underlain by a large metal object.
- Point magnetic, EMF and GPR anomalies are observed throughout the geophysical survey area. The sources of these anomalies is unknown.
- Positive magnetic and lower coil EMF anomalies and GPR hyperbolas are observed over the UST identified with an earlier geophysical survey. Geophysical anomalies are associated with known anthropogenic structures, such as wells and metal signs.

9 References

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Pawlowski, J. and others, 1995, An integrated approach for measuring and processing geophysical data for the detection of unexploded ordnance, Proceedings, SAGEEP '95, p. 965.

Appendix B:

**Field Investigation Results for
Building E7995, Edgewood Area,
Aberdeen Proving Ground, Maryland**

**FIELD INVESTIGATION RESULTS
FOR BUILDING E-7995,
EDGEWOOD AREA,
ABERDEEN PROVING GROUND, MARYLAND**

HMF Record Nos: 91686

Prepared by

**Reclamation Engineering and Geosciences Section
Energy Systems Division
Argonne National Laboratory**

Submitted to

**U.S. Army
Directorate of Safety, Health, and Environment
Aberdeen Proving Ground, Maryland**

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1 Introduction

Building E-7995 was constructed in 1953 on Carroll Island as an enclosed controlled-velocity test chamber (wind tunnel). The tunnel is divided into three sections: the mixing chamber, the test section, and the exhaust section, which comprises a blower and an exhaust stack. The wind speeds in the tunnel ranged from 2 to 20 mi/h. Testing was performed by spraying agent, from hand-held sprayers, at concentrations ranging from 10 to 500 mg/m³.

In the 1970s, a scrubber system was installed to allow use of the wind-tunnel fan. Effluent air was introduced into the scrubber chamber, passed through an ethylene glycol/water mist, and exhausted to the atmosphere. Two pump assemblies continuously recirculated the ethylene glycol/water scrubber solution. CS was the only material that was introduced into the scrubber system (U.S. Army CRDEC, undated).

The facilities on Carroll Island were shut down in June 1973. During its active life, Building E-7995 hosted extensive toxic agent work. The agent chamber was decontaminated after each test by using the appropriate decontaminate agent. An HMF containing ethylene glycol and water is located at the west side of the building. The ethylene glycol and water solution was used as a coolant for the vacuum pump.

The Consent Order identifies one HMF (No. 91686) as being associated with Building E-7995. Information provided in the Consent Order lists this HMF as a 500-gal capacity, ethylene glycol HMF, with an unknown installation date. This HMF was used to store regulated hazardous substances that may have become contaminated with CS material.

The project strategy was to investigate all HMFs suspected of non-UST Program activities under a separate Health and Safety (H&S) Plan. Because of the potential exposure to chemical warfare (CW) agent and radioactive isotopes from the non-POL HMFs during content sampling, DSHE provided specialists from the Chemical Operation Branch (COB) of ERDEC to complete the content-sampling. The H&S Plan required COB personnel to sample the non-POL HMFs while wearing the appropriate level of personnel protective equipment. The H&S Plan incorporated the POL-content-sampling techniques and procedures set forth in the original Work Plan to retrieve a representative sample of the liquid. The liquid sample was transferred to ERDEC's laboratory, which is located in Building E-3300. The HMF-content sample was analyzed for the CW agents GB, GD, GA, VX, and HD, before it was released to the commercial laboratory for analysis.

2 Results of the Geophysical Investigation

2.1 Establishment of Survey Coordinates

The geophysics survey area, shown in Figure 1, is located immediately south of the east side of Building E-7995. A detailed map of the survey area, which measures 12 ft \times 12 ft, is shown in Figure 2. Geophysical profiles and maps were constructed relative to a gridded array of painted marks and/or wooden stakes that were placed on the ground at the survey area and coded relative to position. Prior to the placement of the stakes, Schonstedt magnetic gradiometer sweeps were conducted to locate any surficial or shallow-buried metallic objects. Because of logistical considerations and local site conditions, no magnetic survey was conducted for Building E-7995.

2.2 Geophysical Observations

Ground-penetrating-radar measurements were conducted over 132 ft of traverse along 11 profiles. The lines were numbered in sequence and are listed in Table 1, along with the beginning and ending positions relative to the grid survey. The 500-MHz transceiver provided the best penetration and resolution at Building E-7995. A range setting of 40 ns was used for the entire survey area, at a scan rate of 32 scans per second.

Figure 3 shows the locations of GPR anomalies and the approximate depth range. The anomalies are interpreted as reflections from an HMF located in an area bounded by 7N, 11N, 2E, and 10E and buried at a depth of 2-3 ft. The depth is given as a range because the type of soil overlying the reflector and the propagation speed of the radar signal were unknown at the time of the survey. The GPR profile shown in Figure 4 illustrates the signature corresponding to the reflection from the anomalous feature interpreted as an HMF.

2.3 Geophysics Summary

The GPR technique has been successfully applied to locate a buried HMF at the survey area established at Building E-7995. Five GPR profiles revealed prominent reflections in the area bounded by 7N, 11N, 2E, and 10E. The data suggest the presence of an HMF buried 2-3 ft below the surface.

TABLE 1 Coordinates of GPR Profiles
Collected at Building E-7995

Line No.	Coordinates			
	Start		End	
	North	East	North	East
1	00	00	12	00
2	00	02	12	02
3	00	04	12	04
4	00	06	12	06
5	00	08	12	08
6	00	10	12	10
7	00	12	12	12
8	12	00	12	12
9	10	00	10	12
10	08	00	08	12
11	06	00	06	12

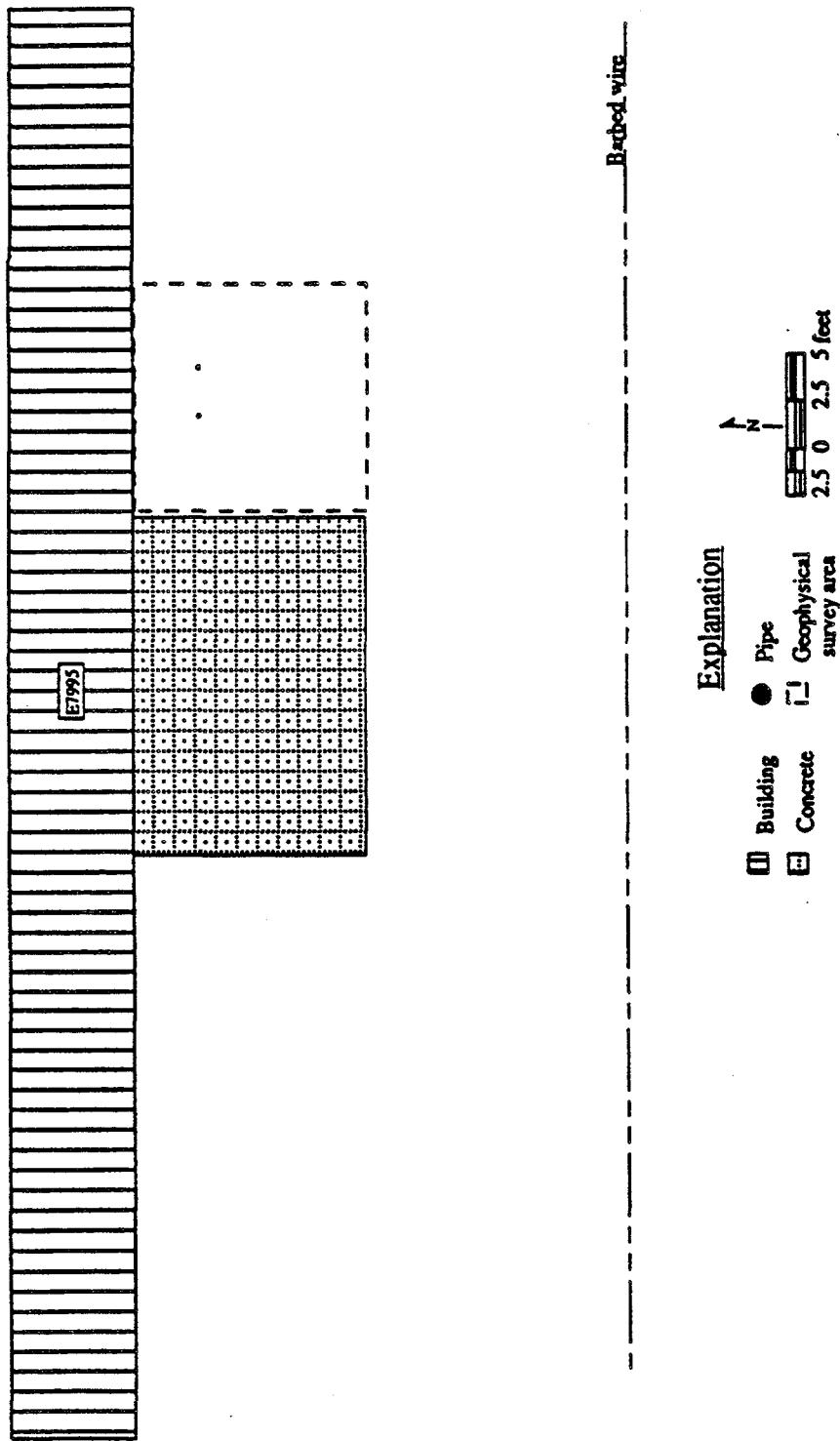
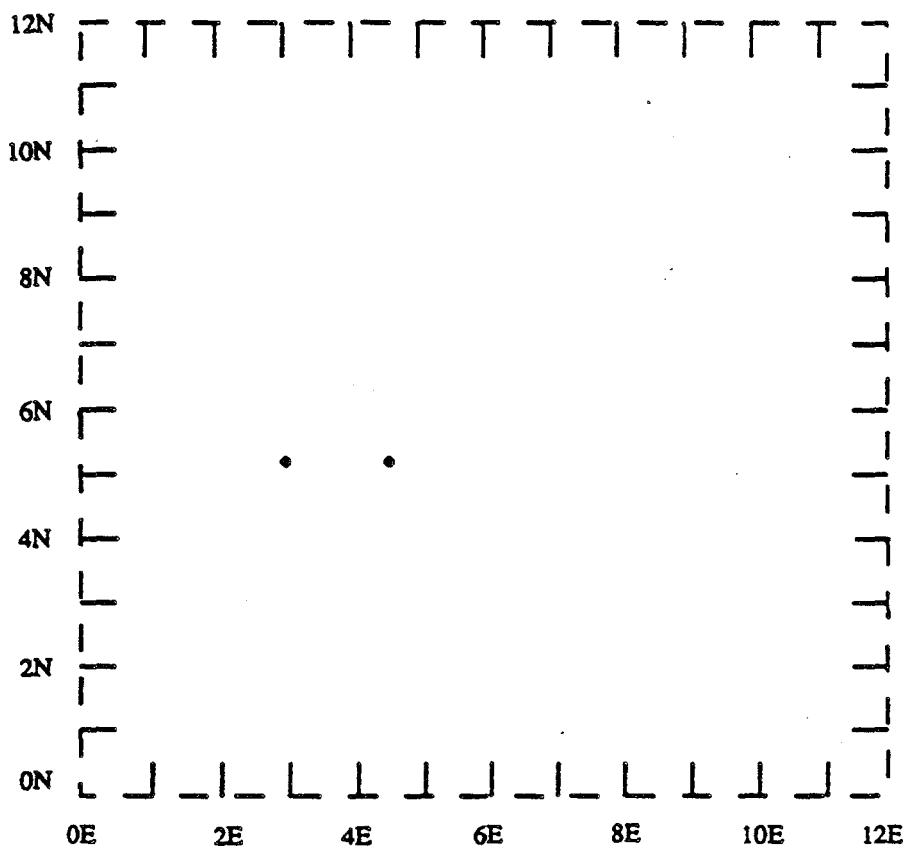


FIGURE 1 General Location Map of Building E-7995



Explanation

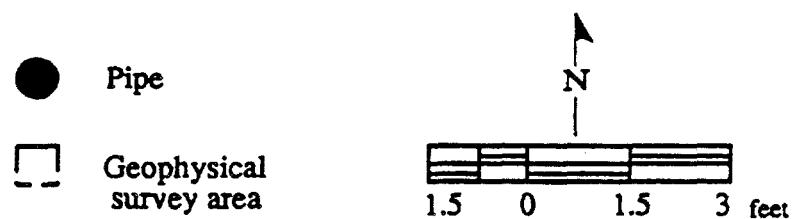
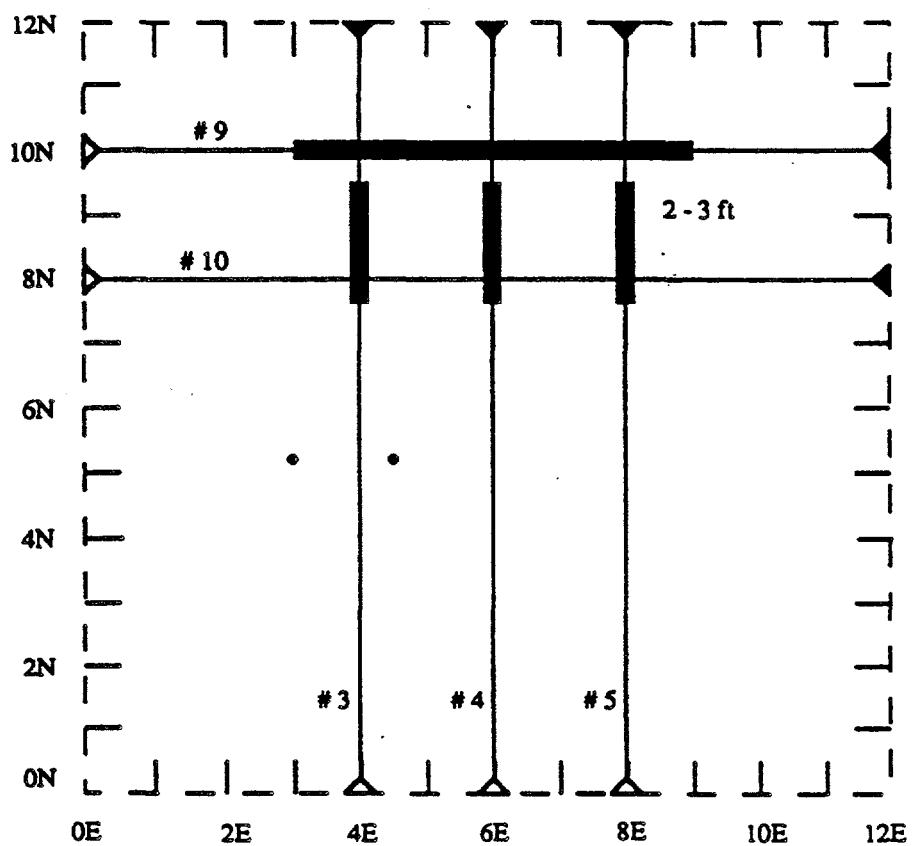


FIGURE 2 Location of Geophysical Survey Area for Building E-7995



Explanation

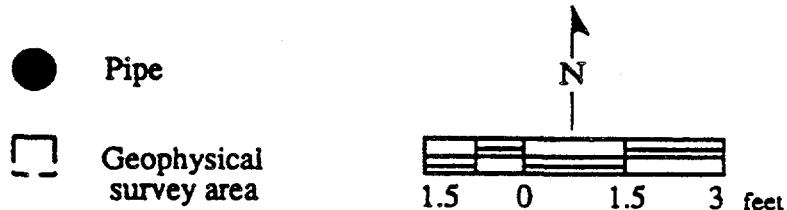


FIGURE 3 Location of GPR Anomalies over the HMF at Building E-7995

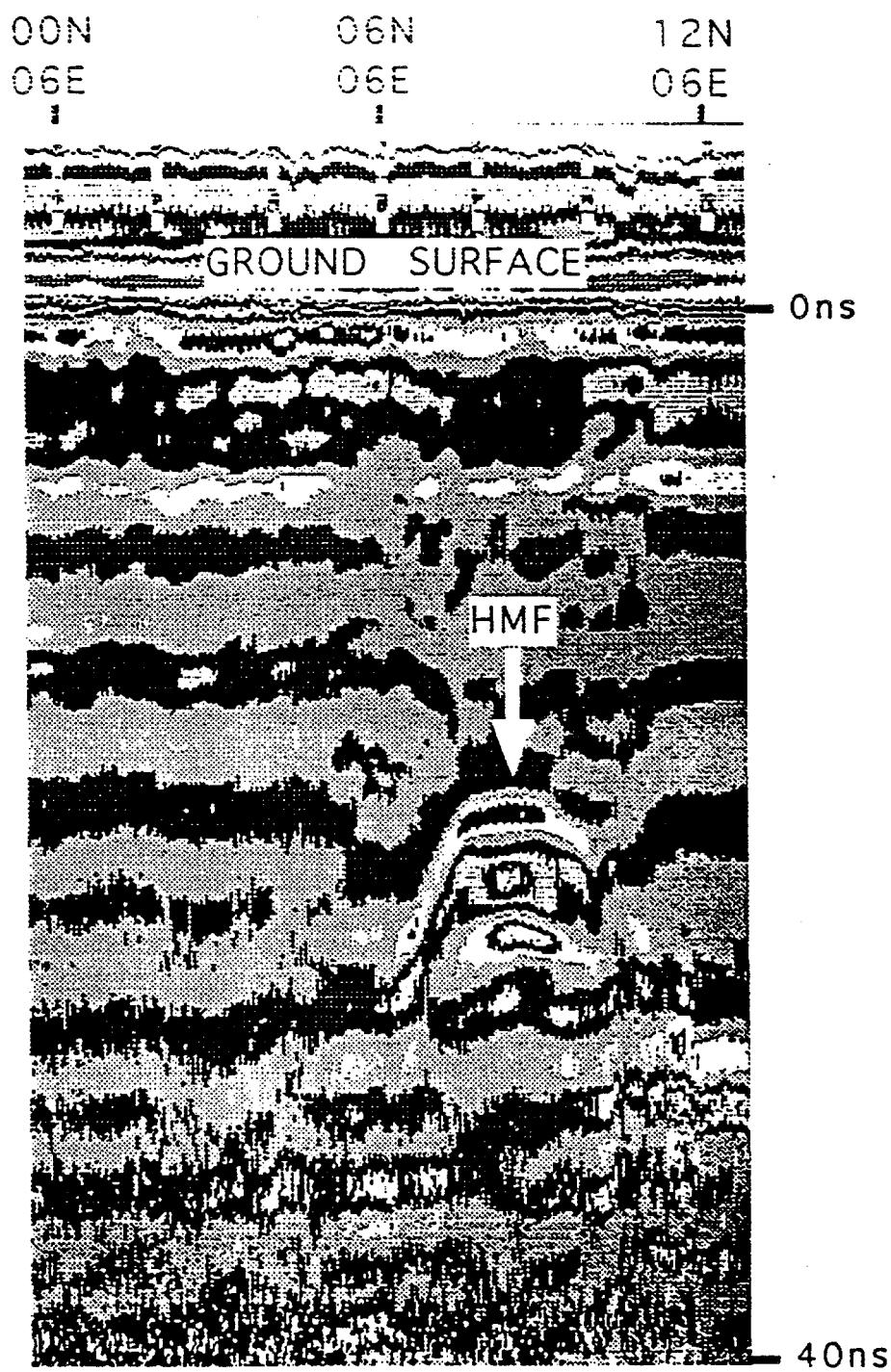


FIGURE 4 South-North Ground-Penetrating-Radar Profile over an HMF at Building E-7995 (The location of this profile is shown in Figure 3 as line No. 4.)

3 Results of the HMF-Content Analyses

Sampling of the content from the HMF at Building E-7995 began on December 6, 1993, through existing openings in the HMF. The COB sampling team strictly adhered to all provisions in the ANL- and APG-approved Work Plan and H&S Plan.

The HMF at Building E-7995 is located on the south side of the building adjacent to the concrete pad. The location of the HMF is marked by two 2-in. pipes at ground level, just east of the concrete pad. A peristaltic pump was utilized to retrieve the liquid samples. The tygon tubing was lowered down to the bottom of the HMF and then raised slowly to retrieve a representative sample. The samples were transferred to appropriate glass sample bottles.

The suspect CW-agent samples were analyzed by Eugene Vickers from the Analytical Research Team (SCBRD-RTC) using the standard operating procedures contained in Attachment A. The samples were tested for the presence of GA, GB, GD, VX, and HD. The instrument detection limit and method detection levels were determined for each sample. The instrument detection limit is defined as the minimum level that instruments can detect, taken directly from the calibration curve, whereas the method detection level is determined from a known amount of a pre-extraction spiked sample (spiked at midpoint of curve). The analytical results were negative for the presence of CW agents. A summary of the analytical results is presented in Attachment B.

The content of the HMF was *not* hazardous, as determined by comparison of the analytical results with characteristics for RCRA hazardous waste. The content was a liquid with a green tint, either surface-water or groundwater infiltrate.

4 Results of the Subsurface Investigation

No subsurface investigation was performed at Building E-7995 because regulated CERCLA activity is planned as an overall Edgewood Area strategy.

The Environmental Conservation and Restoration Division, under the Directorate of Safety, Health, and Environment, is implementing the Installation Restoration Program. U.S. EPA Region III and the MDE Waste Management Administration's Environmental Response and Restoration Program Office have regulatory responsibility and oversight of abandoned non-POL HMFs.

5 Conclusions and Recommendations

5.1 Conclusions

On the basis of a review of historical records and HMF-content analytical results, it is determined that the HMF located at Building E-7995 is not regulated under the UST Program directed by MDE. All HMFs at Carroll Island will be investigated under CERCLA guidance, as agreed to by the MDE in its November 4, 1993, letter to APG.

The HMF located at Building E-7995 was used to store ethylene glycol, a regulated hazardous substance that may have been contaminated with CS material.

5.2 Recommendations

The Environmental Conservation and Restoration Division, under the Directorate of Safety, Health, and Environment, is implementing the Installation Restoration Program. U.S. EPA Region III and the MDE Waste Management Administration's Environmental Response and Restoration Program Office have regulatory responsibility and oversight of abandoned non-POL HMFs.

On the basis of a review of the HMF content sample analyses and the regulatory responsibility stated above, all HMFs at Carroll Island will be investigated under CERCLA guidance, as agreed to by the MDE in its November 4, 1993, letter to APG.

6 Reference

U.S. Army Chemical Research, Development, and Engineering Center (CRDEC), undated,
Underground Storage Tank Management Program.

Attachment A:

**Standard Operating Procedure for Analytical Methods,
Chain of Custody, Analytical Request and Results,
Method Detection Levels,
and Minimum Detection Limits**

Standard Operating Procedure for Analytical Methods

The extraction procedures for analysis of aqueous samples from the HMFs for agents GA, GB, GD, VX, and HD are the procedures used in IOP No. 003.10, November 1991, with modification.

1.0 Experimental Procedure

- 1.1 Visually inspect the sample and note observations regarding color, consistency, and solids on data/notebook sheet.
- 1.2 Obtain two 200-mL aliquots of aqueous layer. One will be used for the spiked solution and one for the unspiked solution. The steps described below are performed on each aliquot.
- 1.3 Pour the aliquot into a clean beaker, mix, and check pH. Record pH.
- 1.4 Weigh out 4.0 g of NaCl and place in a separatory funnel. Add the 200-mL aliquot of filtered sample. Swirl the separatory funnel until the NaCl is dissolved.
- 1.5 Add 4 mL of chloroform to the 200-mL aliquot of sample in the separatory funnel. Agitate the separatory funnel contents for 1 min, and allow the layers to separate for a minimum of 3 min.
- 1.6 To prepare the spike sample, add 200 μ L of HD standard agent matrix spike solution and 75 μ L of GA, GB, GD, and VX spike solutions.
- 1.7 Drain the chloroform (bottom) layer into a clean, 15-mL centrifuge tube.
- 1.8 Transfer 1.0 mL of the spiked (or unspiked) solution to a 2-mL GC vial.
- 1.9 Add 100 μ L of internal standard solution (dibutylbutylphosphonate [DBBP] for VX, GA, GB, and GD and diethylsulfide [DES] for HD).

1.10 Cap the vial and store the sample in refrigerator at 4°C until ready for analysis.

2.0 Spiking and Chromatography Procedure

- 2.1 Sample extracts, standards in chloroform, and spiked site-background samples are received in the 2-mL sample vials and signed for. All of the standards and samples will contain the internal standards (IS) DBBP and DES of known concentration.
- 2.2 The samples are run in the gas chromatograph (GC), and the chromatograms are marked for identification. The peak areas and retention times for the internal standards and all agents detected are entered into a laboratory notebook.
- 2.3 The samples and standards are returned to the person from whom they were received. The chromatograms are given to the data coordinator.
- 2.4 The auto sampler needle and GC inlet septum are replaced after no more than 90 injections.

3.0 Calculations

- 3.1 The retention time index is a measure of column and instrument performance and is simply the retention time of the agent of interest divided by that of the internal standard.
- 3.2 Agent quantitation will be determined by using the response factor (RF) of the agent relative to that of the internal standard. The response factor is calculated during the calibration method as follows:

$$RF \text{ (Agent/IS)} = \frac{\text{Peak Area (Agent)} \times \text{Concentration (IS)}}{\text{Peak Area (IS)} \times \text{Concentration (Agent)}}$$

$$\text{where Concentration (agent)} = \frac{\text{Wt of sample}}{\text{Wt of Internal STD}} \times RF \times \text{area of sample}$$

4.0 Quality Control

- 4.1 The calibration curve will consist of duplicate injections of the agents, once each quarter. The samples are loaded in the auto-sampler tray in a random order.
- 4.2 For each analysis, a duplicate phase (oil, aqueous, solid) sample, a midpoint standard (two cocktails of G/H series and V series), a blank, and spiked phase (oil, aqueous, solid) samples will be run. The order of analysis in the auto-sampler tray will be

Position #1:	Blank
Position #2:	Mid-Pt (G/H Series)
Position #3:	Mid-Pt (VX Series)
Position #4:	Phase Oil (1) Sample
Position #5:	Phase AQ (1) Sample
Position #6:	Phase Solid (1) Sample
Position #7:	Phase Oil (2) Sample
Position #8:	Phase AQ (2) Sample
Position #9:	Phase Solid (2) Sample
Position #10:	Spiked-Phase Oil (1) Sample
Position #11:	Spiked-Phase Solid (1) Sample
Position #12:	Spiked-Phase Solid (1) Sample

- 4.3 The midpoint standards must be within $\pm 10\%$ of the calibration or the samples must be reanalyzed.
- 4.4 Maintain documentation of standard-curve concentrations, as well as maintain the internal standard concentration for each sample.
- 4.5 Record retention times for the standard midpoints and the internal standards.
- 4.6 Label and review each chromatogram prior to submission to the data coordinator.

- 4.7 Record the peak areas for the standard midpoints and for the internal standards.
- 4.8 Refer to IOP No. 014.10 "Quality Control and Data Validation Procedures" for related information.
- 4.9 The peak area of the internal standard will be monitored. The area should come within $\pm 10\%$ of its original response time calibration curves.
- 4.10 The retention time of the internal standard will be monitored. The time shall be within ± 5 seconds of its original response time.

MATERIEL COURIER RECEIPT		SHIPPER'S CONTROL/DOCUMENT NO <u>3340-1</u>		PRIVACY ACT STATEMENT		
SHIPPER <u>O.C. Due: E3832</u>	X120Z	SUPPLY ACCOUNT NUMBER		AUTHORITY: 34 U.S.C. Sec 552a (PL 92-373) PRINCIPAL PURPOSES: To provide a receipt for transfer of controlled material. The use of the SSAN is required and is necessary to provide positive identification of the individual retaining the material. ROUTINE USES: To document transfer of material from a shipper to a courier, thus erasing the SSAN of the shipper. DISCLOSURE IS VOLUNTARY: Since the SSAN must be used, refusal to provide SSAN may be grounds for action to remove the individual concerned from duties involving the material transferred or use of this form.		
DESTINATION <u>E-3300 E. Vicksburg, K. Semptana</u>		SUPPLY ACCOUNT NUMBER				
I certify by my signature that I have received the material listed on this form and am aware of the Army Materiel Safety and Security Requirements				SHIPMENT DESCRIPTION		
SHIPMENT TRANSFERS				LINE NUMBER	QUANTITY	SERIAL NUMBERS
FIRST	LOCATION OF TRANSFER <u>F 3302</u>	DATE (YR-MO-DAY) <u>13/12/06</u>		1	1 qt	<u>5A</u>
				2	1 qt	<u>6A</u>
						<u>Redo of Bldg 5188</u>
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.) <u>Supplier Kenzie M</u>				ORGAN OR ACCOUNT NO <u>SCARD-116</u>		
SIGNATURE <u>Janet H. H.</u>				SOCIAL SECURITY NUMBER <u>217-94-2666</u>		
SECOND	LOCATION OF TRANSFER <u>F 3302</u>	DATE (YR-MO-DAY) <u>12/8/06</u>				
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)				ORGAN OR ACCOUNT NO		
SIGNATURE				SOCIAL SECURITY NUMBER		
THIRD	LOCATION OF TRANSFER	DATE (YR-MO-DAY)				
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)				ORGAN OR ACCOUNT NO		
SIGNATURE				SOCIAL SECURITY NUMBER		
FOURTH	LOCATION OF TRANSFER	DATE (YR-MO-DAY)				
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)				ORGAN OR ACCOUNT NO		
SIGNATURE				SOCIAL SECURITY NUMBER		
FIFTH	LOCATION OF TRANSFER	DATE (YR-MO-DAY)				
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)				ORGAN OR ACCOUNT NO		
SIGNATURE				SOCIAL SECURITY NUMBER		

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22 MAY

PREVIOUS EDITION MAY BE USED UNTIL 31 DEC 87

ANALYTICAL REQUEST AND RESULTS		
TO: (Requester, please fill in name and address) Argonne National Laboratories		DATE 9 Dec 93
FROM: Analytical Chemistry Team, SCBRD-RTC		PHONE NO. 53121/52984
ANALYSIS OF (Structure or further description IF UNCLASSIFIED on reverse side):		
SAMPLE NO. 5A-7 and 6A (5188)		
TOXIC	NON TOXIC	MOL. WT.
DETERMINE: Presence of CW agents (GB, GA, GD, VX, and HD)		
RESULTS AS FOLLOWS BY: K. B. Sumpter		
Date: 6 December 1993		
Samples 5A-7 and 6A (5188) are negative for the presence of GA, GB, GD, VX, and HD. See attached sheet for method detection levels and instrument minimum detection limit.		
John F. Weinmaster JOHN F. WEINMASTER, Team Leader, Analytical Chemistry		DATE 5/12/93

SMCCR Form 49, 1 May 85 replaces ORDAR-CL Form 819, Apr 79 which is obsolete.

DATE RECD	6-Dec-93			
DATE OUT	8-Dec-93			
METHOD DETECTION LEVEL		INSTRUMENT MIN. DETECTION LIMIT		
SAMPLE				
5A-7		0.0140 ug/ml for GB	0.3176 ug/ml for GB	
		0.0066 ug/ml for GD	0.2979 ug/ml for GD	
		0.0066 ug/ml for GA	0.3111 ug/ml for GA	
		0.0074 ug/ml for VX	0.3404 ug/ml for VX	
		0.0116 ug/ml for HD	0.7868 ug/ml for HD	
6A (5188)		0.0156 ug/ml for GB	0.3176 ug/ml for GB	
		0.0066 ug/ml for GD	0.2979 ug/ml for GD	
		0.0078 ug/ml for GA	0.3111 ug/ml for GA	
		0.0095 ug/ml for VX	0.3404 ug/ml for VX	
		0.0066 ug/ml for HD	0.7868 ug/ml for HD	

Attachment B:

Analytical Summary Table for Building E-7995

HMF Record No: 91686

TABLE B.1 Content Sample Analysis Summary — Commercial Laboratory

Building Record #	Sample #	TCLP Results Above Detection Limit	Total Petroleum Hydrocarbons (ppm)			BTEX (ppb)						
			pH	Heating Oil	Diesel	Gasoline	Total	Ethyl Benzene	Toluene	Xylene	Total BTEX	
E7995	91686	PW1254	0.14Ba	8.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.6	<0.6	0.0

TPH Analysis methods performed according to SW-846 Test Methods for Evaluating Solid Waste BTEX Analysis performed using EPA methods 5030 & 8240 in accordance with SW-846, 3rd Edition All results expressed as parts per million (ppm) unless otherwise indicated.

