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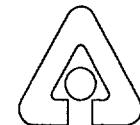
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**Contamination Source Review for Building E3641,  
Edgewood Area, Aberdeen Proving Ground, Maryland**

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**Energy Systems Division  
Argonne National Laboratory**



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## **Contamination Source Review for Building E3641, Edgewood Area, Aberdeen Proving Ground, Maryland**

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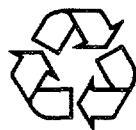
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**Contamination Source Review  
for Building E3641, Edgewood Area,  
Aberdeen Proving Ground, Maryland**

by

S.D. Zellmer, A.K. Draugelis, 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 E3641 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, and review of available records regarding underground storage tanks and hazardous materials facilities associated with Building E3641. The field investigations were performed by ANL during 1994 and 1995.

Building E3641 (current APG designation) is part of the Building E3640 Process Laboratory Complex located within the Kings Creek Area of APG's Edgewood Area. The complex was used as the developmental chemical process laboratory for surety items and "one-of-a-kind" experimental chemicals in support of the research and development community at Edgewood. Building E3641 contained the scrubber equipment that was used to remove toxic vapors produced in various laboratories in Building E3640. Building E3641 was constructed during 1953 and actively used until the complex was closed in 1978.

The physical inspection and photographic documentation of Building E3641 were completed by ANL staff during November 1994. The 43-ft by 19-ft building is a steel-frame structure with corrugated transite walls, a corrugated transite gable roof, and a concrete floor. The building comprises a single story and has no interior walls or partitions. At the time of the inspection, Building E3641 contained four 6-ft-diameter scrubber vessels (tanks) that extend through the roof of the building, electric-powered pumps, duct work, piping, and control panels associated with the scrubber system. The building also contained lighting fixtures, electrical conduits and panels, and steam heaters and associated piping. Some steam supply pipes are wrapped with suspected asbestos-containing insulation. A sump is located beneath the floor of the building.

ANL staff conducted geophysical surveys of the Building E3640 Complex during the winter of 1993-1994 by using nonintrusive methods. Survey results suggest the presence of some underground objects in the Building E3640 Complex, but they do not provide conclusive evidence of the source of geophysical anomalies observed during the surveys. None of the observed anomalies were in the surveyed areas within 40 ft of Building E3641.

No information regarding air quality at Building E3641 was available.

The sump beneath the floor of Building E3641 was sampled as part of the field investigation of Hazardous Materials Facilities (HMF) conducted by ANL. Two samples were collected in early 1994; the chemical agent Taban (GA) was detected in both samples.

No underground storage tanks are associated with Building E3641.

On the basis of the information collected and reviewed by ANL for Building E3641, it is the authors' judgment that the potential presence of suspected asbestos-containing insulation on steam supply pipes warrants further investigation and evaluation. HMF analytical results revealed the presence of GA in the sump beneath the floor of Building E3641. The caustic scrubber system and sump are designated Solid Waste Management Units (SWMUs); any future activities related to these SWMUs should follow remedial investigation guidelines established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

## 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 contamination source review consisted of the following tasks: historical records search, physical inspection, photographic documentation, geophysical investigation, and review of available records regarding underground storage tanks associated with each building. This report provides the results of the contamination source review for Building E3641.

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.

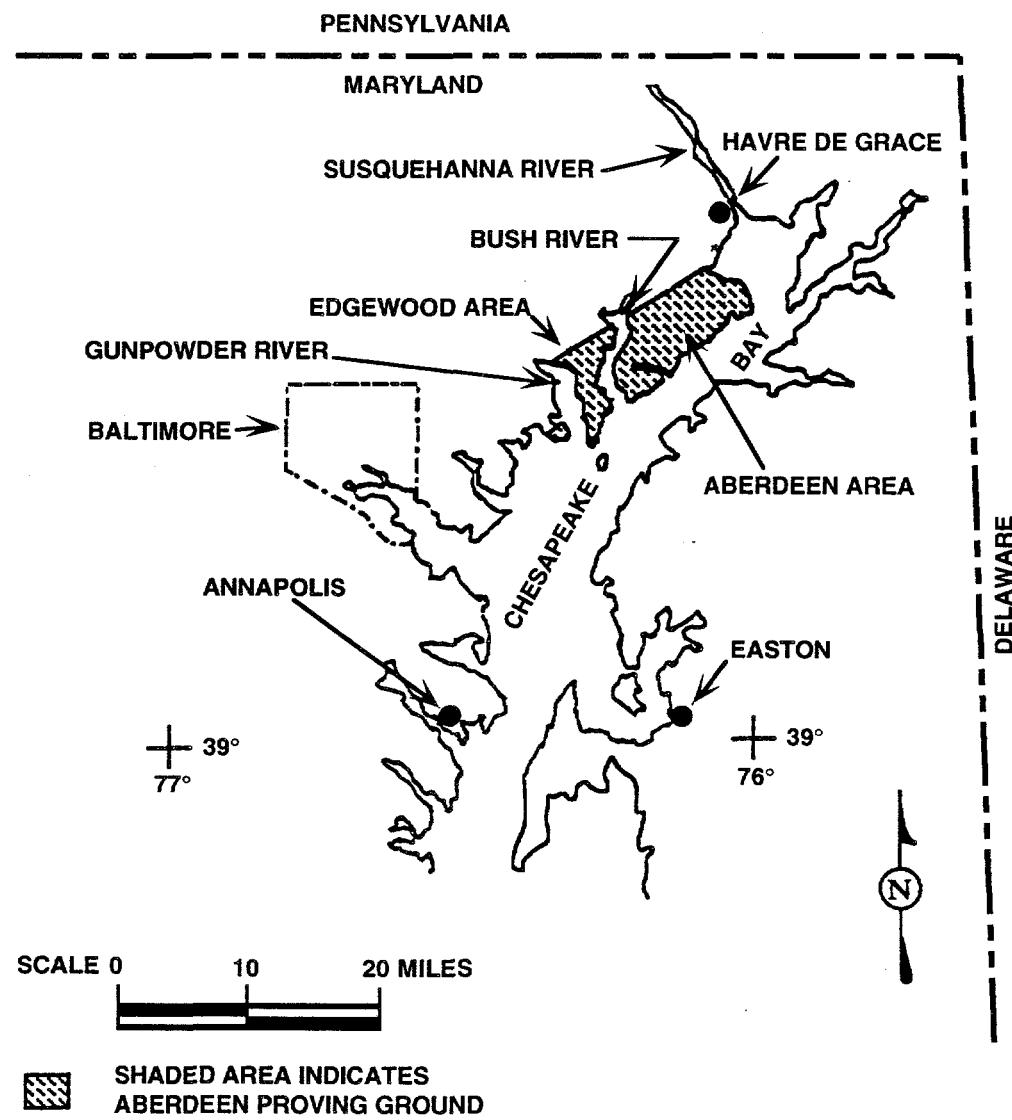


FIGURE 1 Map of Aberdeen Proving Ground Location

## 2 Methodology

Before the detailed building inspection, ANL personnel made a preliminary site visit to locate the building 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 exterior and interior surfaces during the building inspection in November 1994. The photographs followed a set sequence whenever possible. The exterior was photographed starting on the north side and continuing clockwise around the building; walls were photographed starting in the north or northwest corner of each room and continuing clockwise until reaching the starting point. The ceiling and floor of each room were also photographed.

The area around Building E3641 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 (McGinnis et al. 1995).

The sump beneath the floor of Building E3641 was sampled in early 1994 as part of the HMF field investigation conducted by ANL personnel (Cobo 1994). The investigation was conducted to characterize all HMFs believed to contain petroleum, oil, and lubricants (POL HMFs) and those that potentially contained chemical warfare agents (non-POL HMFs). Because of potential exposure to chemical warfare agents or radioactive isotopes, the Directorate of Safety, Health, and Environment provided specialists from the Chemical Operations Branch of the U.S. Army Chemical Research, Development, and Engineering Center (CRDEC) to conduct the sampling and analysis of non-POL HMFs.

No underground storage tanks are associated with Building E3641 (Cobo 1994).

A detailed description of the methodologies used for the geophysical investigation is given in McGinnis et al. (1995). A detailed description of the methodology used for the HMF field investigation is provided in the appendix.

### 3 Historical Record Search

Building E3641 (APG designation) is part of the Building E3640 Process Laboratory Complex located in the Kings Creek Area within APG's Edgewood Area. The Building E3640 Process Laboratory Complex consisted of the following four buildings and two drum storage areas: Building E3640 (originally designated Building 2345), the process laboratory building; Building E3641 (2345A), used to house the caustic scrubber and associated equipment; Building E3642 (2345B), used as a storage facility and to house a caustic tank for the scrubbing system; and Building E3643 (2345C), used as an office, electrical shop, and for storage (this building was demolished in about 1980 according to Nemeth [1989]). The first drum storage area, located west of Building E3640, includes a small structure designated as Building E3646. The second drum storage area is located east of Building E3641.

Building E3640 (process laboratory) was constructed during 1951 and 1952, opened in 1952, and actively used until 1978 (Nemeth 1989). It was used as the developmental chemical process laboratory for surety items, as well as for undertaking "one-of-a-kind" experimental chemical projects supporting research and development at the site. Pilot lots of chemical agents were also manufactured to support the medical research effort at Edgewood. No more than five liters of an agent was made at any one time (EAI Corporation 1989).

Building E3641 contains four scrubbers and associated equipment used to remove toxic vapors produced by operations in various laboratories in Building E3640. Building E3641 was constructed during 1953 and actively used until the Building E3640 Process Laboratory Complex was closed in 1978.

## 4 Building Description

This section provides a detailed physical description of Building E3641 and the surrounding site as they appeared during the ANL inspection in November 1994. This physical description includes an account of the condition of the exterior walls, roof, interior walls, ceiling, and floor of the building. At the time of the inspection, the building contained four 6-ft-diameter scrubber vessels (tanks) and associated electric-powered pumps, duct work, piping, and control panels. The scrubber vessels extend through the roof of the structure. The building also contains lighting fixtures, electrical conduits and panels, and steam heaters and associated piping. There is also a sump beneath the floor of the building.

### 4.1 Site Description

#### 4.1.1 Location

The Building E3640 Process Laboratory Complex, which includes Building E3641, is located about 200 ft north of Beach Point Road and approximately 725 ft west of the intersection of Point Beach Road and 57th Street (Figure 2).

#### 4.1.2 Proximity to Other Buildings

Building E3641 is about 25 ft north of Building E3640 and 10 ft west of Building E3642. The northeast (unnumbered) drum storage area is about 120 ft east of the building (Figure 2).

#### 4.1.3 Building Structure

The building is a single-story, rectangular structure with no interior walls or partitions. The structure is made of a steel frame with corrugated transite walls and a corrugated transite gable roof. Figure 3 shows the floor plan of the building, developed during the inspection in November 1994. Figure 4 provides photographs of the exterior of the building.

#### 4.1.4 Exterior Dimensions

The exterior dimensions of the building are 43 ft by 19 ft (Figure 3). The height of the eaves is about 8 ft, and the height at the peak of the gable is about 11 ft.

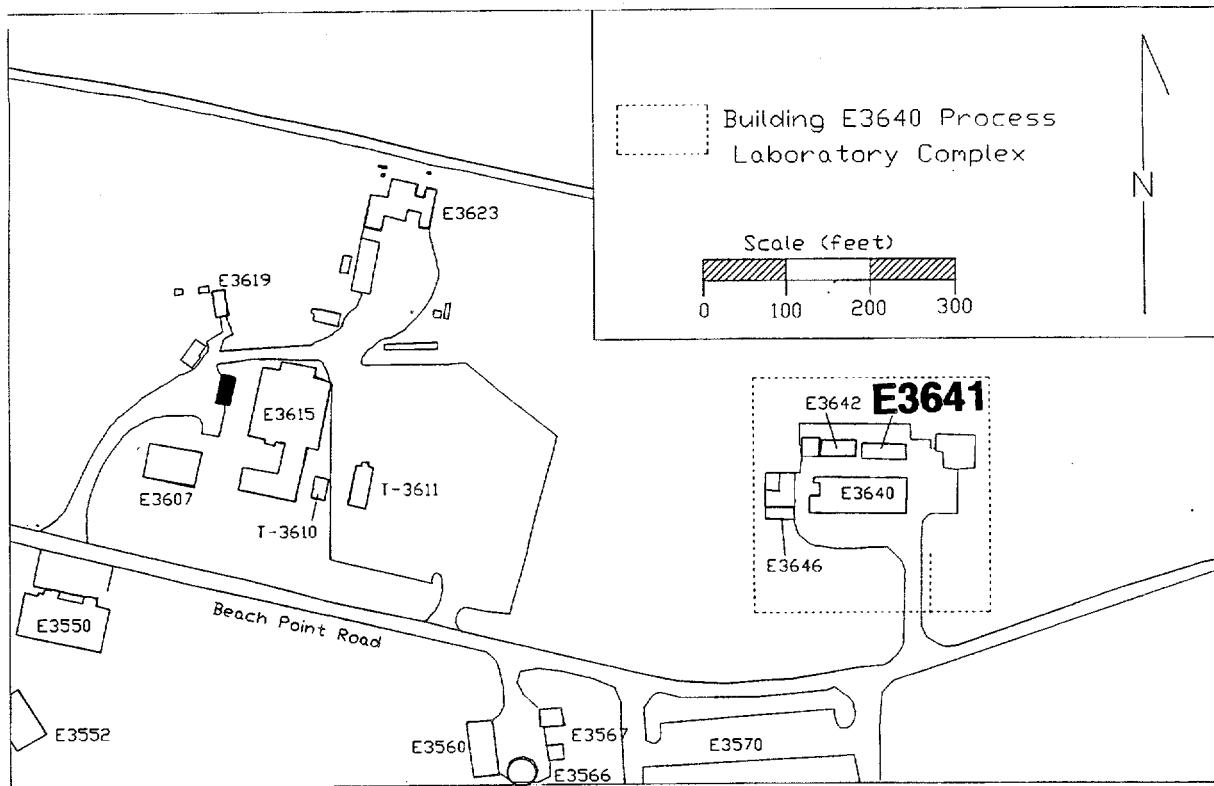


FIGURE 2 Map of Building E3641 Location

#### 4.1.5 Topography

The area surrounding the building is generally level, with a gentle slope to the north.

#### 4.1.6 Vegetation in the Immediate Vicinity

Vines are growing along the north wall; some extend onto the roof of the building. Areas north and east of the building are covered by scattered, cut vegetation (Figures 4A and 4B).

#### 4.1.7 External Aboveground Structures or Equipment

A wooden catwalk on the roof of the building extends to Building E3642 (Figure 4A). Four exhaust stacks with blowers connected to the scrubber vessels that extend through the roof are located along the north side of the building (Figure 4A). On the east side of the building, ANL observed a short stack with a blower connected to the large-diameter pipe (duct) originating from Building E3640. A large-diameter pipe (duct) connected to Building E3640 is located along, and connected to, the south exterior wall (Figures 4C and 4D).

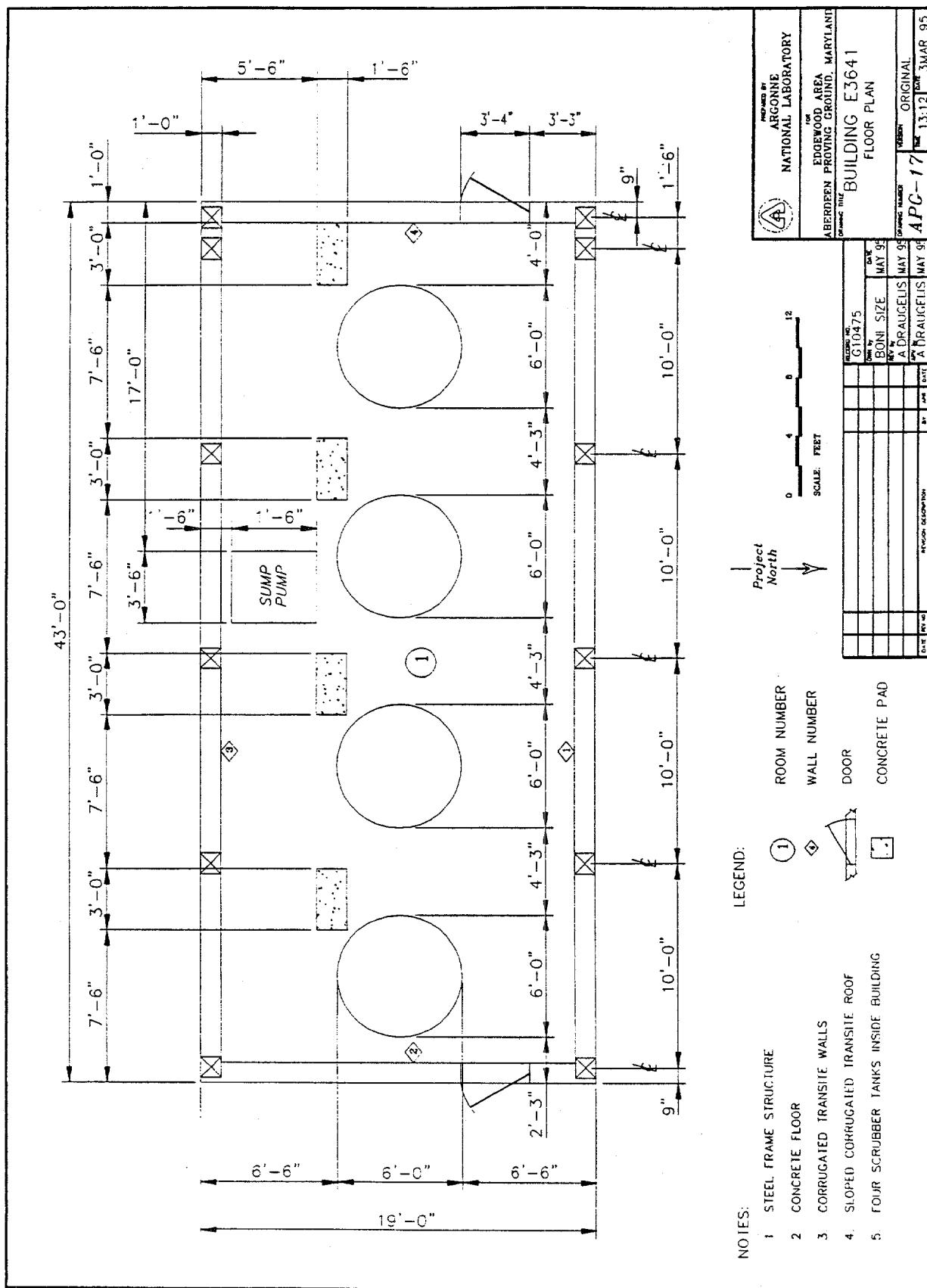
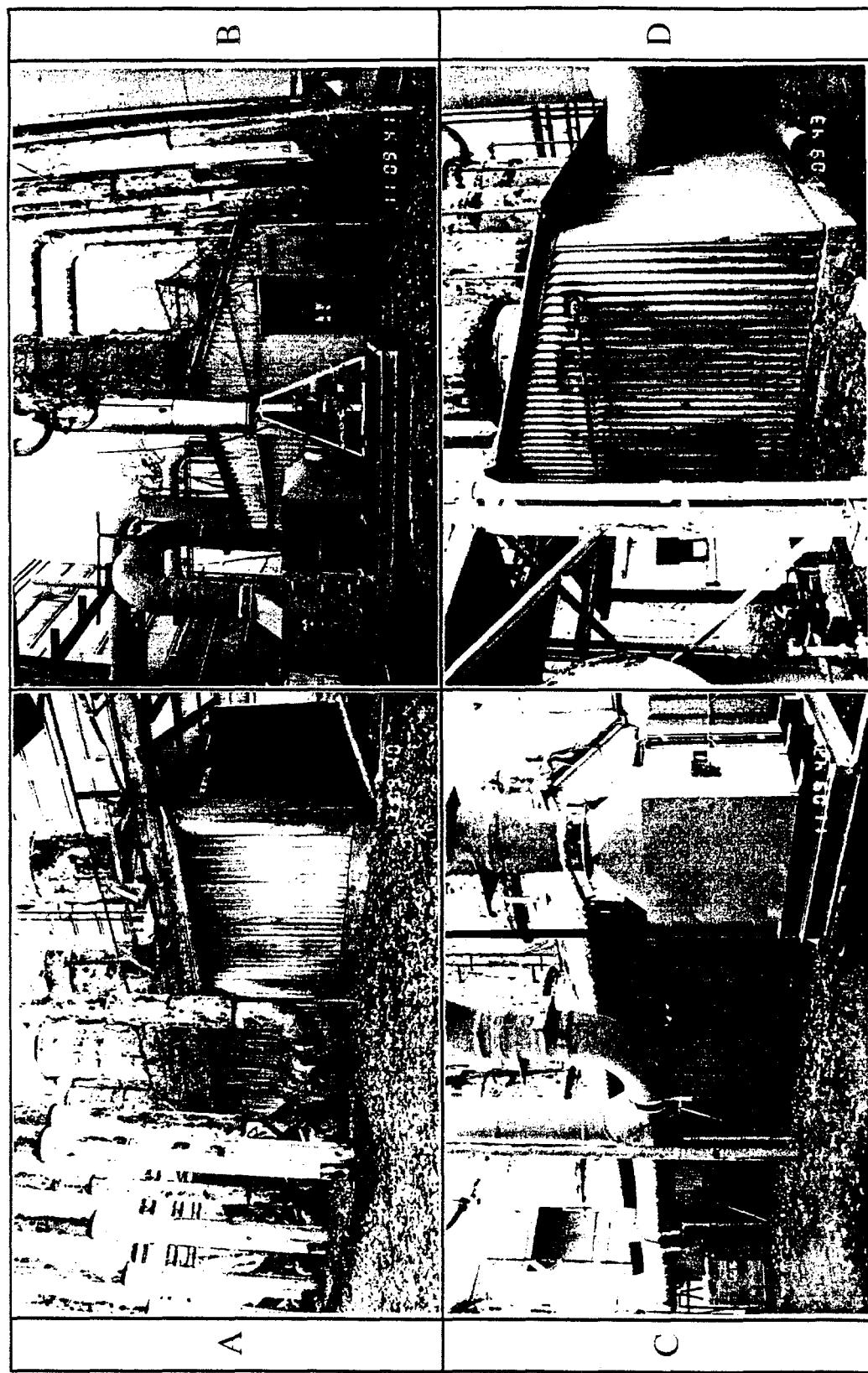


FIGURE 3 Building E3641 Floor Plan



A	North & West Elevation	B
C	South & East Elevation	D

FIGURE 4 Photographs of Building E3641 Exterior

#### **4.1.8 Connections with Adjacent Buildings**

The wooden catwalk on the roof of the building is connected to Building E3642 (Figure 4A). A large-diameter pipe (duct) located along, and connected to, the south exterior wall runs to Building E3640 (Figures 4C and 4D). A caustic supply line (pipe) and steam and steam condensate pipes extend from the west wall to Building E3641 (Figures 4A and 4D).

#### **4.1.9 Underground Structures**

A sump is located beneath the floor, along the south wall, near the center of the building (Figure 3). This sump, which collected waste water from the scrubber system, is connected to the Building E3640 process laboratory chemical waste water system and to an exterior sump northeast of Building E3640. Effluent from the exterior sump flowed into the Building E3640 storm drain system that discharged into Kings Creek via an open ditch (U.S. Army CRDEC undated).

#### **4.1.10 Surface Drainage System**

None.

#### **4.1.11 Utility Access Points**

None.

#### **4.1.12 Exterior Piping**

The scrubber vessels (tanks) and associated piping extend through the roof of the building (Figure 4). A large-diameter pipe (duct) connected to Building E3640 is located along, and connected to, the south exterior wall (Figures 4C and 4D). A caustic supply line (pipe) and steam and steam condensate pipes extend from the west wall to Building E3642 (Figures 4A and 4D).

#### **4.1.13 Nearby Roads and Sidewalks**

There is concrete slab between the west end of the building and Building E3642. The area south of the building is an asphalt driveway. A concrete sidewalk runs from the east building door to the asphalt driveway.

### **4.2 North Exterior Elevation**

#### **4.2.1 Dimensions**

The north wall is 43 ft long; the height of the eaves is about 8 ft (Figures 3 and 4).

#### **4.2.2 Construction Materials**

The north exterior wall is corrugated transite.

#### **4.2.3 Doors and Windows**

None.

#### **4.2.4 Piping**

None.

#### **4.2.5 Utility Connections**

None.

#### **4.2.6 External Equipment or Structures**

Four tall exhaust stacks with blowers connected to the scrubber vessels that extend through the roof of the building are located on a concrete pad along the north side of the building (Figure 4A).

#### **4.2.7 Vegetation**

Vines are growing along the north wall; some extend onto the roof of the building. The area north of the building is covered by scattered, cut vegetation (Figure 4A).

#### **4.2.8 Overall Condition**

The overall condition of the north exterior wall of the building is good.

### **4.3 East Exterior Elevation**

#### **4.3.1 Dimensions**

The east exterior elevation measures 19 ft long; the height of the eaves is about 8 ft, and the height at the peak of the gable is about 11 ft (Figures 3 and 4).

#### **4.3.2 Construction Materials**

The east exterior wall is corrugated transite.

#### **4.3.3 Doors and Windows**

A doorway measuring 3 ft 4 in. wide is located near the northeast corner of the east exterior wall. There are no windows in the wall.

#### **4.3.4 Piping**

Two pipes extend from a hole in the east exterior wall.

#### **4.3.5 Utility Connections**

None.

#### **4.3.6 External Equipment or Structures**

A short stack with a blower on the east side of the building connects to a large-diameter pipe (duct) leading from Building E3640 (Figure 4B).

#### **4.3.7 Vegetation**

The area east of the building is covered by scattered, cut vegetation (Figure 4B).

#### **4.3.8 Overall Condition**

The overall condition of the east exterior wall is good, with the exception of a large hole in the corrugated transite.

### **4.4 South Exterior Elevation**

#### **4.4.1 Dimensions**

The south exterior wall measures about 43 ft long; the height of the eaves is about 8 ft (Figures 3 and 4).

#### **4.4.2 Construction Materials**

The south exterior wall of the building is corrugated transite.

#### **4.4.3 Doors and Windows**

None.

#### **4.4.4 Piping**

A large-diameter pipe (duct) connected to Building E3640 is located along, and connected to, the south exterior wall (Figures 4C and 4D).

#### **4.4.5 Utility Connections**

None.

#### **4.4.6 External Equipment or Structures**

A large-diameter pipe (duct) connected to Building E3640 is located along, and enters, the south exterior wall (Figures 4C and 4D).

#### **4.4.7 Vegetation**

None.

#### **4.4.8 Overall Condition**

The overall condition of the south exterior wall is good, with the exception of a large-diameter hole (former duct work connection) covered with plastic and located near the east end of the wall (Figure 4C).

### **4.5 West Exterior Elevation**

#### **4.5.1 Dimensions**

The west exterior wall of the building measures 19 ft long; the height of the eaves is about 8 ft, and the height at the peak of the gable is about 11 ft (Figures 3 and 4).

#### **4.5.2 Construction Materials**

The west exterior wall of the building is corrugated transite.

#### **4.5.3 Doors and Windows**

A doorway measuring 3 ft 4 in. wide is located near the northwest corner of the west exterior wall. There are no windows in the wall.

#### **4.5.4 Piping**

A caustic supply line (pipe) extends from the west exterior wall to Building E3642 (Figure 4D).

#### **4.5.5 Utility Connections**

Steam and steam condensate pipes extend from the west exterior wall to Building E3642 (Figure 4A).

#### **4.5.6 External Equipment or Structures**

None.

#### **4.5.7 Vegetation**

None.

#### **4.5.8 Overall Condition**

The overall condition of the west exterior wall is good.

### **4.6 Roof**

#### **4.6.1 Type and Dimensions**

The building has a gable roof measuring 43 ft long by 19 ft wide (Figure 4).

#### **4.6.2 Height**

The height of the eaves is about 8 ft, and the height at the peak of the gables is about 11 ft.

#### **4.6.3 Surface Materials**

The roof of the building is corrugated transite.

#### **4.6.4 Support System**

The roof is supported by steel beams.

#### **4.6.5 Condition**

The condition of the roof appears to be good, but a portion of the roof is covered by a catwalk and vines (Figure 4A) and could not be thoroughly inspected.

#### **4.6.6 Equipment Located on Roof**

A wooden catwalk on the north side of gable provides access to the four 6-ft-diameter scrubber vessels that extend through the roof.

#### **4.6.7 Chimneys, Roof Vents, or Vent Stacks**

Four 6-ft-diameter scrubber vessels extend through the roof.

#### **4.6.8 Piping**

Several small-diameter pipes associated with the scrubber system extend through the roof.

## 4.7 Interior Floor Plan

### 4.7.1 Room Numbers and Dimensions

Building E3641 is a single-story, rectangular structure with no interior walls or partitions. Interior dimensions of the single room, referred to as room 1 in this report, are 43 ft by 19 ft. Figure 3 shows the floor plan of the building, developed during the ANL inspection in November 1994. Figure 5 shows photographs of the interior walls of the building, and Figure 6 shows photographs of the ceiling and floor.

### 4.7.2 Walls

The interior walls are corrugated transite; the steel beam framework that supports the building is exposed (Figure 5).

### 4.7.3 Floor

The floor is concrete and in good condition (Figure 6A).

### 4.7.4 Floor Penetrations

A manhole provides access to the sump located beneath the floor along the south wall, near the center of the building (Figure 3). A number of pipes penetrate the floor over the sump.

### 4.7.5 Interior Partitions

None.

### 4.7.6 Equipment or Supplies

During the ANL inspection in November 1994, the building contained four scrubber vessels (tanks) with associated electric-powered pumps, duct work, piping, and control panels. In addition, the building contained lighting fixtures, electrical conduits and panels, steam heaters, and associated steam and condensate pipes.

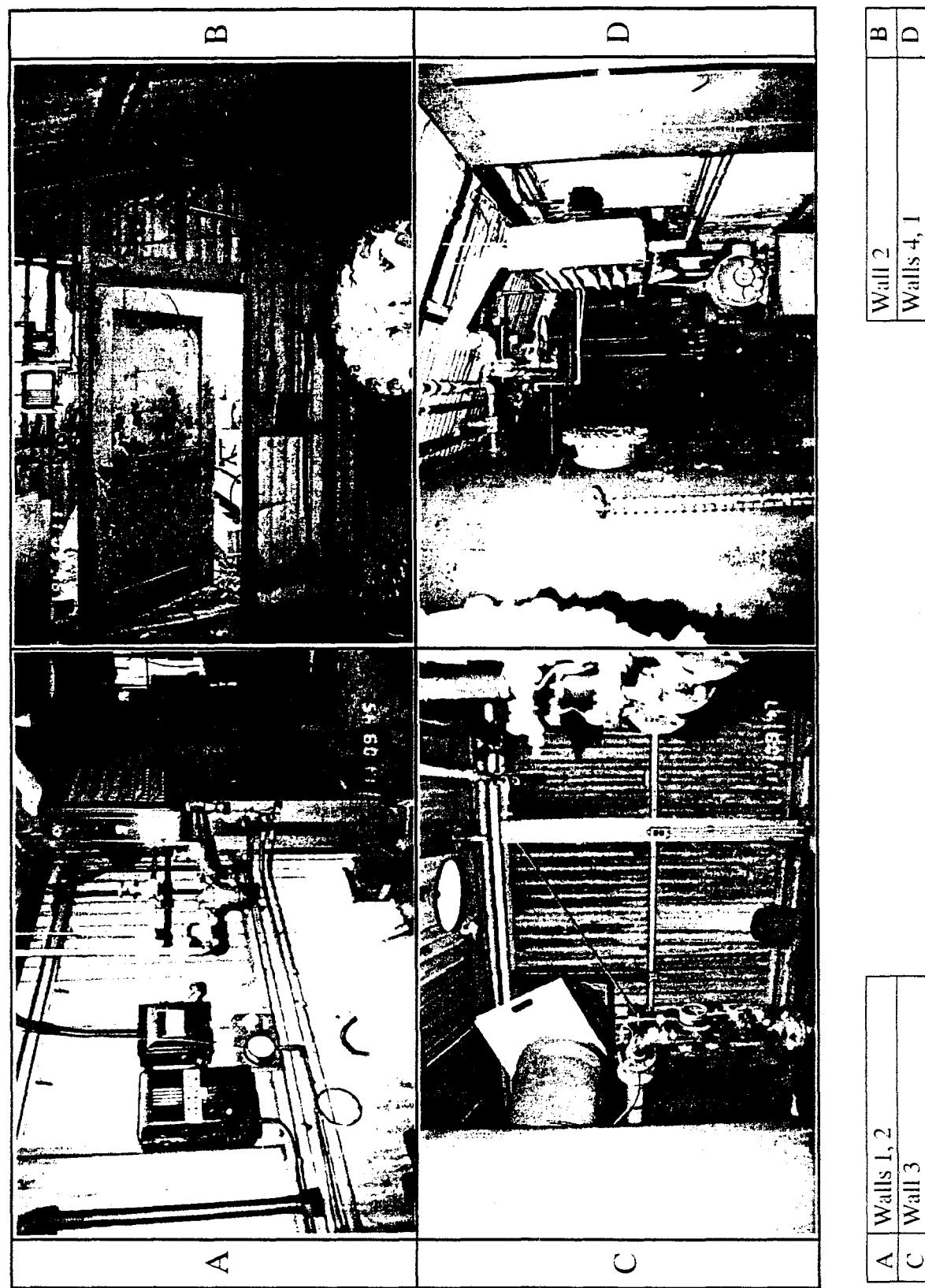


FIGURE 5 Photographs of Room 1 — Walls

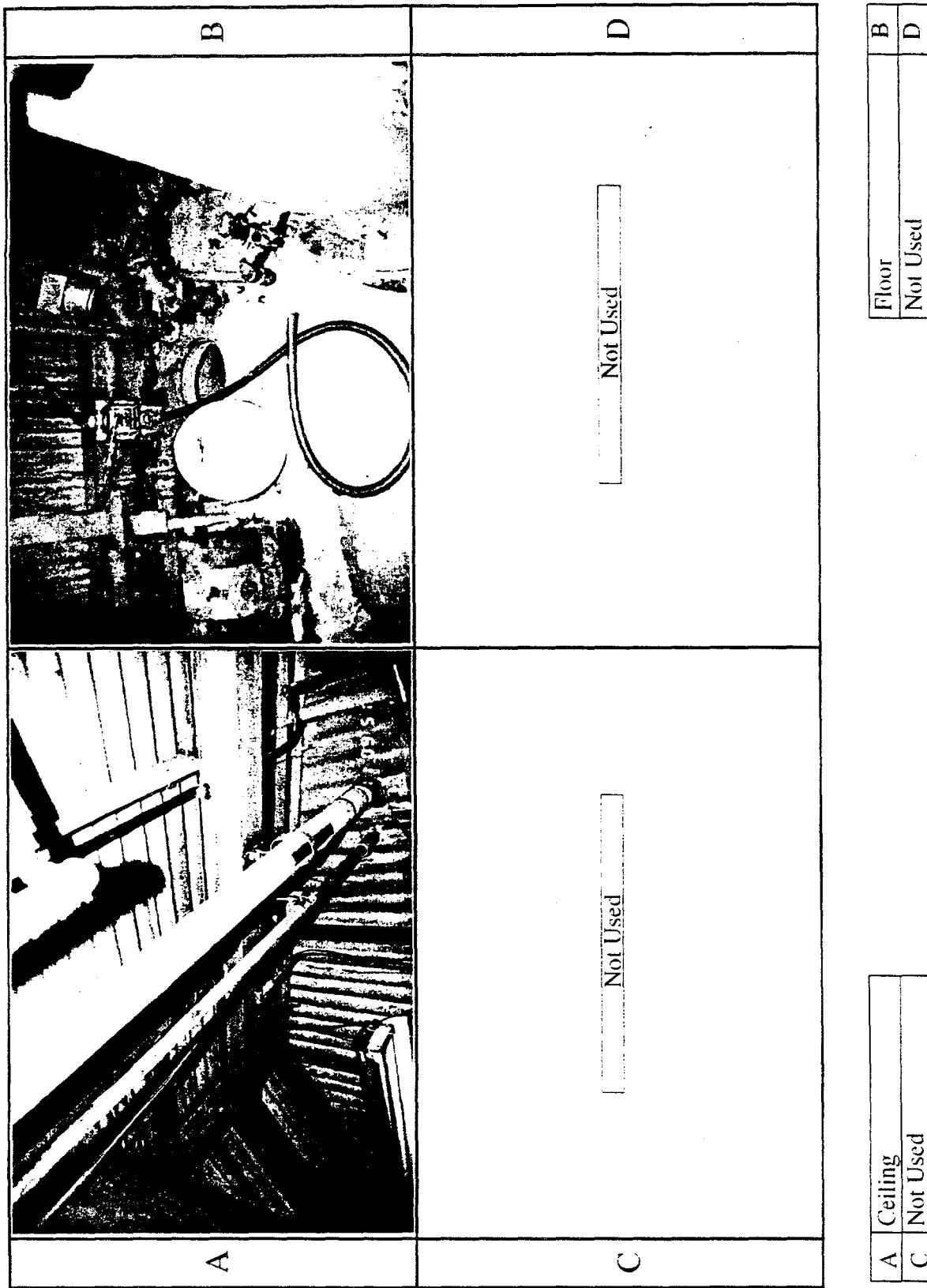


FIGURE 6 Photographs of Room 1 — Floor and Ceiling

## 4.8 Room 1

Building E3641 is a single-story structure with no interior walls or partitions. The interior dimensions of the single room are 43 ft by 19 ft. The height of the north and south walls is about 8 ft, and the height of the east and west walls at the peak of the gable is about 11 ft.

### 4.8.1 Walls

The interior walls of the building are corrugated transite. The steel beam framework that supports the building is exposed. Attached to the walls are duct work, piping, and electrical and control panels associated with the four scrubber vessels housed in the building. Electrical conduits, panels, and outlets are also attached to the walls (Figure 5).

### 4.8.2 Finish Materials

None.

### 4.8.3 Piping

A number of pipes and duct work associated with the scrubber system are attached to the walls of the building. There are also a number of electrical conduits attached to the walls (Figure 5).

### 4.8.4 Equipment

The building contained four scrubber vessels (tanks) and associated electric-powered pumps, duct work, piping, and control panels. The building also contained lighting fixtures, electrical conduits, outlets, and panels, steam heaters, and associated steam and condensate pipes.

### 4.8.5 Doors and Windows

Two doors measuring 3 ft 4 in. wide were observed in the building. One doorway is 3 ft 3 in. from the northeast corner in the east wall; the other is 3 ft 3 in. from the northwest corner in the west wall of the building (Figure 3).

#### **4.8.6 Ceiling**

The ceiling is corrugated transite with an exposed steel beam support system. Attached to the ceiling are electrical conduits, light fixtures, and a steam heater with associated steam and condensate pipes. Some steam pipes are wrapped with suspected asbestos-containing insulation (Figures 5 and 6A).

#### **4.8.7 Floor**

The floor is concrete and is in good condition. A manhole provides access to the sump located beneath the floor along the south wall, near the center of the building (Figure 3). A number of pipes penetrate the floor over the sump (Figure 6B).

## 5 Geophysical Investigation

ANL geophysical staff surveyed the area around the Building E3640 Process Laboratory Complex, including areas near Building E3641, by using several nonintrusive geophysical survey methods during the winter of 1993-1994 (McGinnis 1995). Nonintrusive methods used included magnetic gradiometer, magnetometer, conductive meter (EM-31), millivolt meter (EM-61), and ground-penetrating radar (GPR).

Complex and large-amplitude anomalies were caused by aboveground metal objects in the survey areas that obscured many smaller features produced by subsurface sources. All buried liquid waste lines and fresh water lines were identified by one or more of the techniques. No underground storage tanks were observed during the surveys; however, point sources remain unidentified.

Major geophysical anomalies produced by subsurface features are as follows:

- An EM-61 and EM-31 lineament caused by a water line extends north from the south fence to a hydrant southwest of the southwest corner of Building E3640. An EM-61 anomaly caused by overhead pipes, an apparent continuation of the first anomaly, extends north to the north fence. This line is approximately 40 ft west of the west side of Building E3641.
- A broad positive magnetic anomaly north of the northeast drum storage area is caused by the presence of ferric materials. This area is about 75 ft northeast of the northeast corner of Building E3641.
- A 30-ft-wide band of EM-31 anomalies extends from the front gate of the complex to the southwest corner of Building E3640. This band of anomalies is caused by roadbed materials, underground utilities, and a nearby security fence. This area is south of Building E3640, and is not near Building E3641.
- An EM-61 anomaly produced by buried utilities corresponds to the EM-31 anomaly at the location described above.
- Three GPR lines extend from the exterior sump northeast of Building E3640 about 190 ft to the eastern fence. The lines may be a portion of the Building E3640 storm drain system that discharged into the Kings Creek marshes. The exterior sump is about 80 ft east of the east end of Building E3640.
- Smaller, unidentified, localized anomalies were observed throughout the survey area.

The geophysical surveys indicate the presence of some underground objects in the Building E3640 Process Laboratory Complex. None of the major geophysical anomalies observed in the surveyed areas were within about 40 ft of Building E3641. However, areas immediately adjacent to Building E3641 were not surveyed and may contain underground objects not identified by the geophysical surveys. Details of the geophysical surveys for the Building E3640 Process Laboratory Complex are given in McGinnis et al. (1995).

## **6 Air Quality Monitoring**

No information on air quality associated with Building E3641 is available.

## 7 Underground Storage Tanks

The sump beneath the floor of Building E3641 was sampled as part of the HMF field investigation conducted by ANL personnel (Cobo 1994). The investigation was conducted to characterize all HMFs believed to contain petroleum, oil, and lubricants (POL HMFs) and those that potentially contained chemical warfare agents (non-POL HMFs). Because of potential exposure to chemical warfare agents and radioactive isotopes, the Directorate of Safety, Health, and Environment provided specialists from the Chemical Operations Branch of CRDEC to conduct the sampling and analysis of non-POL HMFs. The sump located beneath the floor of Building E3641 was considered a non-POL HMF because it was a part of the scrubber and wastewater system that handled chemical warfare agents from the laboratories in Building E3640.

An initial sample from the sump was collected on January 24, 1994. At that time, the sump was three-fourths full of a clear solution; leaf material was floating on the surface. Analytical results of this sample indicated the presence of the GA (Taban), a chemical warfare agent. The solution in the sump was resampled on February 1, 1994. Analytical results from this second sample also indicated GA, but at a level below the U.S. Army Drinking Water Standards. Because of the presence of GA in the second sample, no additional sampling or analyses were conducted. The caustic scrubber system and sump are designated Solid Waste Management Units (SWMUs); any future activities related to these SWMUs should follow remedial investigation guidelines established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

No information was available regarding underground storage tanks associated with Building E3641. The appendix provides a copy of the HMF investigation report.

## 8 Conclusions

On the basis of the information collected and reviewed by ANL for Building E3641, it is the authors' judgment that the potential presence of suspected asbestos-containing insulation on steam supply pipes warrants further investigation and evaluation. Transite must be removed in a manner designed to prevent the release of potential asbestos-containing materials.

HMF results revealed the presence of GA in the sump beneath the floor of Building E3641. The caustic scrubber system and sump in Building E3641 are designated SWMUs; any future activities related to these SWMUs should follow remedial investigation guidelines established by CERCLA.

## 9 References

Brubaker, K.L., J.M. Dougherty, and L.D. McGinnis, 1994, *Initial Building Investigation at Aberdeen Proving Ground, Maryland: Objectives and Methodology*, ANL/ESD/TM-61, prepared for Aberdeen Proving Ground, Maryland, by Argonne National Laboratory, Argonne, Ill.

Cobo, H., 1994, unpublished information.

EAI Corporation, 1989, *Historical Records Search and Site Survey of the Edgewood Area Building — Final Report*, prepared for U.S. Army CRDEC, Aberdeen Proving Ground, Maryland, under contract no. DAAIS-87-D0021.

McGinnis, L.D., S.F. Miller, H.M. Borden, M.A. Benson, M.D. Thompson, C.A. Padar, and C.R. Daudt, 1995, *Interim Progress Report — Environmental Geophysics: Building E3640 Decommissioning, Aberdeen Proving Ground, Maryland*, ANL/ESD/TM-84, prepared for Aberdeen Proving Ground, Maryland, by Argonne National Laboratory, Argonne, Ill.

Nemeth, G., 1989, *RCRA Facility Assessment Report, Edgewood Area, Aberdeen Proving Ground, Maryland*, unnumbered report prepared for Aberdeen Proving Ground, Maryland.

U.S. Army CRDEC, undated, *Underground Storage Tank Management Program*.

**Appendix:**

**Field Investigation of Hazardous Materials Facilities Report**



**FIELD INVESTIGATION RESULTS  
FOR BUILDING E-3641,  
EDGEWOOD AREA,  
ABERDEEN PROVING GROUND, MARYLAND**

**HMF Record No: 91557**

**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-3641 (Figure 1) was built in 1953 as a scrubber building for the adjacent building, Building E-3640, in order to meet ventilation requirements for the laboratory facilities. It was active from 1953 until 1978, when the plant was closed. The scrubbers were used to remove the toxic vapors emanating from operations in the various laboratories of Building E-3640. The building has served no other purpose, except to provide storage space for electrical parts in an open area inside the building. It has not been used for its original purpose or for any other use since 1978 (Nemeth 1989).

The building is constructed of concrete floors and foundation, and corrugated Transite walls and roof. The main building measures 19 ft x 42 ft 7 in. x 7 ft 5 in. Each of four scrubbing towers is connected to E-3640 by an exhaust duct (EAI Corporation 1989.)

One sump is associated with Building E-3641. There is no domestic or toxic drainage associated with this building. The sump is located beneath the floor in the south side of the building and is connected to the dilution tank located northeast of Building E-3640 via 4-in. and 6-in. piping. The process-laboratory chemical-wastewater system in Building E-3640 collected wastewater from the caustic scrubbers in Building E-3641 (U.S. Army CRDEC, undated).

Wastewater from a sump, located below the floor in the caustic scrubber building, was carried via 4-in. underground lines to the east-west line located north of Building E-3640 and south of Building E-3641, and on to the exterior sump. Effluent from the exterior sump flowed via a 6-in. line to the storm-drain system for the Building E-3640 area located immediately north of the sump. Effluent was then discharged through a 12-in. line into an open ditch at a point approximately 190 ft northeast of the sump. The wastewater was carried via the open ditch to a marsh associated with Kings Creek. The Building E-3641 caustic-scrubber system and sump are SWMUs. As of February 1992, the building was not being used (U.S. Army CRDEC, undated).

The Consent Order identifies one HMF (No. 91557) as being associated with Building E-3641. Information provided in the Consent Order lists this HMF as a 200-gal capacity, decontamination-agent-content HMF installed in 1958.

The proposed project strategy was to investigate all HMFs suspected of non-UST Program activities under a separate H&S Plan. Because of potential exposure to 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 wearing the appropriate level of personal 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 located in Building E-3300, where it was analyzed for CW agents GB, GD, GA, VX, and HD. However, positive results were reported for Building E-3641 for GA on both sampling and analysis. Thus, samples were not forwarded for commercial laboratory analysis.

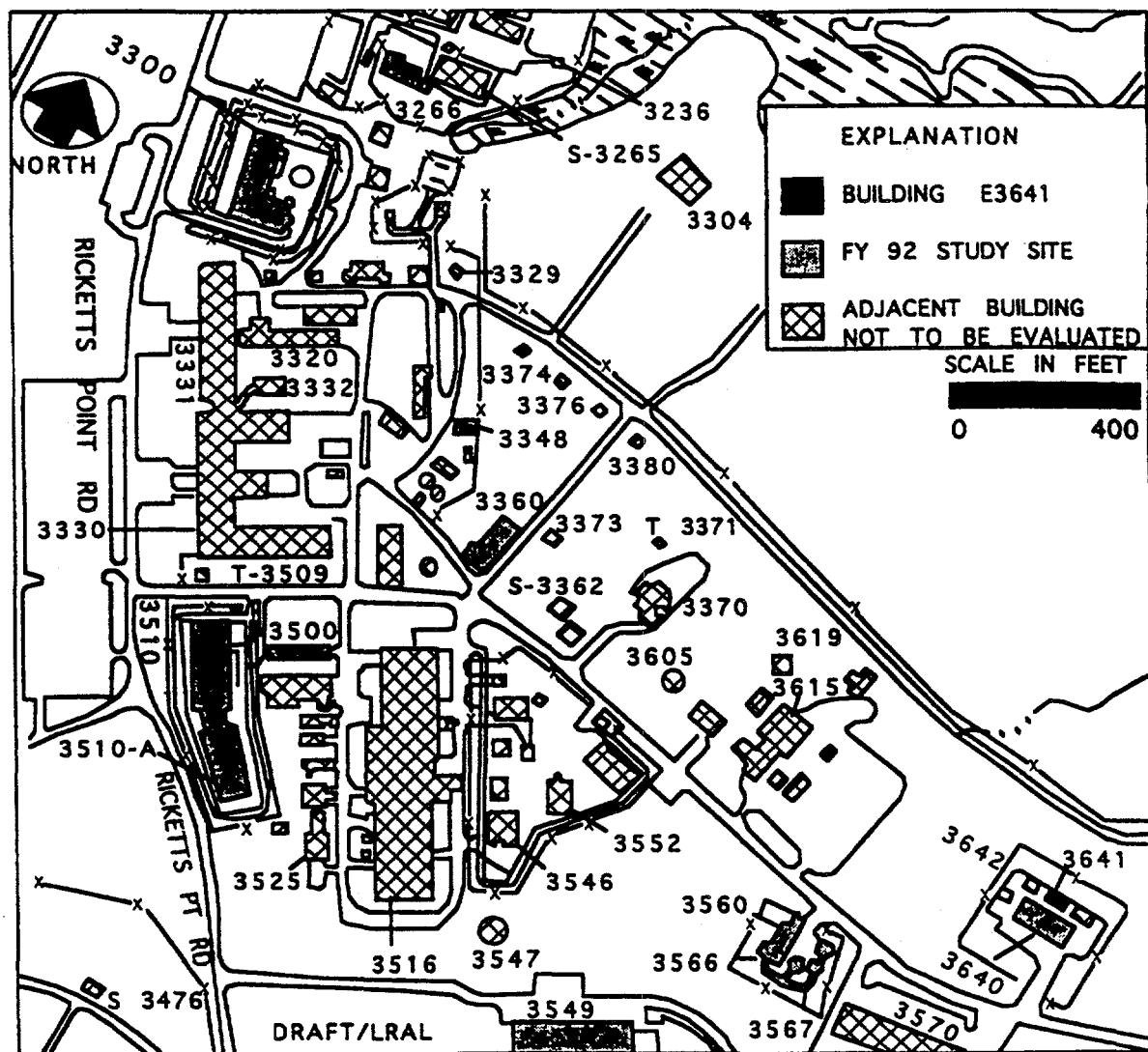


FIGURE 1 General Site Map of Canal Creek Area, Aberdeen Proving Ground, Maryland



## **2 Results of the Geophysical Investigation**

The geophysical investigation was not conducted because the HMF is located inside the building.



### 3 Results of the HMF-Content Analyses

Sampling of the content from the HMF at Building E-3641 began on January 24, 1994, through existing openings of the HMF. The chemical Operation Branch sampling team strictly adhered to all provisions in the ANL- and APG-approved Work Plan and H&S Plan. The HMF is a wastewater sump for the caustic scrubber located beneath the floor on the south side of the building. At the time of sampling the sump was three-fourths full of a clear solution, with a floating leaf material.

The suspect CW agent samples were analyzed by Eugene Vickers from the Analytical Research Team (SCBRD-RTC), using the standard operating procedures contained in the attachment. 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 the instrument 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 CW-agent analysis showed a positive presence for GA. The HMF was resampled on February 1, 1994. The second analysis showed another positive presence for GA, below the Army's Drinking Water Standards. No further sampling or analysis is planned for this HMF.

This HMF was a below-floor wastewater sump for the caustic scrubber system in Building E-3641. The wastewater system and the scrubber-system sump in Building E-3641 handled chemical surety or agent from the laboratory activities in Building E-3640 and are designated SWMUs. Any further regulatory activity should follow CERCLA remedial investigative guidelines.



#### **4 Results of the Subsurface Investigation**

No subsurface investigation was performed at Building E-3641, 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-3641 is not regulated under the UST Program directed by MDE. This HMF was regulated under the Clean Water Act, because the liquid in the HMF discharged to a sewer line or to a creek, marsh, or river, and consequently, the HMF is excluded from the UST Program.

This HMF was a wastewater sump for the caustic scrubber system, which discharged to the marsh associated with Kings Creek. The caustic scrubber and the sump are designated SWMUs; any further regulatory activity should follow CERCLA remedial investigative guidelines.

### 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 of the regulatory responsibility stated above, ANL recommends the following remedial action for Building E-3641:

- Direct further remedial activity under the CERCLA program, currently under the direction of the Environmental Conservation and Restoration Division.



## 6 References

EAI Corporation, 1989, *Historical Records Search and Site Survey of Edgewood Area Buildings, Final Report*, U.S. Army Chemical Research, Development and Engineering Center, Contract No. DAAA15-87-D-0021, August.

Nemeth, G., 1989, *RCRA Facility Assessment, Edgewood Area, Aberdeen Proving Ground, Maryland*, Waste Disposal Engineering Division, U.S. Army Environmental Hygiene Agency, prepared for Aberdeen Proving Ground, Test and Evaluation Command, U.S. Army Materiel Command, November.

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



**Attachment:**

**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  $\mu$ L of HD standard agent matrix spike solution and 75  $\mu$ 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  $\mu$ 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  $\pm 5$  seconds of its original response time.

MATERIEL COURIER RECEIPT		SHIPPER'S CONTROL/DOCUMENT NO <b>94024</b>		PRIVACY ACT STATEMENT				
SHIPPER <i>O.C. Rice E 3832</i>	94024	SUPPLY ACCOUNT NUMBER	AUTHORITY: 5 U.S.C., Sec 662a (PL 93-570). PRINCIPAL PURPOSES: To provide a record for transfer of controlled material. The use of the SSAM is required and it is necessary to provide positive identification of the individual recovering for the materiel. ROUTINE USES: To document transfer of materiel from a shipper to a courier, courier to courier or to receiver.					
DESTINATION <i>E3300 E. Vicker / K Sumpfer</i>	X3272	SUPPLY ACCOUNT NUMBER	DISCLOSURE IS VOLUNTARY: Since the SSAM must be used, refusal to provide SSAM may be grounds for action to remove the individual concerned from duties involving the materiel transferred by use of this form.					
I certify by my signature that I have released the material listed on this form and am aware of the applicable safety and security requirements.								
SHIPMENT TRANSFERS								
FIRST	LOCATION OF TRANSFER <b>E3300</b>		DATE(YR/MO/DA) <b>94/01/24</b>		LINE NUMBER 1.	QUANTITY 1gt	SERIAL NUMBERS 1A	REMARKS <i>Tank at E3841</i>
	RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.) <i>Sumpfer Klement B</i>		ORGAN OR ACCOUNT NO. <b>SCBBD- PTC</b>		2.	1gt	2A	<i>Tank at 3714</i>
SIGNATURE <i>K. Sumpfer</i>	SOCIAL SECURITY NUMBER <b>217-194-5446</b>				3.	1gt	3A	<i>Tank at E3726</i>
SECOND	LOCATION OF TRANSFER <b>E3300</b>		DATE(YR/MO/DA) <b>94/01/28</b>		4.	1gt	4A	<i>Tank at E3871</i>
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.) <i>Manthri Michael S</i>		ORGAN OR ACCOUNT NO. <b>SLBRD-ODC-0</b>		NOTHING Follows				
SIGNATURE <i>Michael J. Manthri</i>	SOCIAL SECURITY NUMBER <b>31802-7650</b>							
THIRD	LOCATION OF TRANSFER <i>Army A Corp</i>		DATE(YR/MO/DA) <b>1/31/94</b>					
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)		ORGAN OR ACCOUNT NO.						
SIGNATURE	SOCIAL SECURITY NUMBER							
FOURTH	LOCATION OF TRANSFER		DATE(YR/MO/DA)					
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)		ORGAN OR ACCOUNT NO.						
SIGNATURE	SOCIAL SECURITY NUMBER							
FIFTH	LOCATION OF TRANSFER		DATE(YR/MO/DA)					
RECIPIENT'S PRINTED NAME (LAST, FIRST, M.I.)		ORGAN OR ACCOUNT NO.						
SIGNATURE	SOCIAL SECURITY NUMBER							

DD FORM 1911  
26 MAY 1987

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 26 Jan 94
		PHONE NO. 53212
FROM: Analytical Chemistry Team/SCBRD-RTC		
ANALYSIS OF (Structure or further description if UNCLASSIFIED on reverse side):		
SAMPLE NO. 1A (E3641), 2A (E3714), 3A (E3726), 4A (E3871)		
TOXIC	NON TOXIC	MOL. WT.
DETERMINE: Presence of CW Agents (GA, GB, GD, VX, and HD)		
RESULTS AS FOLLOWS BY: E. B. Sumpter, E. L. Vickers, A. C. Torres		
Date: 25 Jan 94		
Sample 1A (E3641) was positive for GA (0.0098 ug/mL in aqueous sample) but well below the drinking water level of 0.02 ug/mL for GA. Sample 1A was negative for the remaining CW agents listed above. Samples 2A, 3A, and 4A were negative for all CW agents listed above.		
Method detection limits and instrument minimum detection levels are listed on the attached.		
John F. Weimaster JOHN F. WEIMASTER, Team Leader, Analytical Chemistry		DATE 27 Jan 94

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

DATE RECD	24-Jan-94	
DATE OUT	26-Jan-94	
METHOD DETECTION LEVEL		INSTRUMENT MIN. DETECTION LIMIT
SAMPLE		
1A (E3841)	0.0176 ug/ml for GB 0.0089 ug/ml for GD 0.0098 ug/ml for GA 0.0068 ug/ml for VX 0.0069 ug/ml for HD	0.3176 ug/ml for GB 0.2979 ug/ml for GD 0.3111 ug/ml for GA 0.2940 ug/ml for VX 1.3116 ug/ml for HD
2A (E3714)	0.0151 ug/ml for GB 0.0085 ug/ml for GD 0.0095 ug/ml for GA 0.0068 ug/ml for VX 0.0072 ug/ml for HD	0.3176 ug/ml for GB 0.2979 ug/ml for GD 0.3111 ug/ml for GA 0.3404 ug/ml for VX 1.3116 ug/ml for HD
3A (E3726)	0.0179 ug/ml for GB 0.0089 ug/ml for GD 0.0105 ug/ml for GA 0.0073 ug/ml for VX 0.0065 ug/ml for HD	0.3175 ug/ml for GB 0.2979 ug/ml for GD 0.3111 ug/ml for GA 0.3404 ug/ml for VX 1.3116 ug/ml for HD
4A (E3871)	0.0176 ug/ml for GB 0.0130 ug/ml for GD 0.0109 ug/ml for GA 0.0082 ug/ml for VX 0.0068 ug/ml for HD	0.3176 ug/ml for GB 0.2979 ug/ml for GD 0.3111 ug/ml for GA 0.3404 ug/ml for VX 1.3116 ug/ml for HD

ANALYTICAL REQUEST AND RESULTS		
TO: (Requester, please fill in name and address) Argonne National Laboratories		DATE 15 Feb 94
FROM: Analytical Chemistry Team/SCRD-RTC		PHONE NO. 52212
ANALYSIS OF (Structure or further description IF UNCLASSIFIED on reverse side):		
SAMPLE NO. 1A (C3641)		
TOXIC	NON TOXIC	MOL. WT.
DETERMINE: Presence of CA		
RESULTS AS FOLLOWS BY: K. B. Sumpter, A. C. Torres		
Date Analyzed: 14 February 1994		
Sample 1A is negative for the presence of CA by GC-FPD with a DB-210 column (30 m, dF=1.2 micron).		
Instrument minimum detection level = 0.3000 ug/mL Method detection limit = 0.0007 ug/mL		
<i>John F. Weimaster</i> JOHN F. WEIMASTER, Team Leader, Analytical Chemistry		DATE 15 Feb 94

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

15feb94

AGENT/COMPONENT: GA  
 SOLVENT: CHCl<sub>3</sub>  
 I.S.: DBBP

BASELINE GENERATED: 14feb94  
 DATE OF ANALYSIS: 14feb94

INSTRUMENT OPERATOR: kbs  
 DATA ANALYST: kbs  
 STANDARDS/SAMPLE PREPARATION: elv

INSTRUMENT USED: bp5890  
 DETECTOR: FPD  
 UNITS FOR WT'S:ug

COMMENTS: ARGONNE SAMPLE 1A analyzed with a DB-210 column

PROGRAM OPTION # 1

UNSPIKED SAMPLE: NEGATIVE  
PRE-EXTRACTION SPIKED SAMPLE: POSITIVE

I.S. WT.	I.S. AREA	AGENT AREA	RESULT CONC (WT)
0.63750 --	962168.00000 --	4956714.00000 --	1.28924
0.63750 --	902039.00000 --	4982256.00000 --	1.38227
0.63750 --	919307.00000 --	4977242.00000 --	1.35494

SAMPLE AVERAGE CONC.= 1.34215 ug/ml (s= 0.04781)  
 RSD (% imprecision)= 3.56245 % (for sample)

RF= 2.54735

Parameters:

Determined Recovery Efficiency: 75.92633 %  
 Expected sample spike concentration: 1.76770 ug/ml  
 Aqueous volume (ml): 200.00000  
 Organic Volume (ml): 4.00000  
 Instrument Minimum Detection Level: 0.30000 ug/ml

Sample Vial Contents:

Volume of extracted sample (in ml): 1.00000  
 Volume of internal standard (in ml): 0.10000

METHOD DETECTION LIMIT: 0.00869 ug/ml

