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# **Inspection Report**

## **of Unauthorized Possession and Use of Unsealed Americium-241 and Subsequent Confiscation**

J. C. Haynes Company, Newark, Ohio

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**U.S. Nuclear Regulatory  
Commission**

Region III



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Region III  
Division of Radiation Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Glen Ellyn, IL 60137



## ABSTRACT

This U.S. Nuclear Regulatory Commission report documents the circumstances surrounding the March 26, 1985, confiscation and subsequent decontamination activities related to the use of unauthorized quantities of americium-241 at the John C. Haynes Company (licensee) of Newark, Ohio. It focuses on the period from early February to July 26, 1985. The incident started when NRC Region III received information that John C. Haynes possessed unauthorized quantities of americium-241 and was conducting unauthorized activities (diamond irradiation). By July 26, 1985, the decontamination activities at the licensee's laboratory were concluded. The licensee's actions with diamond irradiation resulted in contamination in restricted and unrestricted areas of the facility. The confiscation and decontamination activities required the combined efforts of NRC, Federal Bureau of Investigation, U.S. Department of Energy, Oak Ridge Associated Universities, the State of Ohio, and the U.S. Environmental Protection Agency. The report describes the factual information and significant findings associated with the confiscation and decontamination activities.



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## 1 INTRODUCTION

### 1.1 Scope

This report by the U.S. Nuclear Regulatory Commission (NRC) documents the circumstances surrounding the March 26, 1985, confiscation of unauthorized quantities of americium-241 from the John C. Haynes Company of Newark, Ohio (licensee), and the subsequent decontamination of the licensee's facility. The report focuses on the period from early February to July 26, 1985. The incident started when NRC Region III received information that John C. Haynes possessed unauthorized quantities of americium-241. By July 26, 1985, the decontamination activities at the licensee's facility were concluded. The report provides the details of the allegation followup, including the planning by officials of the NRC and the Federal Bureau of Investigation (FBI); the confiscation of the americium-241 and subsequent cleanup operations; safety concerns; and institutional (offsite agencies) response to the event. The primary objective of this report is to stress the serious hazards involved with unauthorized possession and use of large quantities of unencapsulated americium-241.

The report does not cover in detail the criminal justice aspects of the case which are under the jurisdiction of the U. S. Department of Justice.

### 1.2 Background

This report is the product of an NRC task force composed primarily of representatives from the Region III Office. The task force received assistance from the U.S. Department of Energy (DOE), Radiological Assistance Teams (Battelle Columbus Laboratory and Monsanto's Mound Laboratory), the FBI (Columbus, Ohio, Office) and the Ohio Disaster Services Agency. The information documented in this report was developed through observations, measurements, interviews, and record reviews.

### 1.3 Executive Summary

During the early 1970's the licensee was authorized to use curie quantities of americium-241 for purposes of inducing color changes in diamonds. At one time the licensee was authorized to possess up to 25 Ci of unencapsulated americium-241.

The licensee's facility (authorized place of use) was located in a rural area on Parr Road in Licking County, Ohio, approximately 18 km southwest of Newark, Ohio. The facility resembled a residential dwelling with the exception of a 15 m<sup>2</sup> laboratory area located in the northwest corner. The remainder of the house had been used at various times as living quarters.

The licensee claimed to have dealt with the irradiation process only until 1973. In 1974 the licensee claimed to have disposed of all radioactive material with the exception of 85 mCi of contaminated articles. These claims were later found to be false.

On the basis of a history of poor performance and a determination by the NRC that radioactive contamination existed in both restricted and unrestricted areas of the facility, in 1981 the NRC issued an Order to the licensee restricting the license to "for storage only" and requiring decontamination of the facility. The licensee responded to the Order by naming himself as the principal individual to perform the decontamination activities. The NRC did not grant the licensee authorization to perform the cleanup and amended the license by authorizing "possession and storage only" of approximately 85 mCi of americium oxide in contamination and waste. That amendment did not authorize the licensee to receive, use, decontaminate, or remove any radioactive material from the facility.

In 1983 the licensee requested termination of its license and decontamination of the facility, claiming financial inability to pay for the cleanup.

In 1984 the NRC issued an "Order to Show Cause" why the licensee should not decontaminate its facility. The licensee again responded by claiming financial inability to pay for decontamination of the facility.

Because the NRC felt that the facility, as it existed, was an unacceptable risk to nearby residents and the environment and the licensee was financially unable to pay for the decontamination, the NRC began to seek alternative funding. The U.S. Environmental Protection Agency (EPA), through its Superfund Trust, agreed to determine whether this site qualified for the Superfund Trust.

In early February 1985, NRC Region III received an allegation claiming that the licensee, John C. Haynes, was in possession of and using large amounts of americium-241 for the irradiation of diamonds.

The matter was referred to and accepted by the NRC Office of Investigation and the FBI.

From mid-February until March 26, 1985, NRC personnel met with the FBI on numerous occasions to discuss plans for the confiscation of the material. Radiological safety training was provided to FBI agents and key NRC personnel because of the hazards involved with americium-241.

At approximately 8:00 a.m. on March 26, 1985, John C. Haynes was arrested at his residence on charges of illegal possession and use of radioactive material and making false statements to the NRC. On that day, the FBI and NRC confiscated 10.56 Ci of americium-241 and four contaminated diamonds. Surveys performed at the facility by the NRC revealed that approximately 2-4 Ci of americium-241 remained in gloveboxes at the facility. To ensure against vandalism or unauthorized entry to the area, the NRC contracted with the Licking County Sheriffs Department to provide around-the-clock security.

On April 5 and May 10, 1985, the NRC issued Orders to the John C. Haynes Company allowing persons or an agency authorized by the Commission to perform decontamination activities at the facility, restricting the licensee or other persons not authorized by the NRC to enter areas under the control of the NRC or its agents, and holding Haynes responsible for any costs associated with the decontamination.



To ensure that no contamination spread to any areas offsite and to ensure that nearby residents had not been exposed to radioactive material, the NRC provided home surveys, water and soil samples, and offered whole-body counts to nearby residents requesting an evaluation. A total of six residents requested surveys and water and soil samples, and five residents, including Haynes, requested and were provided whole-body counts. The results of those surveys and whole-body counts proved to be negative. Accordingly, NRC surveys confirmed that no offsite contamination was detected.

On April 17, 1985, decontamination activities began at the facility. The work was performed by Battelle Memorial Laboratories and Oak Ridge Associated Universities (ORAU) at a total cost of approximately \$385,000. The funding was made available through EPA's Superfund Trust. An additional 12 Ci of americium-241 were found at the facility, thus bringing the total amount of americium-241 confiscated to 23 Ci.

Throughout the entire decontamination of the facility, NRC Region III personnel were onsite monitoring the activities. All americium-241 confiscated was transferred either to Mound Laboratories in Miamisburg, Ohio, or to Battelle Laboratories in Columbus, Ohio, for storage pending eventual disposition at a burial site.

On July 26, 1985, decontamination activities of the facility were concluded. All areas were decontaminated in accordance with the criteria in the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of License for Byproduct, Source or Special Nuclear Material," dated July 1982, by the NRC Division of Fuel Cycle and Material Safety.

On August 19, 1985, the John C. Haynes Company's NRC license was terminated. At the time of this printing criminal proceedings by the U. S. Department of Justice are pending.

### 1.3.1 Conclusions

Before February 1985, the NRC had relied on information provided by the licensee that he had disposed of all but approximately 85 mCi of americium-241. Without the information provided to the NRC by the alleged, it would have been virtually impossible to determine that Haynes still possessed unauthorized quantities of americium-241 and was still using the material for his diamond irradiation process. The more pertinent reasons for that follow:

- (1) All inspections performed at the laboratory were announced. Several unannounced inspections were attempted, but were not successful because Haynes throughout the day and night as a result of other full-time responsibilities at his jewelry store in Heath, Ohio. On the attempted unannounced inspections, Haynes was not present, nor could he be located, and the NRC did not have authority to enter the facility without the licensee.
- (2) The NRC had no way to determine the quantity of americium-241 that Haynes claimed was disposed of in 1974 because Haynes claimed to have lost records pertaining to that disposal. In addition, commercial burial sites rely on the licensee's determination of quantities of radioactive waste and do not independently verify that determination.



- (3) Haynes kept the majority of his unauthorized quantities of americium-241 at various locales other than his authorized facility.
- (4) It was alleged that Haynes knew when the NRC was in the vicinity of Columbus-Heath-Newark, Ohio area performing inspections, thus he would not perform any work with the americium-241 until after the inspectors departed the area.

On the basis of whole-body assays, surveys, soil and water samples, and the prompt and precise identification of contamination and remedial actions implemented by Federal and State response personnel, it was determined with confidence that no offsite contamination occurred and that no members of the general public received radiation exposure as a result of the licensee's actions. It was also determined that all radioactive material possessed by Haynes was confiscated.

#### 1.3.2 Lessons Learned

- (1) The licensee was financially unable to decontaminate his facility, thus placing the burden on the taxpayers. This generic problem is currently being evaluated by the NRC. On February 11, 1985, the NRC published a Proposed Rule in the Federal Register that would require a licensee to provide reasonable assurance that adequate funds would be available to ensure that decommissioning can be accomplished in a safe manner.
- (2) Before issuing a license differing from the normal, as was Haynes' license request for the irradiation of gemstones with americium-241, the following criteria should be reviewed closely.
  - (a) A risk analysis should be performed to determine if the risks involved outweigh any of the benefits to the public.
  - (b) Prelicensing site visits should be performed to determine the adequacy of personnel, equipment and facilities, especially if some of the equipment and facilities were fabricated by the licensee.
- (3) The Haynes case is a prime example of the merits of performing unannounced inspections to ensure health and safety. By announcing inspections licensees may be given the opportunity to assure that on the day of the inspection all NRC requirements would be in order.
- (4) In this emergency situation where waste was transferred to DOE facilities and funding was provided by the EPA, the DOE was not required to expend any funds for the management of the waste. The NRC was responsible for securing appropriations for any funds necessary for the waste management over and above what the EPA provided.

#### 1.4 Licensed Activities and History

During the early 1970's, the licensee was using curie amounts of americium-241 for the purpose of inducing color changes in diamonds. The licensee possessed a United States patent for the process of irradiating diamonds. The process basically consisted of placing a diamond in close contact with the americium-241.

The alpha particles emitted from the americium would cause color changes on the diamond's surface, thus increasing its market value. The licensee's ultimate goal was to produce a "green" diamond indistinguishable from a natural "green" diamond.

The licensee's laboratory was located in a rural area on Parr Road in Licking County, Ohio, approximately 18 km southwest of Newark, Ohio (see Figures 1.1 and 1.2). The property consists of two interlocking steel-walled buildings, a house and a garage (see Figures 1.3-1.5). Both buildings are on concrete slabs. The house resembles a residential dwelling, with the exception of a 15 m<sup>2</sup> laboratory area in the northwest corner (see Figure 1.6). This laboratory area was where operations involving radioactive material were conducted.

The restricted area contained three gloveboxes and a vented hood (see Figures 1.7-1.10). Glovebox 2 was used for cleanup activities and glovebox 3, according to the licensee, was never used for operations involving radioactive material. This later turned out to be false.

The remainder of the house was used at various times as living quarters and for activities in support of the licensee's operations (see Figures 1.11 and 1.12).

The garage was primarily used for storage of miscellaneous equipment not associated with the radioactive materials work (Figures 1.13 and 1.14). However, this building did contain two metal drums of contaminated waste materials.

The licensee claimed to have dealt with the irradiation of diamonds using radioactive material until November of 1973. According to licensee's statements, all radioactive materials with the exception of approximately 85 mCi of contaminated materials were disposed of at a commercial burial site on February 19, 1974. These were later determined by the NRC to be false statements.

The licensee's NRC Byproduct Material License No. 34-13774-1 was originally issued to the John C. Haynes Company on August 18, 1970. The license initially authorized possession of three 300-mCi sealed americium-241 sources for the purpose of irradiation of crystalline materials (diamonds). Since the time of issuance, the following amendments were made to the license:

May 18, 1971 - Authorized for up to 7 Ci of americium-241 in any form.

November 1, 1971 - Authorized for up to 25 Ci of americium-241 in any form.

September 25, 1973 - License amended to add up to 100 Ci of cesium-144 in any form.

April 25, 1978 - License amended in its entirety authorizing up to 25 Ci of americium-241 as americium oxide.

On August 28, 1981, the NRC issued an Order to Modify License No. 34-13774-01 to restrict the license to storage only and to require decontamination of the facility. That Order was based on a threatened foreclosure on the property where the laboratory was located by the mortgagee and a concern that this could result in the licensee's loss of control over the facility. It was also based

on a concern of the licensee's capabilities because of his inspection history. On October 2 and 23, 1981, the licensee submitted a decontamination plan to the NRC naming himself as the principal individual performing the decontamination. The NRC did not grant the authorization for the licensee to perform the decontamination because of the previous inspection findings and lack of assurance that the licensee would be capable of conducting such activities. The 1981 Order was rescinded on June 15, 1982, based on (1) the licensee's demonstration that it had paid off the mortgage and had obtained clear title to the property, and (2) an amendment to the license, issued on April 28, 1982, limiting the licensed activity to possession and storage only of approximately 85 mCi of americium oxide as contamination and waste. That amendment did not authorize the licensee to receive, use, decontaminate, or remove any radioactive material from the facility.

On August 19, 1983, the licensee requested termination of the license and decontamination of the facility, claiming financial inability to pay for decontamination.

From 1970 through 1981, the NRC inspected the licensee's facility five times. Numerous violations and concerns were identified throughout that period. Some of the more serious violations and concerns follow:

- (1) The licensee made erroneous statements on the initial application for an NRC license regarding training and experience.
- (2) The licensee received a hand overexposure and failed to report the overexposure as required by the NRC.
- (3) The licensee failed to conduct proper surveys to assure that radioactive material was not being spread to adjacent areas of the laboratory.
- (4) The licensee failed to use protective clothing.
- (5) The licensee failed to sample liquid and air effluents.
- (6) The licensee incinerated licensed material without authorization.
- (7) The licensee stored radioactive waste in an unrestricted area not secured from unauthorized removal.
- (8) Americium-241 contamination in excess of NRC limits existed in both restricted and unrestricted areas of the laboratory. Note: Contamination primarily was in the restricted areas. Unrestricted area contamination was not removable and was evaluated by the NRC as not being a significant hazard.

Since 1981, the NRC has made numerous announced site visits and attempted unannounced visits to the facility to determine the licensee's status and to assure that the licensee was performing required air sampling and was complying with the license requirements of limiting activities to storage only. No violations of NRC requirements were identified during those site visits.

On August 18-19, 1983, at the request of the NRC, personnel from Oak Ridge Associated Universities' Radiological Site Assessment Program conducted an extensive radiological survey of the J. C. Haynes facility and submitted to

the NRC a proposed decontamination plan. The results of that survey determined that americium-241 contamination existed in both the restricted and unrestricted areas of the facility (see Appendix A). It was later determined that the results of that survey were low since Haynes removed the bulk of the americium-241 before the survey and stored it at another locale. The decontamination plan estimated it would take approximately 4 weeks to decontaminate the facility at an estimated cost of \$130,000 (see Appendix B for plan and schedule). One of the major drawbacks of the plan was finding a waste disposal site willing to accept transuranic waste in excess of 100 nCi/g.

On June 19, 1984, the NRC issued an "Order to Show Cause" why the licensee should not decontaminate its facility in accordance with the decontamination plan prepared by Oak Ridge Associated Universities. The licensee responded to the Order claiming again that it was unable to pay for the decontamination of the facility. The licensee provided the NRC with documents that supported its financial status.

Because the NRC was concerned with public health and safety, an assessment was made of radiological doses associated with the potential release of americium-241 from the Haynes property. Various assumptions and scenarios were evaluated in that report based on 150 mCi of residual radioactivity remaining inside the gloveboxes. The report estimated exposures to various individuals in the event of a fire or an intrusion at the facility.

In the event of a fire, the americium oxide would further oxidize to americium dioxide which is soluble. The major pathways of concern for exposure to this form of americium are inhalation and skin wounds with critical organs being liver, gonads, red bone marrow, and bone surface. An individual residing at a home 70 m from the Haynes property could receive a 50-year dose commitment ranging from 0.16 rem to 8.2 rem in the event of a fire. EPA's guidance requires offsite protective measures for doses exceeding 5 rem. In addition, in the event of a fire, the release of americium-241 could contaminate nearby property. The EPA guidance states that levels above 0.2  $\mu\text{Ci}/\text{m}^2$  necessitates cleanup operations. The area of contamination exceeding the EPA's guidance could extend to almost 250 m from the site in the event of a fire. These doses assumed a source term of 150 mCi. In reality, the NRC found up to 23.0 Ci of americium-241. Accordingly doses would have been significantly higher and the spread of contamination could have extended several kilometers.

In the event of an intruder entering the laboratory, the critical pathway would be by direct inhalation. An intruder inhaling air in the hood area for approximately 30 min could receive a dose commitment of about 25 rem. This dose exceeds the recommended annual 500 millirem dose limit for members of the general public. The above values later were determined to be low since the americium present at the facility was significantly greater than estimated.

On the basis of the results of that report, the NRC felt that the facility was an unacceptable risk to nearby residents and should be immediately decontaminated. Since the licensee was unable to financially decontaminate the facility, the NRC actively began to seek alternative funding for the decontamination of the site to alleviate the health and safety problems which existed. EPA Region V through its Superfund Trust, agreed to determine whether the site qualified for the Superfund Trust.

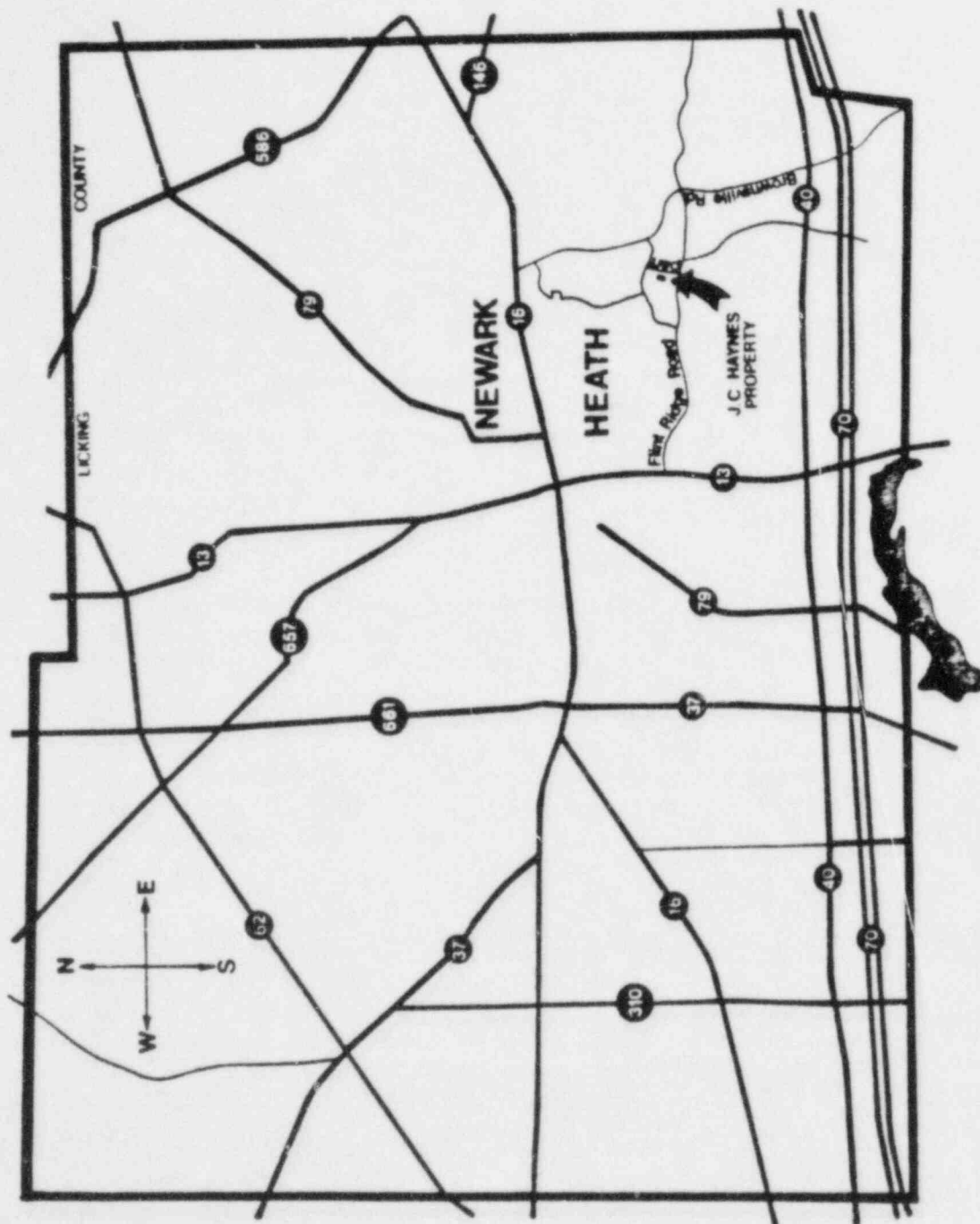


Figure 1.1 Map of Licking County, Ohio, indicating the location of the J.C. Haynes property



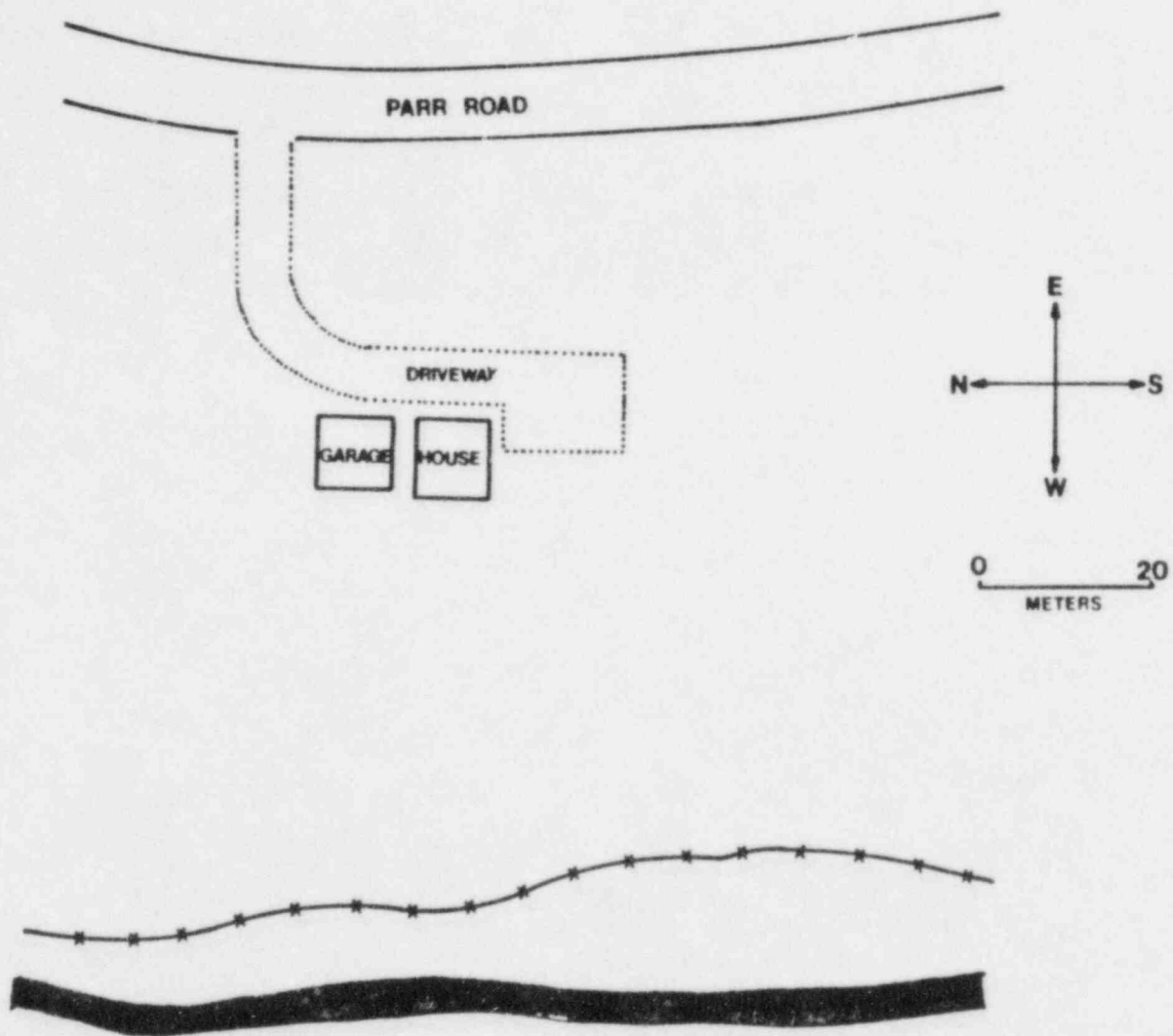


Figure 1.2 Plan view of the Haynes property



Figure 1.3 Front view of house showing main building and garage



Figure 1.4 Rear view of house and garage





Figure 1.5 Aerial view of Haynes' facility

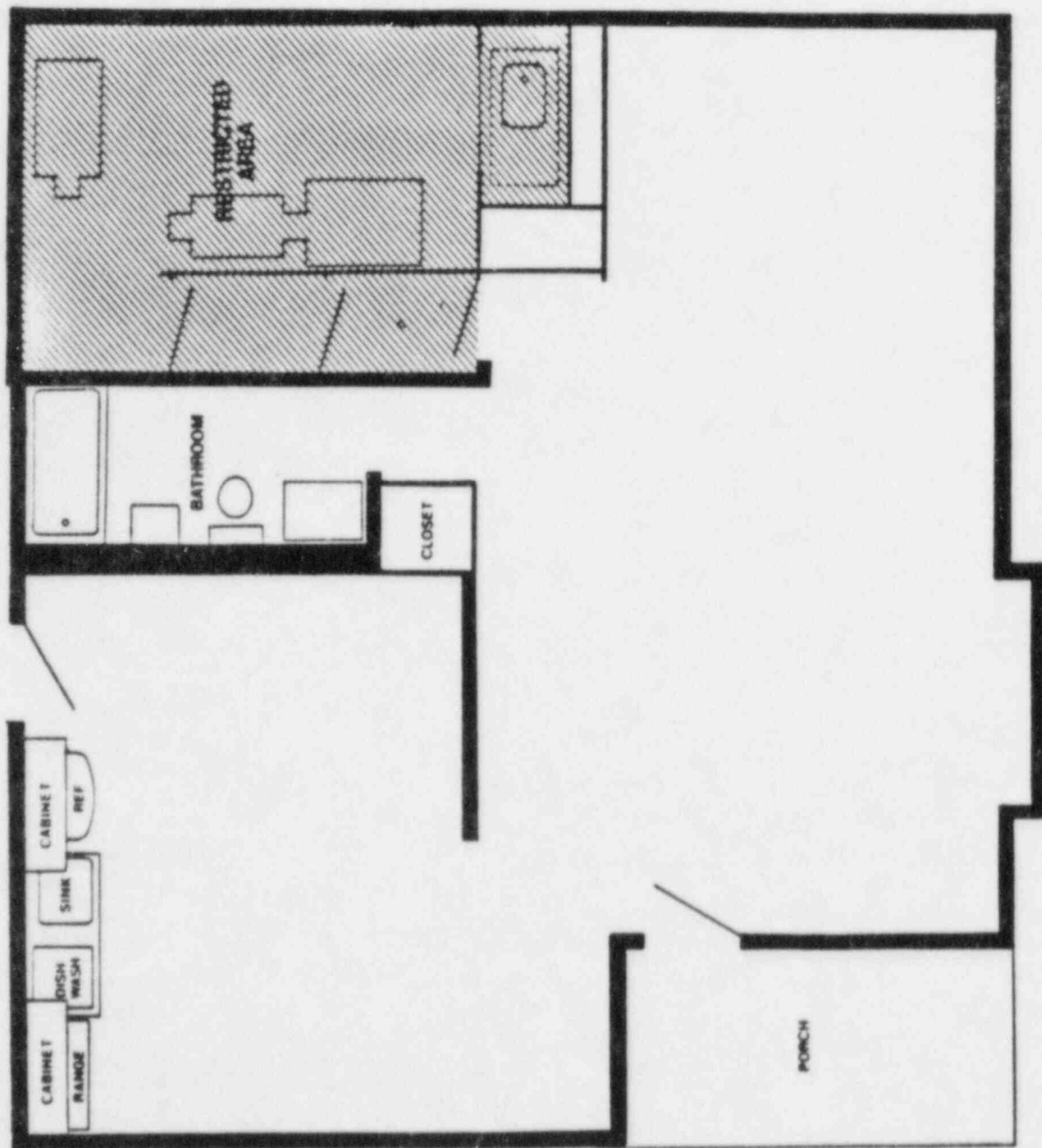


Figure 1.6 Layout of the main building (house) showing the locations of the radioactive materials handling areas

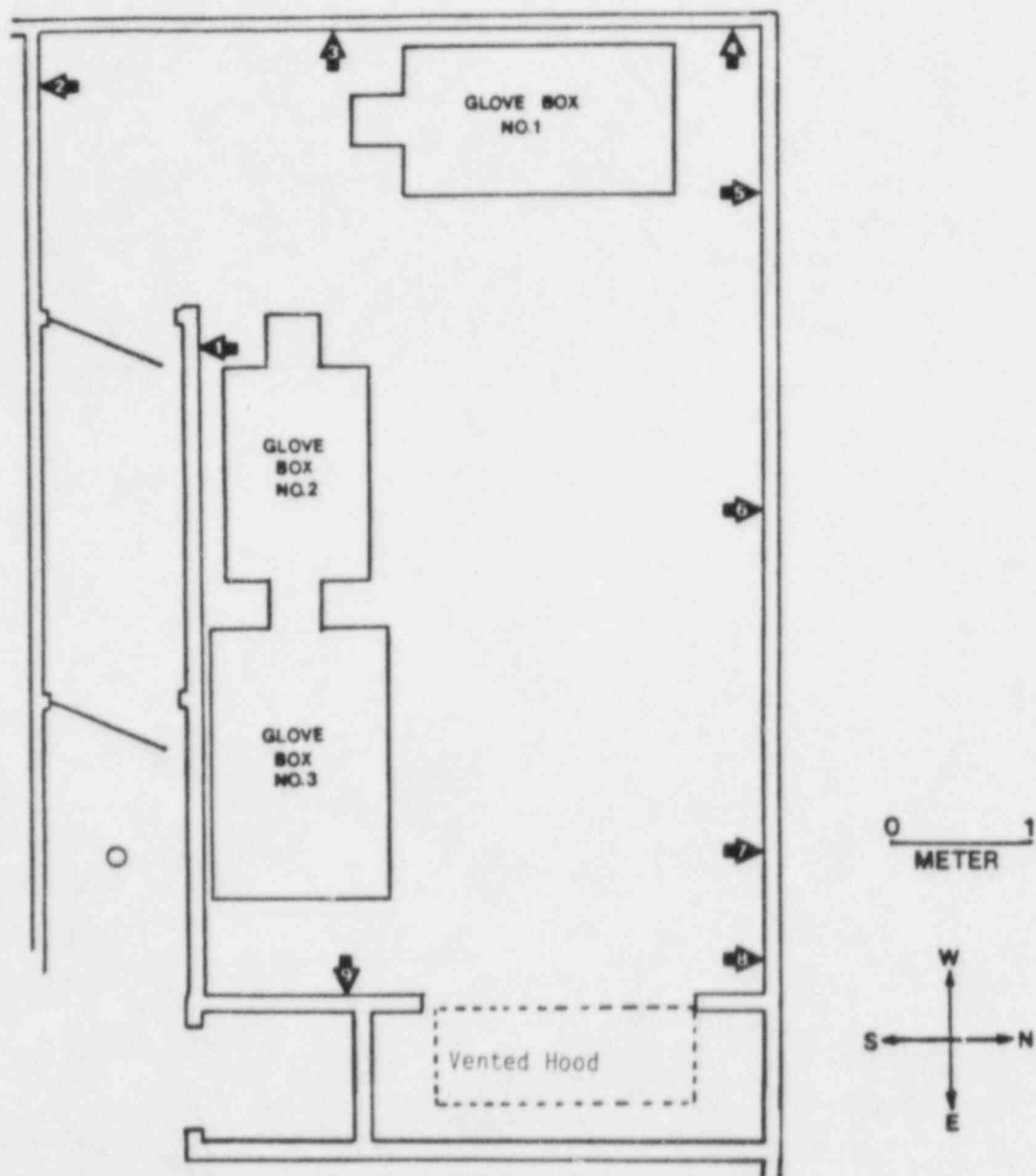


Figure 1.7 Restricted area of facility

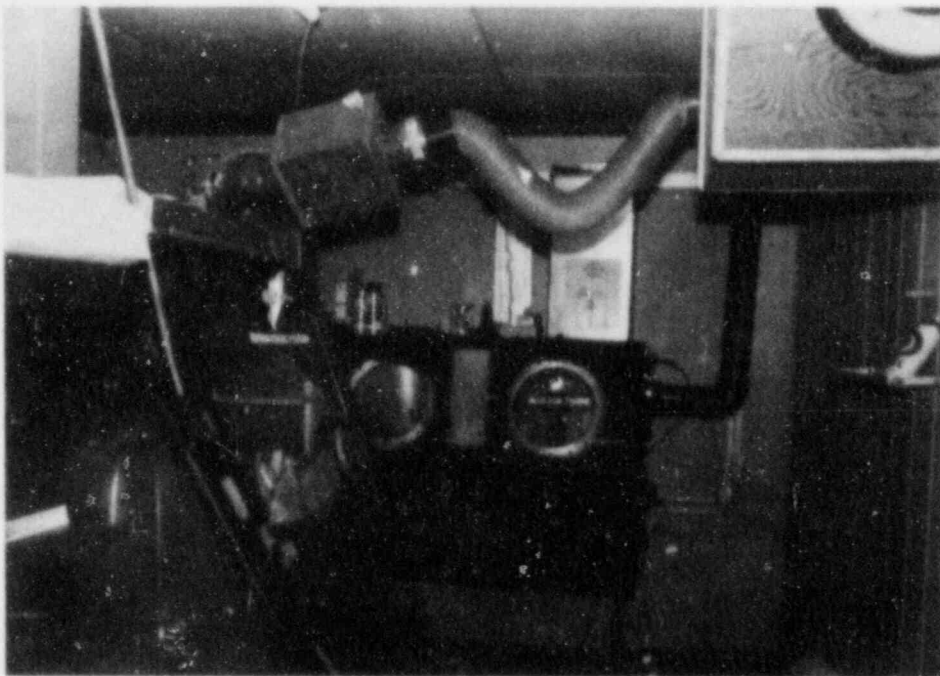


Figure 1.8 View of restricted area showing glovebox 1

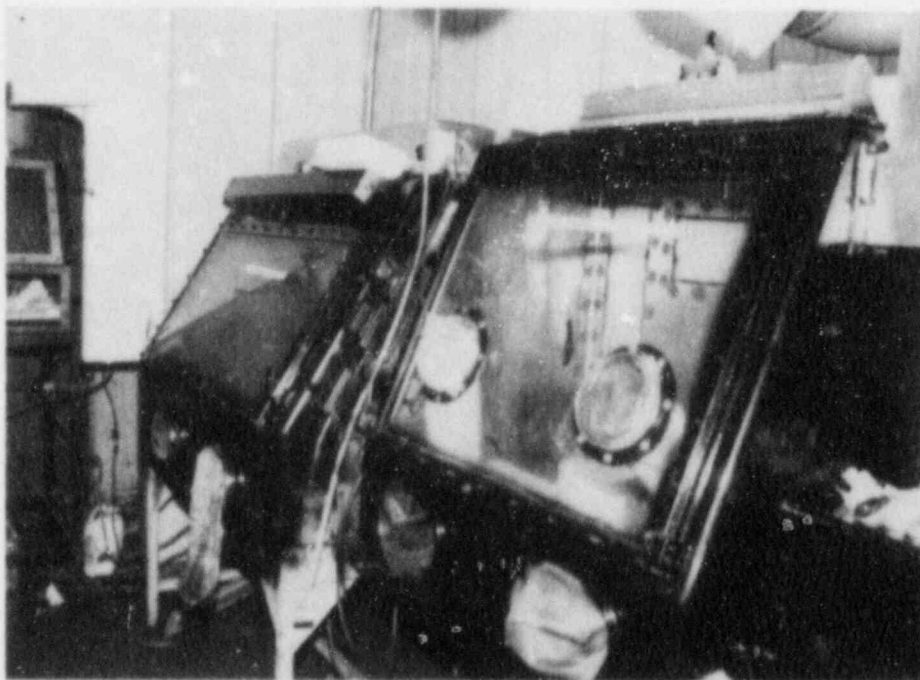


Figure 1.9 View of restricted area showing gloveboxes 2 and 3

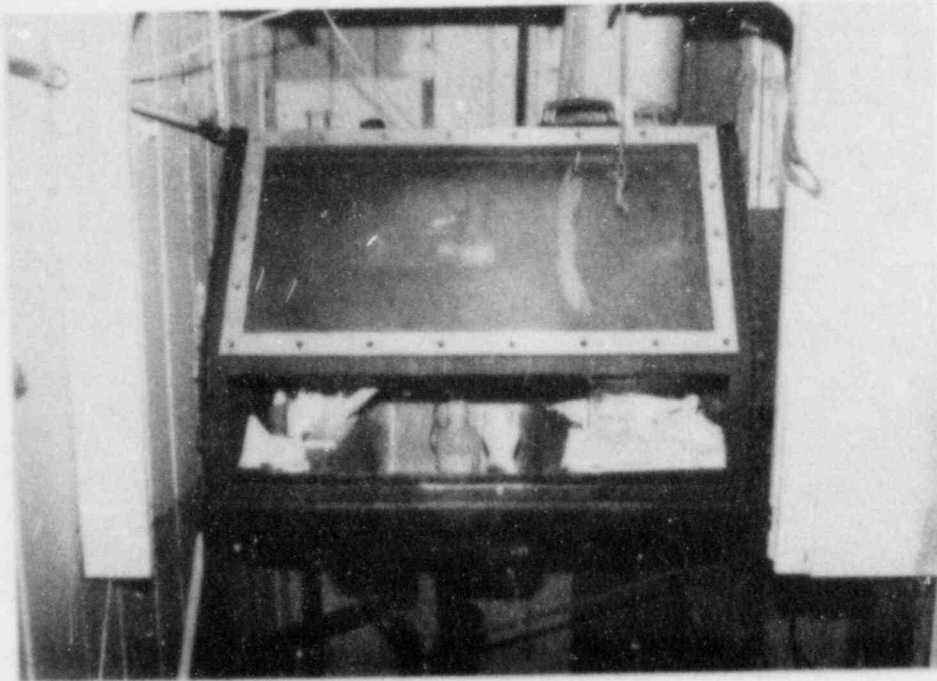


Figure 1.10 View of vented chemical cleaning hood

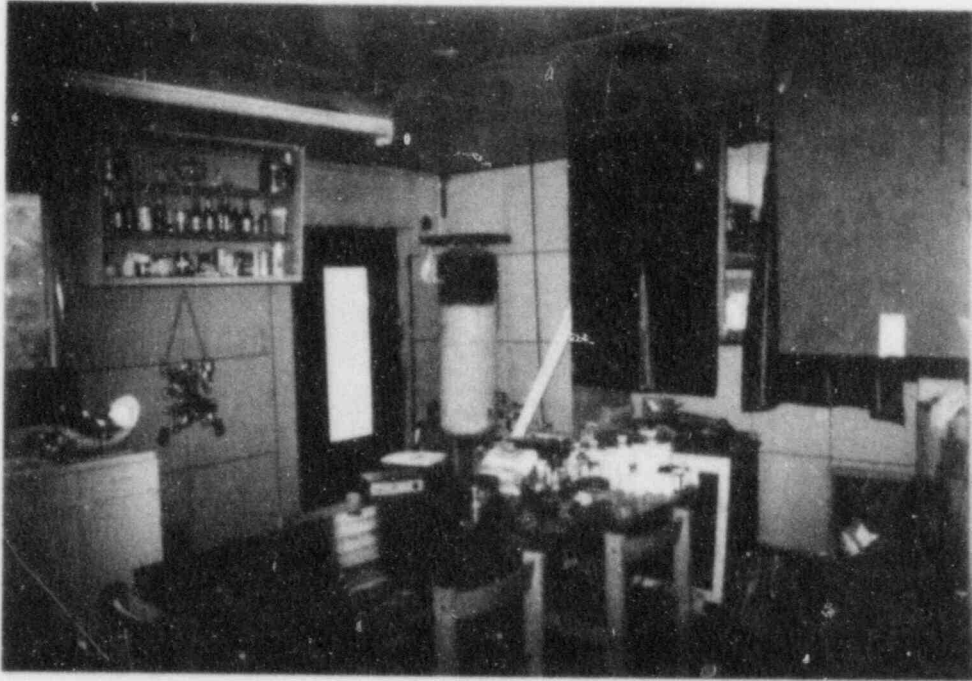


Figure 1.11 View of kitchen area of house

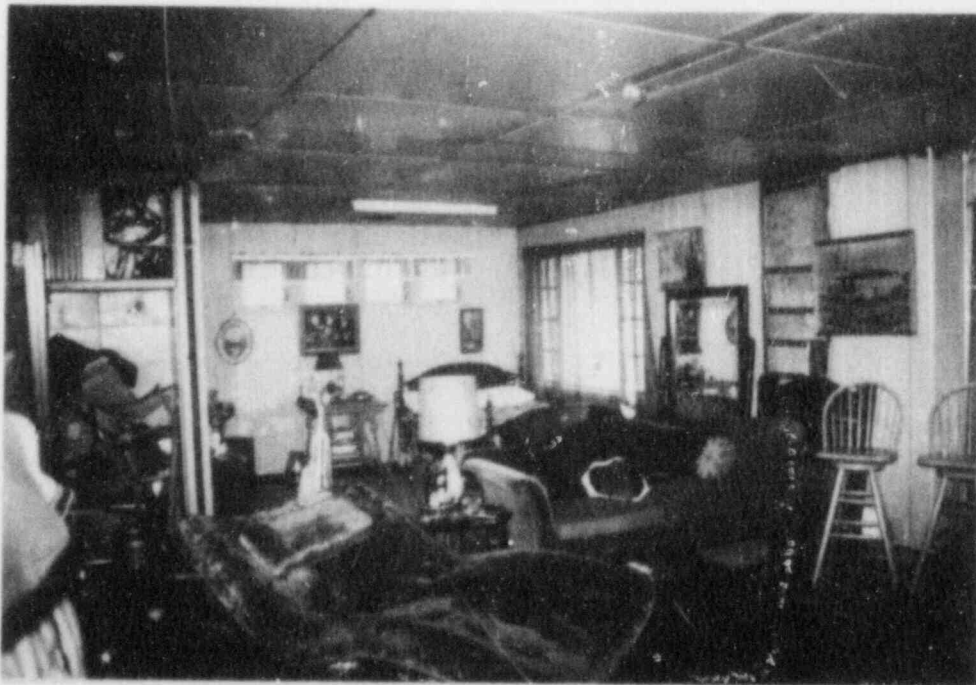


Figure 1.12 View of living room and bedroom areas of house





Figure 1.13 Exterior view of garage



Figure 1.14 Interior view of garage



## 2 EVENT CHRONOLOGY

### 2.1 Pre-event (Before Confiscation)

In early February 1985, NRC Region III received information that John C. Haynes of the John C. Haynes Company of Newark, Ohio, was in illegal possession of americium-241. The allegation was that Haynes possessed large amounts of americium-241 and was using the material to irradiate diamonds.

On several occasions during February 1985, the individual that provided the information to the NRC was interviewed by Region III staff members and a representative from the Office of Investigations. Since it appeared that the licensee was in willful violation of the Atomic Energy Act of 1954 by allegedly possessing unauthorized quantities of radioactive material and providing false statements to the NRC, the matter was referred to and accepted by the FBI office in Columbus, Ohio.

From mid-February until March 26, 1985, NRC personnel met with FBI agents assigned to the case on various occasions to discuss plans for the confiscation of the material. At the request of the FBI, the plans were to be discussed with no one outside of the NRC with the exception of a few individuals from DOE who assisted the NRC in the final plans for the confiscation. Because the FBI agents were not familiar with the handling of radioactive material, NRC personnel spent considerable time briefing the agents on the hazards associated with the americium-241. This included (1) discussing americium-241 (half-life, physical chemistry radiotoxicity, energy, etc.), (2) finding ways to minimize the contamination during the confiscation, (3) demonstrating the proper donning of protective clothing and masks, and (4) stressing the need to minimize a radiological event coupled with a fire. The agents also were provided with and instructed in the use of pocket dosimeters.

Extensive and expeditious planning began at NRC Region III, which included:

- (1) obtaining current maps of Licking County, Ohio
- (2) locating a nearby whole-body counting facility for evaluating americium-241 lung burdens
- (3) arranging flight and ground transportation for NRC personnel assigned to the case
- (4) reserving a rental van to pre-position equipment and personnel near Columbus, Ohio
- (5) preparing emergency kits to ensure that adequate supplies were available for the detection, assessment, and cleanup of an americium-241 incident
- (6) preparing photographic equipment

- (7) preparing adequate radiological instrumentation for NRC site team (This included alpha detection instruments, scintillation meters, and beta-gamma detectors.)
- (8) training all inspectors involved in the proper use of all instrumentation
- (9) obtaining a lead container for storing any confiscated americium-241
- (10) obtaining drums for safely transporting the americium-241
- (11) providing respirators for personnel involved in the initial confiscation of the material
- (12) arranging for the americium-241 to be transported and stored at Mound Laboratories, Miamisburg, Ohio

On March 23, 1985, the FBI decided that the confiscation would take place on March 26, 1985, and would consist of confiscating only the portion of americium-241 that presumably existed at the laboratory on Parr Road.

On March 25, the Governor's Office of the State of Ohio was informed of the case and of the planned confiscation. Also on that date, the Department of Energy and the Ohio Disaster Services Agency were notified to be on standby status in the event of an emergency. Only key individuals from both organizations were briefed on the specifics regarding the case.

That afternoon, all NRC participants and key State of Ohio officials met at the FBI office in Columbus and were briefed on the following plan for the confiscation scheduled for the following day.

The FBI had obtained an arrest warrant for John C. Haynes on charges of illegal possession and use of radioactive material and for making false statements to the NRC. In addition, the FBI obtained a search warrant for the Parr Road facility.

Through conversations with the alleged, the FBI was informed that the material could be at any of the following locations:

- (1) the licensee's laboratory on Parr Road
- (2) a jewelry store located in Newark, Ohio
- (3) one of two residences located near Buckeye Lake, Ohio

Four teams were formed. Each team consisted of two or three NRC representatives and two to four FBI special agents. Team No. 1 consisted of two NRC inspectors, one NRC investigator, and two FBI special agents; this team was assigned to the laboratory on Parr Road. Team No. 2 consisted of two NRC representatives and four FBI special agents and was assigned to John C. Haynes' residence. Team No. 3 consisted of two NRC inspectors and three FBI special agents and was assigned to the jewelry store in Newark, Ohio, and also to a residence near Buckeye Lake. Team No. 4 consisted of two NRC inspectors and four FBI special agents and was assigned to a residence near Buckeye Lake and a residence in Newark where it was alleged that four recent irradiated diamonds were being stored.

It was decided that each team was to be pre-positioned at its assigned sites by 7:30 a.m., Tuesday, March 26. At 8:00 a.m., all teams would be instructed to enter their assigned sites. The FBI established communications with all teams and positioned an airplane over the areas to enhance portable radio communications. NRC personnel were instructed to enter only after the site was secured and deemed safe by the FBI special agents. The NRC's responsibility was that of performing radiation surveys and assisting the FBI in questioning, if necessary. Because the FBI did not have search warrants for the sites other than John C. Haynes' residence and the laboratory, it would be up to the occupants of the residences to allow surveys to be performed.

## 2.2 The Confiscation (March 26, 1985)

By 7:00 a.m., Tuesday, March 26, 1985, all four teams were gathered at various predetermined locations in the vicinity of Heath-Newark, Ohio, to review final plans for the confiscation. By 7:45 a.m., all teams were positioned in the near vicinity of their assigned areas. Surveillance of all areas was being performed by an FBI airplane circling the Heath, Newark, Buckeye Lake areas.

Each team, with the exception of Team No. 1, was equipped with a portable alpha counter, a scintillation detector, and a set of protective clothing in case of an incident. Team No. 1, in addition to the alpha counter and scintillation detector had beta-gamma meters, air sampling equipment, counting equipment, and face masks because of the likelihood that a large portion of the americium-241 was at the laboratory and the laboratory was significantly contaminated.

At approximately 8:00 a.m., FBI special agents of each team entered their assigned areas. NRC members entered shortly after that time once the area was deemed safe by the FBI agents.

John C. Haynes was arrested at his residence shortly after 8:00 a.m. on charges of illegal possession of radioactive material and making false statements to the NRC. Extensive surveys performed by NRC representatives of Team No. 2 at Haynes' residence failed to detect the presence of any radioactive material.

Members of Team No. 3 were allowed by occupants to perform surveys at the jewelry store and a residence at Buckeye Lake, Ohio. Those surveys failed to detect the presence of any radioactive material, yet NRC inspectors did find a rusted 1-gal can, lined with lead, outside the jewelry store (see Figure 2.1). The container was surveyed with a scintillation detector and was found to be free of radioactive contamination. The owner of the jewelry store claimed to have no knowledge of the can's presence.

Members of Team No. 4 did not perform a survey of the residence near Buckeye Lake at this time because the occupant repeatedly denied that any americium was ever on his premises. In addition, as was stated earlier, the FBI did not have a search warrant for the property.

When FBI special agents of Team No. 1 secured the laboratory on Parr Road, two occupants were present in the unrestricted area. When questioned, they stated that they had been living there for approximately 1½ years and had no knowledge that Haynes was irradiating diamonds. They did know of his past irradiation process and were aware that the laboratory portion of the dwelling was contaminated and was off-limits to them. They claimed that Haynes was not charging

them any rent in exchange for their presence acting as site security. After questioning them, the FBI requested that they leave the site. They complied with the request and left a telephone number where they could be reached.

The occupants were offered on numerous occasions whole-body counts by the NRC to determine if they had ingested any americium-241. They repeatedly declined those requests.

Once the occupants left, NRC members of Team No. 1, entered the facility and performed a preliminary survey with a portable alpha counter of the unrestricted areas of the dwelling. No contamination was detected. In addition, a survey, which also failed to detect any contamination, was performed on the occupants' clothing hanging in the closet.

All members of Team No. 1 now began to don protective clothing (Figure 2.2). It was decided that the initial entry inside the laboratory would be made by two NRC inspectors and one FBI agent wearing protective clothing and face masks, while one NRC inspector would be on the outside of the laboratory to monitor them when they exited.

At approximately 9:00 a.m., the first entry was made into the laboratory. Preliminary surveys made inside the laboratory around the gloveboxes revealed gamma levels exceeding 180 mR/hr. On the basis of that survey, it was evident that there may be up to 2-3 Ci of americium-241 present in the laboratory, well in excess of the 85 mCi authorized in the license.

Because it could not be determined if there was significant loose americium-241 in the laboratory, an air sampler was set up. Preliminary counting of the air samples at the facility revealed airborne americium-241 in concentrations exceeding three times the 40-hr maximum permissible concentration (MPC). These samples were later recounted at the Region III office (see Appendix C). Because no individual was in the laboratory for any extended period throughout the confiscation and because face masks were used, it can be safely assumed that no one received internal radiation doses exceeding NRC limits.

All individuals exiting the hot laboratory were monitored using a portable alpha counter. The majority of individuals did have low level contamination on their disposable shoe coverings (1000-2000 dpm). All contaminated clothing was removed before exiting the laboratory.

The Department of Energy personnel on standby status were now called to the facility to perform more extensive surveys. Their preliminary assessment of the facility was that extensive contamination existed in the laboratory, yet none or very little existed in the unrestricted portion of the facility.

At approximately 10:00 a.m., FBI agents brought J. C. Haynes to the facility on Parr Road. Haynes was allowed entry into the laboratory area with one NRC inspector and pointed to the areas in the gloveboxes where the americium-241 was located. Haynes claimed that this was all of the material he possessed and had no more at any other locale. He also claimed that he was very cautious in handling the material and the only area contaminated was inside the laboratory.

Shortly after his arrival at the facility, Haynes contacted his attorney and informed him of his arrest. After speaking with his attorney, Haynes

informed the FBI that he had more americium-241 in a container stored at a residence near Buckeye Lake-Harbor Hills, Ohio. This was the same residence where Team No. 4 was earlier that morning and where the occupant denied that any americium existed on the property.

With Haynes in custody, FBI and NRC personnel departed for the residence near Buckeye Lake-Harbor Hills, Ohio, where the americium-241 was located (see Figures 2.3 and 2.4). When they arrived, the occupant of the residence was questioned by the FBI and again denied knowledge of any americium-241 being present on the property. Haynes informed the FBI that he had placed the container in his basement without the occupant's knowledge.

Haynes then led NRC personnel and FBI agents into a portion of the basement where a large cylinder (approximately 5 ft in diameter by 12 ft long) was located (see Figure 2.5). This was identified as a fallout shelter. At the entrance to the cylinder, Haynes pointed to a small cardboard box and stated that the container was located under it. When the cardboard was removed, there was a silver metal quart-size can presumably containing the americium-241. A survey performed with a beta-gamma meter revealed a surface reading of 0.5 mR/hr. A smear was taken on the exterior surface of the can, immediately analyzed with a portable alpha counter, and deemed to be free of any loose contamination. The can was then removed from the area, placed in a 5-gal container provided by the NRC and carried outside.

The 5-gal container, with the quart can inside, was then filled with approximately 25 lbs of sand for additional shielding and was secured to the cargo area of the NRC rental van. With two Ohio State Patrol vehicles as escort, the van was driven by NRC personnel to the Parr Road facility.

When the van arrived at the facility, the 5-gal container was brought inside and the quart container was removed and placed in a plastic bag (see Figure 2.6). After removing the top of the quart can, it was observed that the can's circumference was filled with approximately 1 in. of lead. Inside the can was another smaller container with a nut and bolt apparatus on top. This was later determined to be fabricated by Haynes from a freeze plug from an automobile engine (see Figure 2.7). A survey taken with a beta-gamma meter revealed readings of 170 mR/hr at the surface and 0.2-0.3 mR/hr at 1 m. Opening of the smaller container was not attempted at the facility because of a lack of proper safety equipment (i.e., gloveboxes and fume hoods).

The quart can was then reassembled and placed back in the 5-gal container and again filled with sand. It was then labelled with a radioactive shipping label and secured to the inside of the van awaiting transport to Mound Laboratory in Miamisburg, Ohio.

Because Mound Laboratory agreed to receive the confiscated americium-241, it was decided to re-enter the laboratory area and try and procure any significant amounts of americium-241 from the glovebox. Two NRC representatives donned protective clothing and face masks and re-entered the laboratory. Two small vials of powder-like material, later determined to be americium-241, were removed from the glovebox and placed in a plastic quart container and double bagged (see Figure 2.8). This was then placed in another NRC-provided 5-gal can and was shielded with sand. This container was labeled for shipment and secured to the inside of the van with the other container.



Shortly after both containers were placed in the van, members of Team No. 4 returned to the facility after confiscating four irradiated diamonds from a residence in Newark, Ohio (see Figure 2.9). The diamonds were surveyed by NRC personnel and were found to have extensive fixed contamination. The diamonds also were smeared to check for removable contamination. The smear samples were brought to Mound Laboratory for analysis. The level of contamination of each diamond exceeded a level which would allow them to be released or be used by the public (Appendix D).

According to the individual (a chemist) from whom the diamonds were confiscated, Haynes brought the four irradiated diamonds there 3 days earlier and asked the chemist to decontaminate them. Successful decontamination had been one of Haynes' problems in the past. The chemist stated that Haynes was authorized by the NRC to irradiate diamonds and was not aware of any wrongdoing. The diamonds were turned over to the NRC by the FBI to be transported to Mound Laboratory along with the americium-241.

At approximately 6:15 p.m., March 26, the van containing the confiscated americium-241 and the diamonds departed from the Parr Road facility enroute to Mound Laboratory, Miamisburg, Ohio. The Governor of the State of Ohio requested the van not pass through Columbus, Ohio, until after the rush-hour traffic. The van driven by NRC personnel was escorted by two Ohio State Patrol vehicles, a Mound Laboratory vehicle, and an Ohio Disaster Services Agency vehicle.

The caravan arrived at Mound Laboratory at approximately 8:30 p.m. that day and transferred the containers and diamonds to Mound personnel. Mound was requested to decontaminate the diamonds and perform a quantitative and qualitative analysis of the presumed americium-241.

It was estimated that another 2-4 Ci of americium-241 still existed in the gloveboxes and the facility. If left unattended, the facility would be vulnerable to vandalism or unauthorized entry. Therefore, the NRC contracted with the Licking County Sheriff's Department to provide around-the-clock security at the facility.

Throughout the entire day, the Regional Administrator of Region III and the Director of the Columbus, Ohio FBI office were in continuous communications with all FBI and NRC teams.

## 2.3 Post-event

### 2.3.1 NRC Survey

On March 27, 1985, NRC Region III inspectors conducted extensive surveys of the facility at Parr Road. The surveys consisted of direct alpha and beta-gamma measurements and smear samples of the restricted and unrestricted areas (see Appendix E).

Direct alpha surveys of the restricted area revealed extensive contamination with results ranging from 300 to 300,000 cpm/57 cm<sup>2</sup> (50% efficiency). Direct gamma surveys of the restricted area revealed radiation levels ranging from 0.3 to 200 mR/hr. Smear samples taken from the restricted area revealed removable contamination ranging from 540 to 3580 dpm (disintegrations per minute/100 cm<sup>2</sup>). The NRC release limits for removable contamination is 20 dpm.

Direct alpha surveys taken in unrestricted areas of the facility failed to detect any contamination. Smear samples taken from the unrestricted areas revealed removable contamination ranging from 0.8 to 15.0 dpm/100 cm<sup>2</sup>.

In addition to the above surveys, NRC and State personnel surveyed clothing, furniture, and personal belongings of the previous occupants before these items were removed from the facility. There was no evidence of any contamination present on any of the items removed.

Surveys performed outside of the facility proved to be negative with the exception of a small area located adjacent to the building where an amount of americium-241 was previously incinerated (see Figure 2.10). Concentrations in that area ranged from 1.38 to 883 pCi/g, which was in excess of the EPA limit for unrestricted use by the public.

On the basis of the above surveys, it was determined that the majority of contamination existed in the restricted area of the facility with some exterior ground contamination well in excess of the EPA limit.

### 2.3.2 NRC Orders

On April 5, 1985, the NRC issued an Order to the John C. Haynes Company requiring it to permit entry into the Parr Road facility and to allow removal, by a person or agency authorized by the Commission, of radioactive material and contamination, which poses an imminent hazard to the public health and safety. The Order was issued in view of the unauthorized use of licensed material, the extensive contamination present, and the absence of a responsible individual to ensure that the facility would be safely maintained. The Order also required decontamination of the facility to levels safe for unrestricted use, holding Haynes responsible for any costs associated with the decontamination. Once the decontamination activities at the facility were completed, the Order stated that the John C. Haynes Company NRC license would be revoked.

On May 10, 1985, the NRC issued another Order to the John C. Haynes Company prohibiting Haynes or any other individual from entering any area under the control of the NRC or its agents at the Parr Road facility until decontamination activities were completed. The Order was issued to prevent interference with the decontamination activities, the spread of contamination, and any unnecessary radiation exposure.

### 2.3.3 Public Meeting

On April 16, 1985, NRC representatives held a public meeting in Licking County to answer questions or concerns which members of the public may have regarding the licensee's actions. Approximately 40 people attended that meeting.

NRC Region III staff discussed the hazards involved with the americium-241, stressed the preliminary findings that so far no contamination was detected outside of Haynes' property, discussed tentative decontamination activities and schedules, and also took requests for property surveys and whole-body counts for individuals concerned that they or their property may have been contaminated.



#### 2.3.4 Mound Laboratory Analysis of Confiscated Materials

On April 1, 1985, NRC Region III was notified by Mound Laboratory of the results of the analysis performed on the four diamonds confiscated on March 26, 1985 (see Appendix D). The results revealed that the diamonds were contaminated with between 800 and 140,000 dpm of removable americium-241. This is in excess of the NRC's maximum allowable removable contamination of 20 dpm/100 cm<sup>2</sup>.

On April 9, 1985, Region III was notified of the results of the initial analysis performed on the containers confiscated on March 26, 1985 (see Appendix F). That analysis revealed a total quantity of  $10.56 \text{ Ci} \pm 1\%$  of americium-241. The quantification was performed by calorimetry and gamma-ray methods eliminating the need to open the containers.

On May 3, 1985, Mound Laboratory, at the request of the FBI and NRC, opened the silver quart can and found a plastic bag containing three inner bags. In one of those bags was a 35 mm film canister containing a metal tube. When Mound personnel opened the tube, they found a small amount of black granular material located in the bottom. This material was determined to be the americium-241 (see Appendix G and Figures 2.11-2.16).

#### 2.3.5 Pre-decontamination Activities

Immediately after the confiscation, NRC Region III contacted the EPA Region V office to determine whether the Superfund Trust could be applied in this case to contain the imminent threat to public health and safety. Based on the NRC assessment and the finding of an imminent threat to public health and safety, EPA agreed that the Superfund Trust could be applied.

The decontamination task was contracted to DOE by the EPA and performed by DOE prime contractors, Oak Ridge Associated Universities (ORAU) and Battelle Memorial Institute, Columbus, Ohio. The task was contracted to these institutions for a variety of reasons, but the three most important reasons were that (1) both institutions have the expertise in handling transuranics; (2) Battelle Memorial Institute is located in Columbus, Ohio, only 145 km from the facility; and (3) ORAU was familiar with the facility because they had performed extensive surveys there under NRC contract and developed a decontamination plan for the site in 1983.

In addition, in order to alleviate the imminent threat to health and safety, DOE agreed to accept wastes contaminated with transuranics at concentrations above 100 nCi/gm for storage at Mound Laboratory because no commercial disposal facility exists for such waste. It was understood that the situation requiring DOE storage was unique and resulted because the licensee had declared bankruptcy and was unable to control the radioactive materials.



Figure 2.1 Gallon can confiscated outside of jewelry store



Figure 2.2 Team No. 1 members donning protective clothing

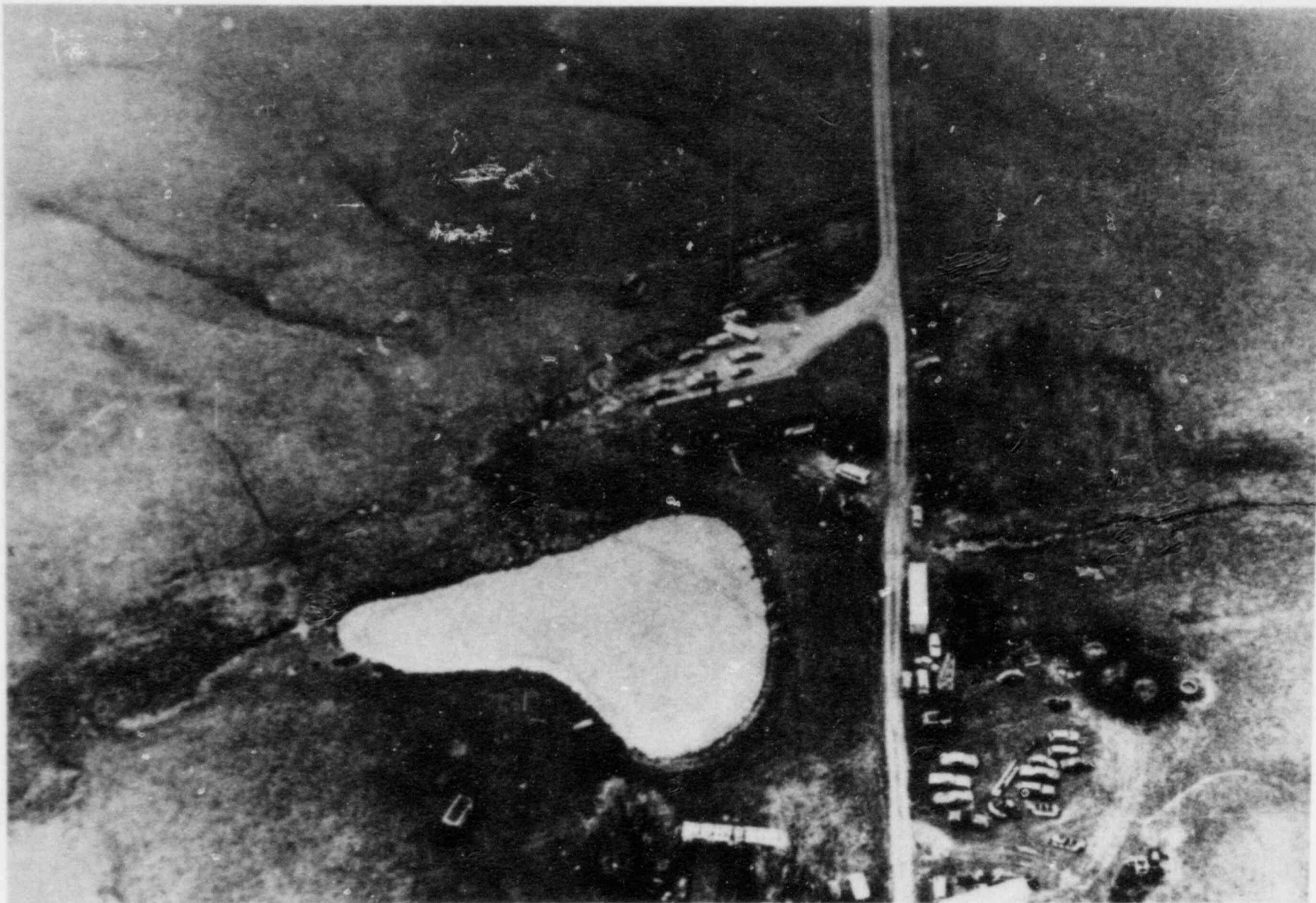


Figure 2.3 Aerial view of residence near Buckeye Lake-Harbor Hills where material was confiscated



Figure 2.4 Residence near Buckeye Lake-Harbor Hills where majority of americium was confiscated

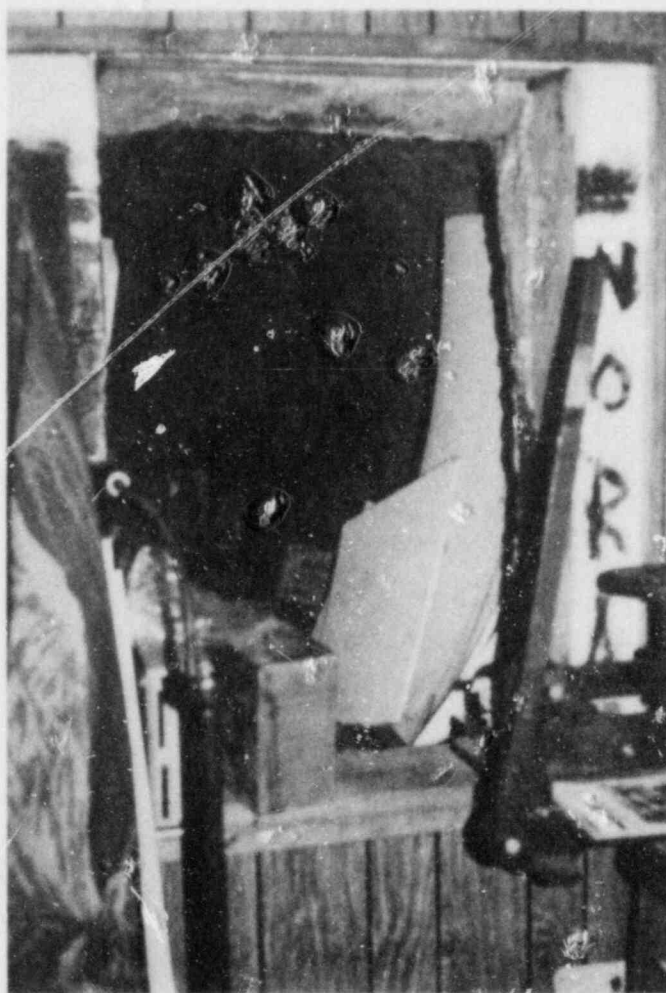


Figure 2.5 Area in basement where container was found

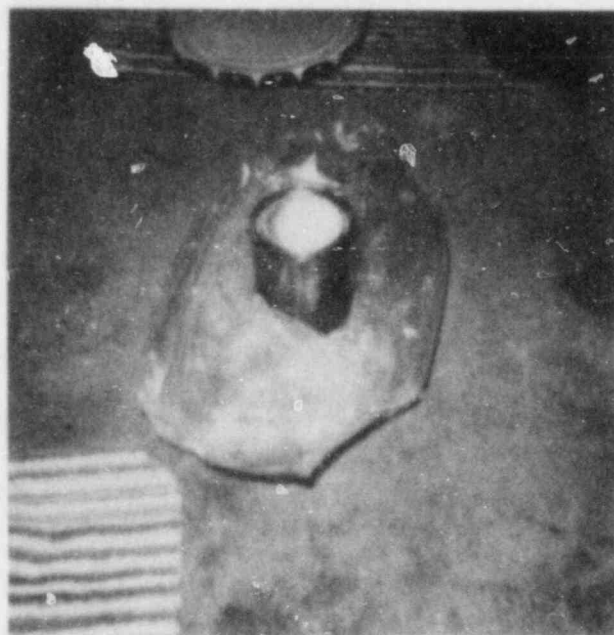


Figure 2.6 Confiscated container



Figure 2.7 Inner container



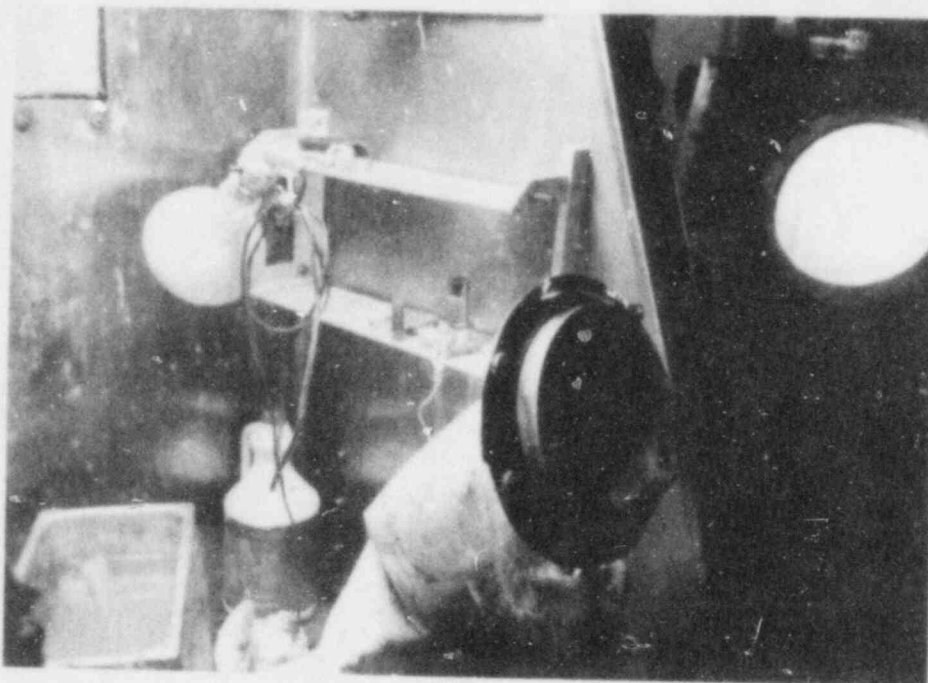


Figure 2.8 Two vials in glovebox containing americium

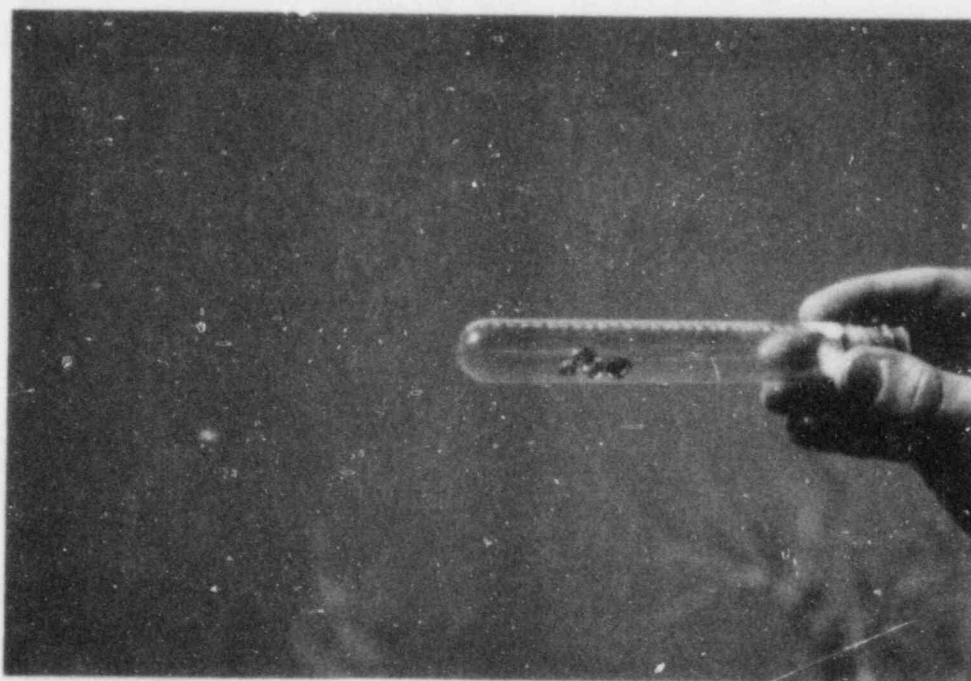


Figure 2.9 Four irradiated diamonds confiscated on March 26, 1985



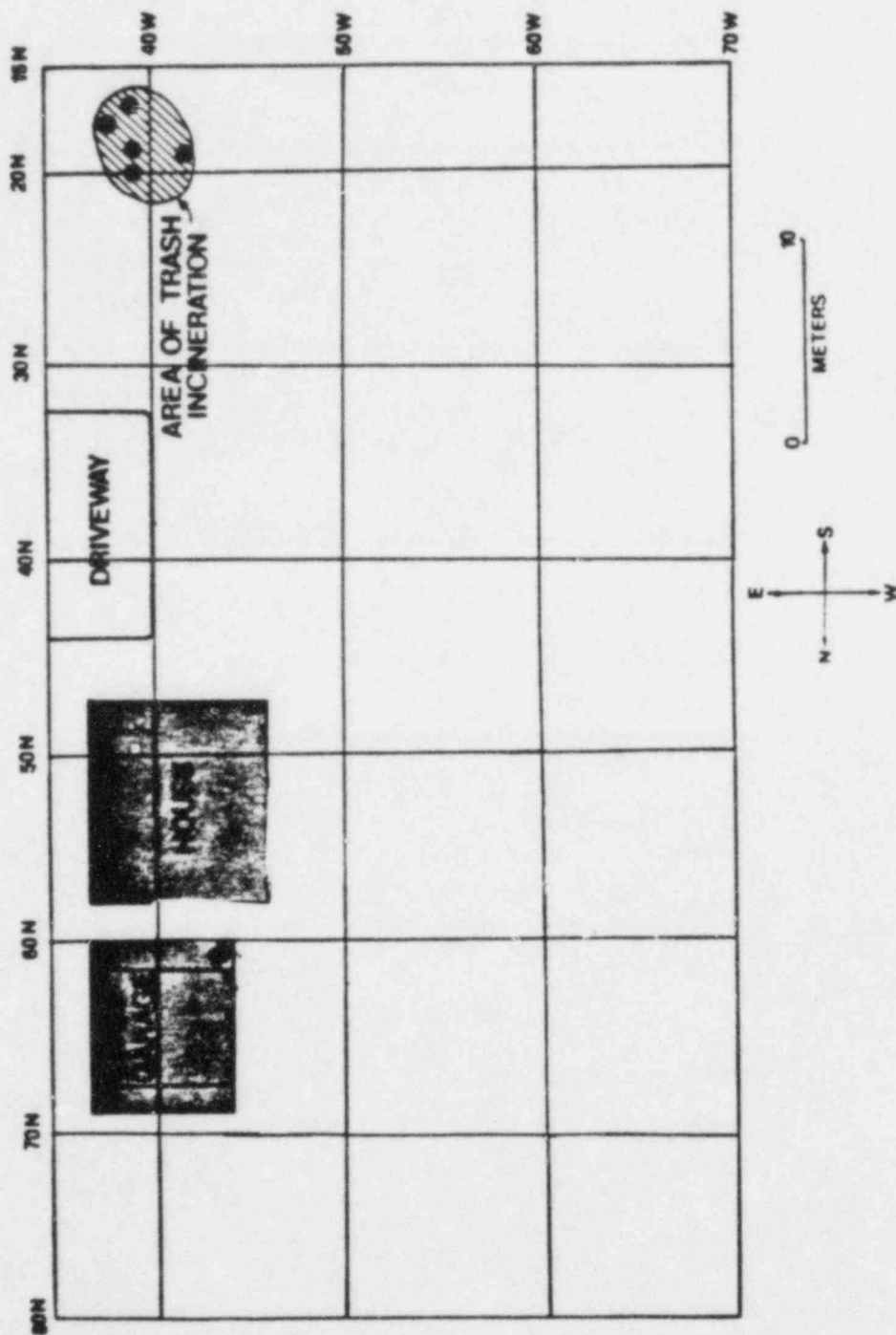


Figure 2.10 Area of previous incineration of americium-241

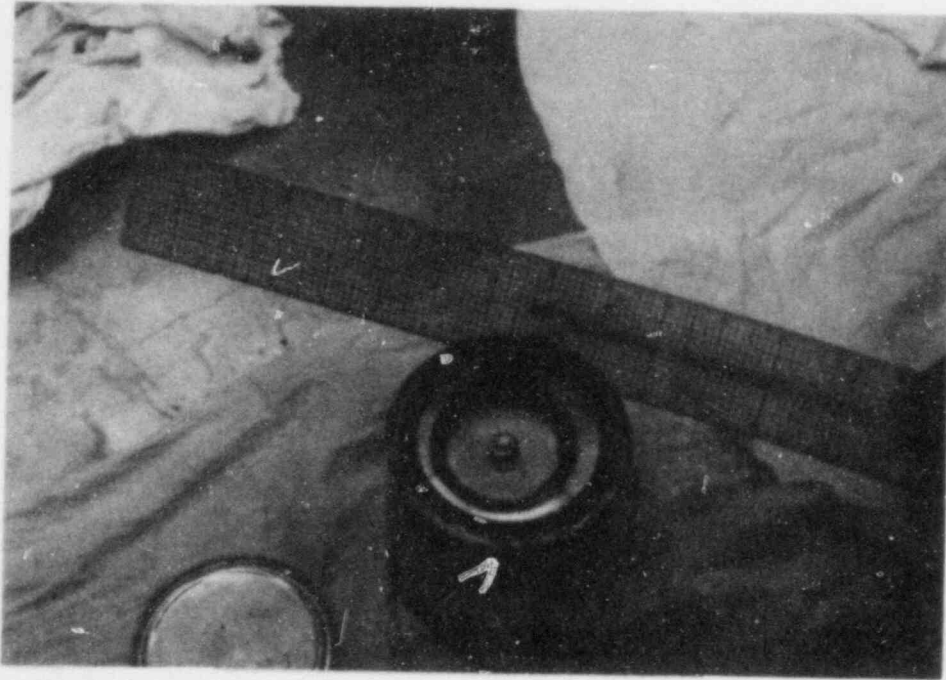


Figure 2.11 Outer container

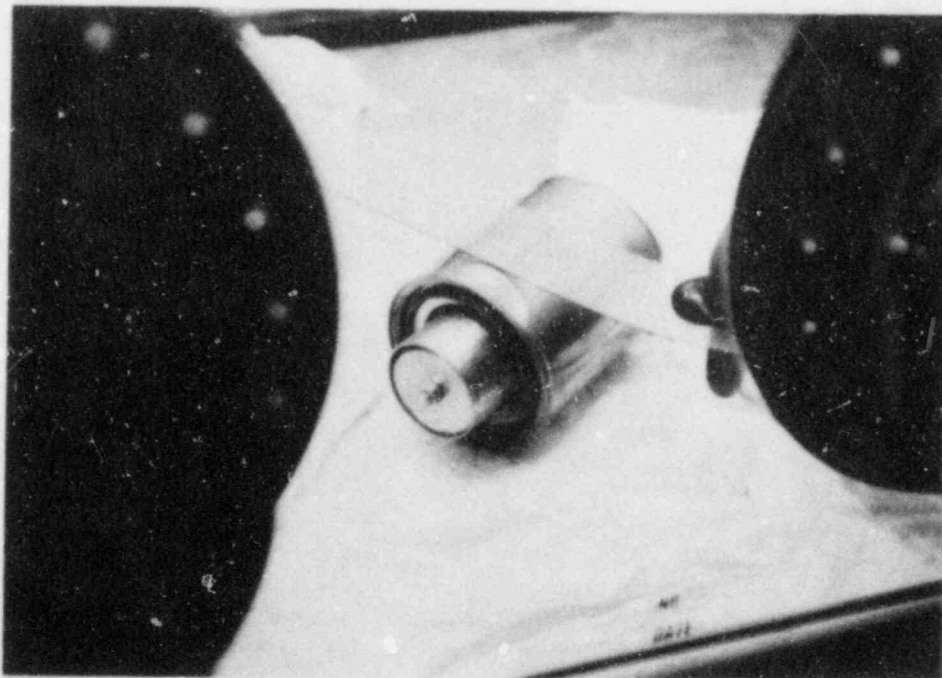


Figure 2.12 Outer and inner containers

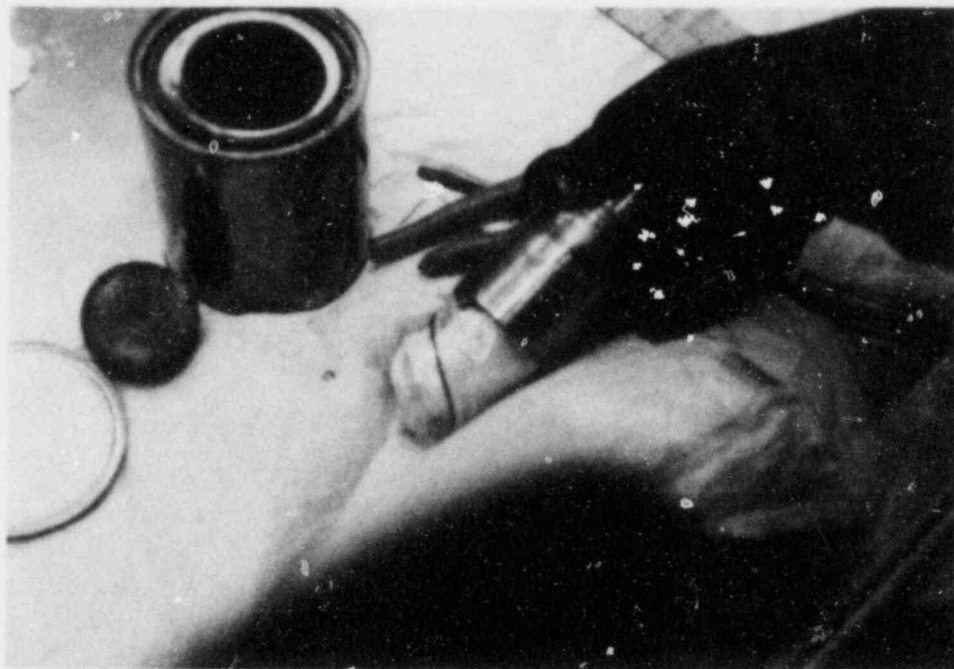


Figure 2.13 Removal of bags from inner container

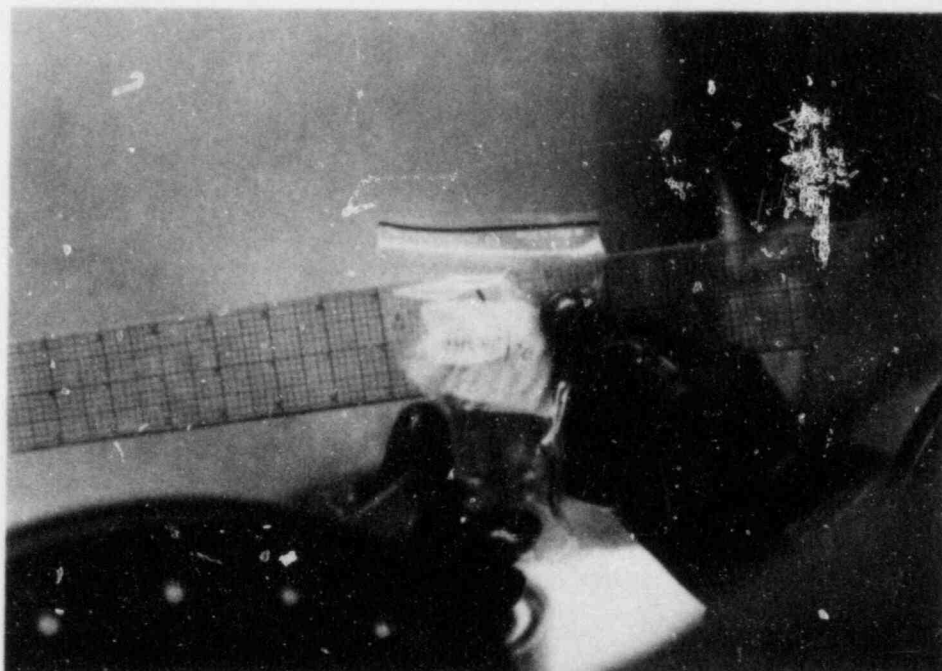


Figure 2.14 Inner bag containing 35 mm film canister



Figure 2.15 Container found inside film canister



Figure 2.16 Americium-241 oxide (black material at end of forceps)

### 3 DECONTAMINATION AND DECOMMISSIONING ACTIVITIES

Decontamination activities began at the site on April 17, 1985, and continued through July 26, 1985 (see Figures 3.1-3.8). The work was performed by Oak Ridge Associated Universities (ORAU) and Battelle Memorial Institute, Columbus, Ohio (Battelle). The funding of the activities was through the EPA's Superfund Trust. Throughout the entire decontamination, NRC Region III personnel were onsite monitoring the cleanup. The total cost of the cleanup was approximately \$385,000.

With the exception of minor modifications deemed necessary as the need arose, the facility was decontaminated in accordance with plans outlined by ORAU (Appendix H). This plan was similar to the plan proposed in 1983. In addition, Battelle maintained extensive quality assurance for each phase of the operation. This included an emergency plan, quantification methods, air monitoring procedures, procedures for removal of materials from the boxes, procedures for fixation of contamination, and waste packaging and transportation.

During decontamination activities, two additional contaminated areas (below surface) were found behind the Haynes building. One of the areas was near the vicinity of a drain field leading from the holding tank from the sink, and the other area was in a metal drum holding liquid from an emergency shower. Both areas were decontaminated to levels safe for unrestricted use.

Approximately 12.0 Ci of americium-241 were found at the site. The majority of the material was contaminated articles found in the gloveboxes. This material was packaged onsite and transferred to Mound Laboratories for storage, awaiting ultimate disposal. The gloveboxes, after all contents were removed, were packaged as L.S.A. (low specific activity waste, less than 10 nCi/g) and shipped to Battelle for storage awaiting ultimate disposal.

On August 19, 1985, in accordance with the NRC Order issued on April 5, 1985, the J. C. Haynes NRC license was revoked.





Figure 3.1 State of Ohio personnel performing ground surveys



Figure 3.2 Oak Ridge Associated Universities personnel removing contaminated soil

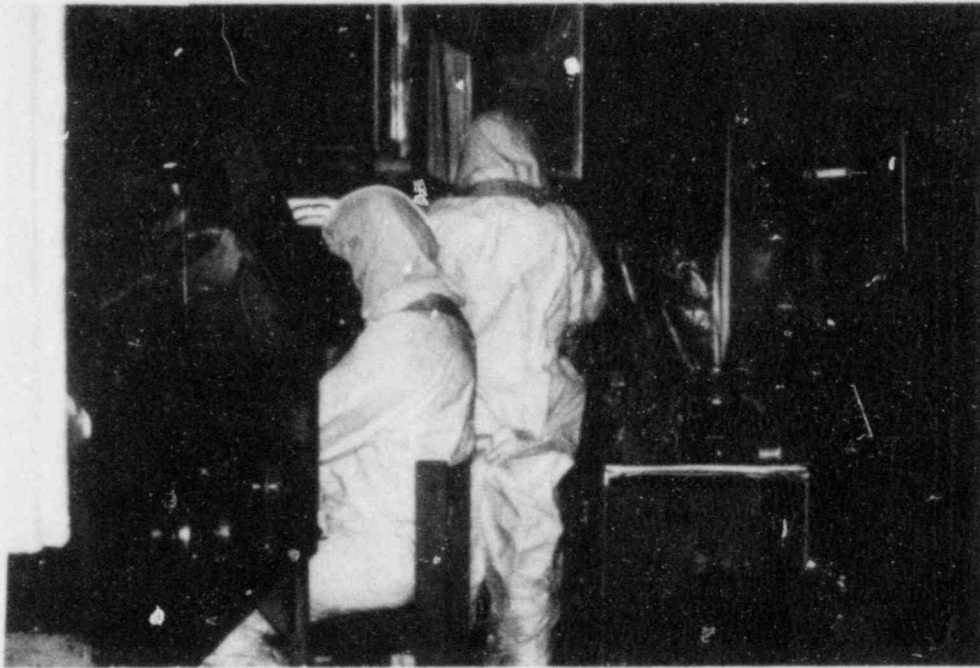


Figure 3.3 Battelle personnel decontaminating gloveboxes

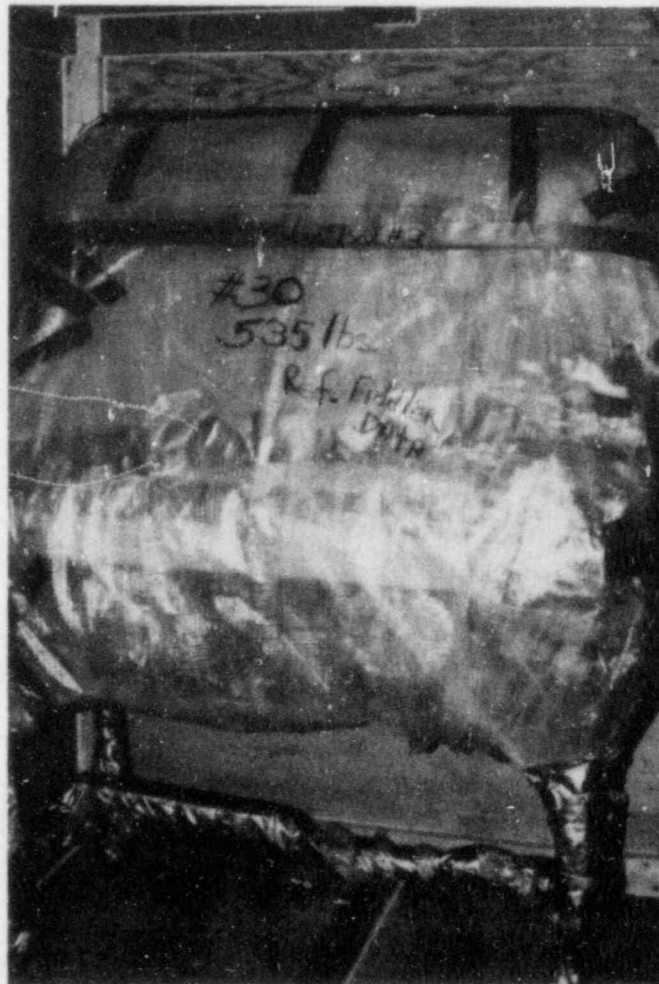


Figure 3.4 Glovebox 3 being packaged in crate



Figure 3.5 Oak Ridge Associated Universities decontaminating roof



Figure 3.6 Contaminated sink holding tank being removed from ground



Figure 3.7 Oak Ridge Associated Universities decontaminating laboratory



Figure 3.8 Oak Ridge Associated Universities decontaminating laboratory



## 4 RADIOLOGICAL CONSEQUENCES

This section evaluates the potential radiological impact that the licensee's actions imposed on members of the general public. It also describes the actions taken by the NRC to assure members of the general public that they or their property were not contaminated with americium-241.

### 4.1 NRC Dose Assessment

As mentioned earlier in Section 1.5, the NRC in early 1985 performed a dose assessment in the event of a fire or an intruder at the Haynes facility. The results of that assessment, based on a conservative estimate of 150 mCi of americium-241 being present at the facility, revealed an unacceptable risk to an intruder and to the surrounding public.

As a result of the March 26 and 27 surveys performed by the NRC after the confiscation, the overall risk and hazards at and around the facility were significantly increased. This was based on the fact that there was an estimated 2-4 Ci of americium-241 present at the facility, rather than the 150 mCi originally assumed, and that it was discovered that flammable material also was present in the gloveboxes along with the americium-241. With this new information, it was determined that an intruder entering the laboratory could receive a dose commitment in excess of 600 rem and an individual residing at a home 70 m from Haynes' property could receive a dose commitment of about 220 rem in the event of a fire. These doses significantly exceed the EPA's and NRC's limits for radiation exposures to members of the public. It later was determined that these values underestimated the dose commitments because 12 Ci of americium-241 was retrieved from the facility and on various occasions the facility may have contained up to 23 Ci.

### 4.2 Internal Evaluations

Even though it was unlikely that surrounding neighbors inhaled or ingested any americium-241, the NRC offered bioassay of the whole-body for americium-241 to anyone wishing such an evaluation. Four individuals and Haynes made such requests and were analyzed at the University of Cincinnati Medical Center. Americium-241 was not detected in any of the whole-body counts for these individuals. Individuals residing at the facility on the day of the confiscation were offered bioassays of the whole body, but declined.

### 4.3 Surveys, Soil and Water Samples

The NRC also offered radiation surveys and water and soil sampling of properties. A total of six neighbors requested surveys and sampling, which NRC and State of Ohio personnel performed. These surveys and samples did not detect any americium-241.



#### 4.4 Conclusion Regarding Radiological Consequences

On the basis of the results of the whole-body counts, surveys, and water and soil samples, it was determined that no americium-241 had spread to any area outside of the confines of the Haynes property.

## 5 RESPONSE ORGANIZATIONS

This section assesses the organizational responses to the confiscation of the unauthorized possession and use of americium-241.

### 5.1 State Response

The Governor's Office of the State of Ohio was notified about the planned confiscation on March 25, 1985, and offered the NRC full support.

The Ohio Disaster Services Agency also notified on March 25, 1985, provided backup radiological instrumentation and provided assistance for performing property surveys.

The Ohio State Police provided escort service for the NRC during the transportation of the confiscated americium-241. This included the transportation of the americium-241 from the residence where the majority of material was confiscated and the transportation to Mound Laboratory, Miamisburg, Ohio.

### 5.2 Local Response

The Licking County Sheriff's Department provided round-the-clock security at Haynes' facility from March 26 through April 16, 1985. After that time, the Sheriff's Department provided security as needed (i.e., off-hours during decontamination activities).

The Licking County Health Department was represented at the public meeting held on April 16, 1985, and offered their assistance, if necessary.

### 5.3 Federal Agency Response

On the day of the confiscation, the NRC and FBI were the primary Federal response agencies. The EPA provided the funding for the decontamination operations.

#### 5.3.1 FBI Response

The FBI had the primary responsibility for planning the confiscation. A total of 13 special agents were assigned to the operation. Each phase of the plan was discussed with NRC Region III representatives in great detail.

#### 5.3.2 Department of Energy Response

Select representatives from DOE were aware of the planned confiscation. DOE awareness was essential in the event of an incident necessitating additional personnel and equipment. In addition, DOE provided loaner equipment to the NRC before and during the confiscation. DOE representatives from Mound Laboratory also provided personnel to assist NRC during the March 27, 1985, surveys at the Haynes facility. Mound Laboratory also provided storage and security for the confiscated americium-241 and contaminated diamonds.

### 5.3.3 Regional NRC Response

Extensive Region III planning took place from early February 1985, when Region III received information that J. C. Haynes possessed unauthorized quantities of americium-241. In addition, throughout decontamination operations, Region III maintained an inspector onsite to monitor all activities.

At approximately 6:30 a.m., March 26, 1985, the Region III Incident Response Center (IRC) was activated. The Executive Director's Office, Commissioners Offices, and Headquarters personnel were briefed periodically throughout the day on events.

The IRC was deactivated at approximately 3:00 p.m. (CST).

## 6 NEWS MEDIA AND PUBLIC AFFAIRS ACTIVITIES

After the completion of the search of the Haynes laboratory facility and other locations in the Newark, Ohio, area and the arrest of J. C. Haynes, a news announcement was issued jointly by the NRC, the FBI, and the State of Ohio.

During the search activities, the Ohio Disaster Services Agency and the Ohio Governor's Press Secretary were periodically informed of the progress of the investigation. The announcement was provided to Columbus and Newark, Ohio, news media and the wire services. NRC Public Affairs personnel and the FBI responded to followup news media inquiries and requests for interviews from the broadcast media.

A second news announcement was issued April 16, 1985, on the cleanup project. This announcement was made by the NRC and the EPA, which provided funds for the cleanup under its Superfund Trust. Also on April 16, 1985, the NRC held a meeting in the Old Franklin Grange Hall near the Haynes facility. Local public officials and residents near the Haynes facility were invited to attend. The meeting covered the plans for cleanup of the Haynes site, as well as answers to questions raised by individuals.

On August 28, 1985, the NRC held another public meeting in the Old Franklin Grange Hall to inform local public officials and residents that the facility had been decontaminated successfully and was released for unrestricted use.

Appendix I reproduces several articles from local newspapers and NRC news releases.

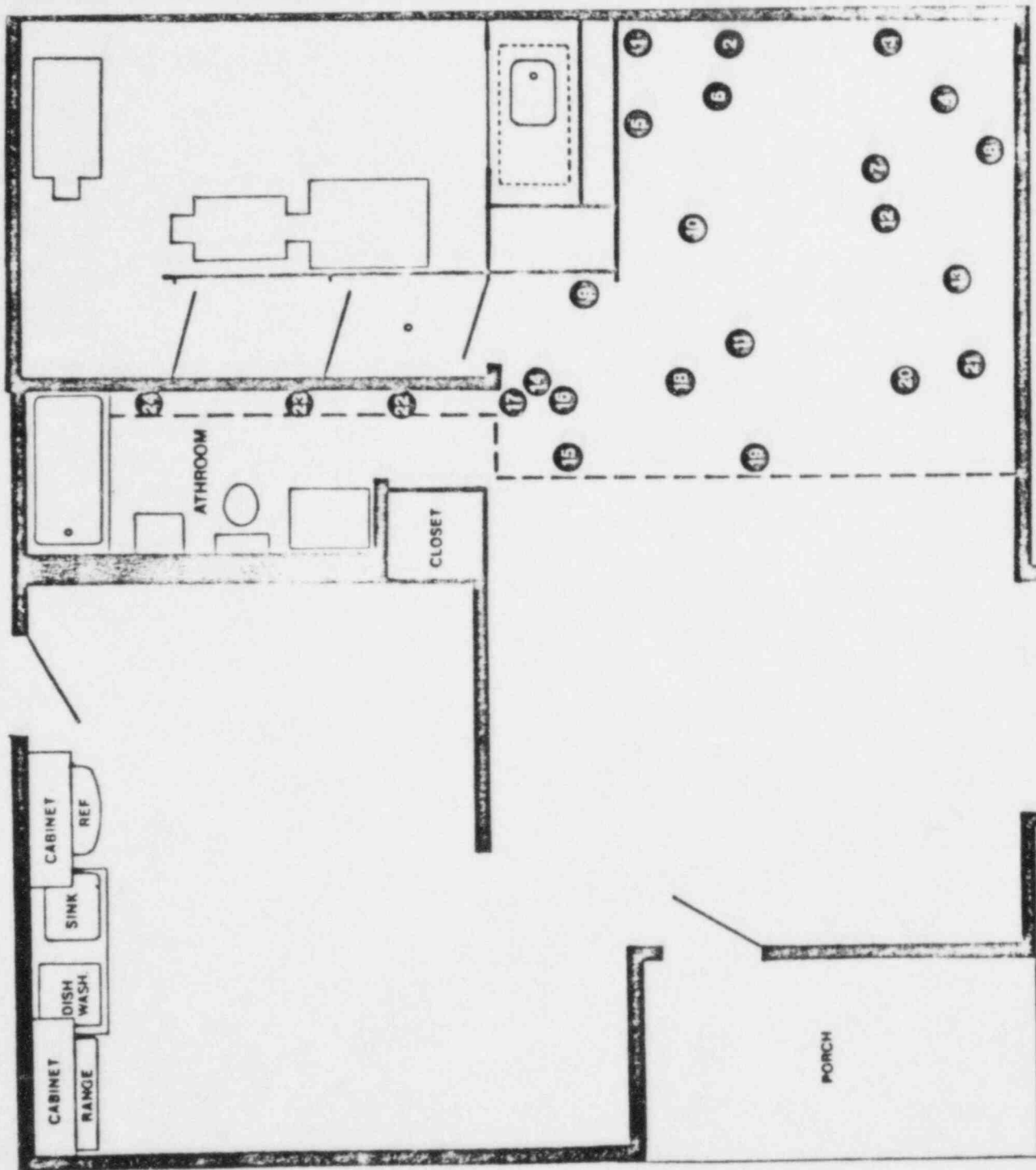
APPENDIX A

SUMMARY OF SURVEY RESULTS PERFORMED BY  
OAK RIDGE ASSOCIATED UNIVERSITIES - AUGUST 1983



This appendix summarizes the results of the survey performed by Oak Ridge Associated Universities during August of 1983. The minimal detectable activity (MDA) as referenced in the results is 56 dpm/100 cm<sup>2</sup> for total alpha determination and 0.3 dpm/100 cm<sup>2</sup> for transferable alpha.

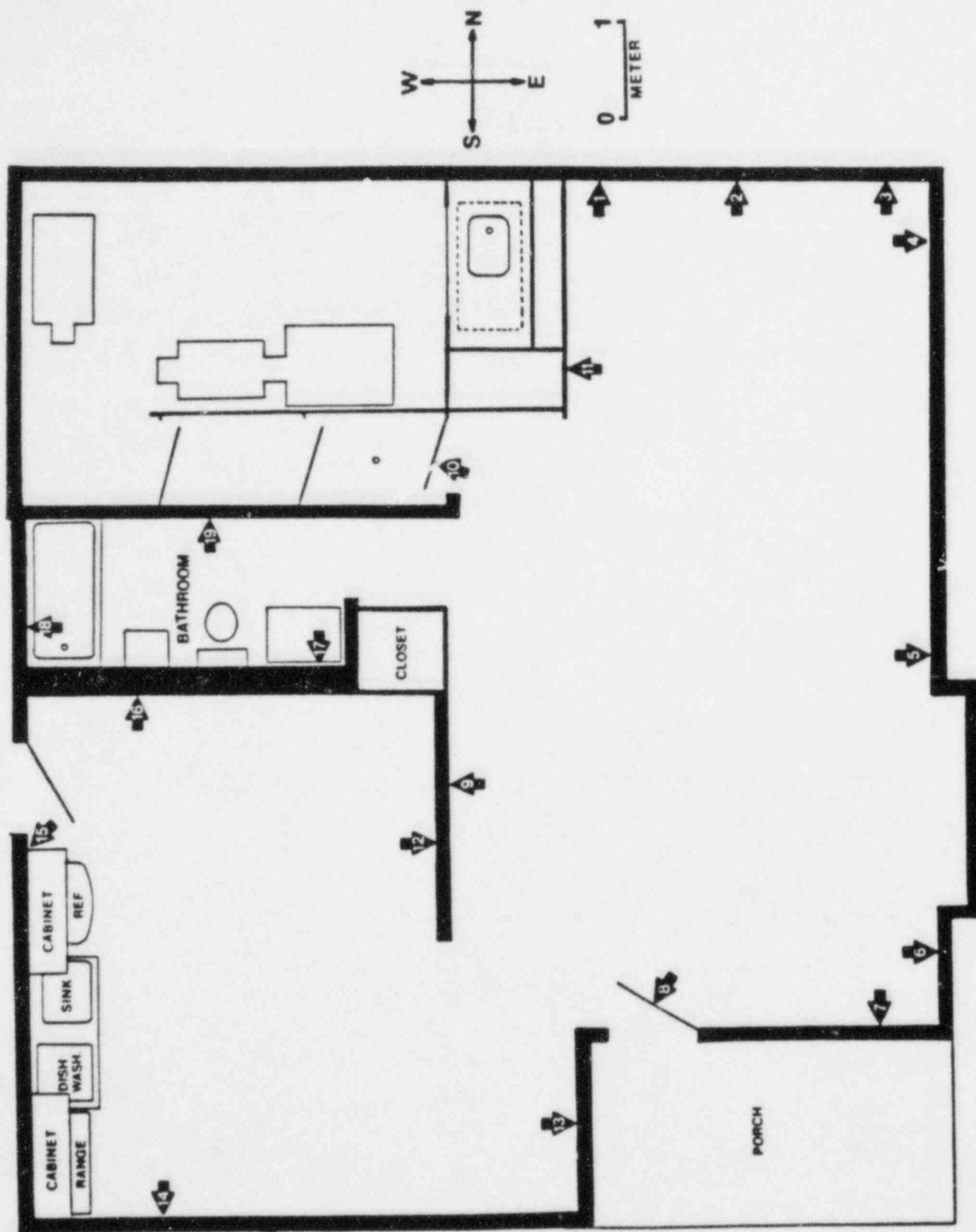
The results of all measurements are located on the page immediately following the diagram.



Locations of Floor Measurements in Unrestricted Area (Carpeting Removed).

CONTAMINATION MEASUREMENTS ON FLOOR  
AREAS (CARPETING REMOVED)

Location No.	Alpha Contamination	
	Total (dpm/100 cm <sup>2</sup> )	Transferable (dpm/100 cm <sup>2</sup> )
1	351	5.7
2	156	4.3
3	169	1.4
4	91	1.4
5	247	<MDA
6	195	1.4
7	156	1.4
8	195	2.9
9	351	4.3
10	143	<MDA
11	221	<MDA
12	208	<MDA
13	156	<MDA
14	195	<MDA
15	1,950	2.9
16	1,430	<MDA
17	3,820	12.9
18	351	<MDA
19	195	<MDA
20	143	5.7
21	28,600	15.7
22	65	4.3
23	104	5.7
24	91	17.1

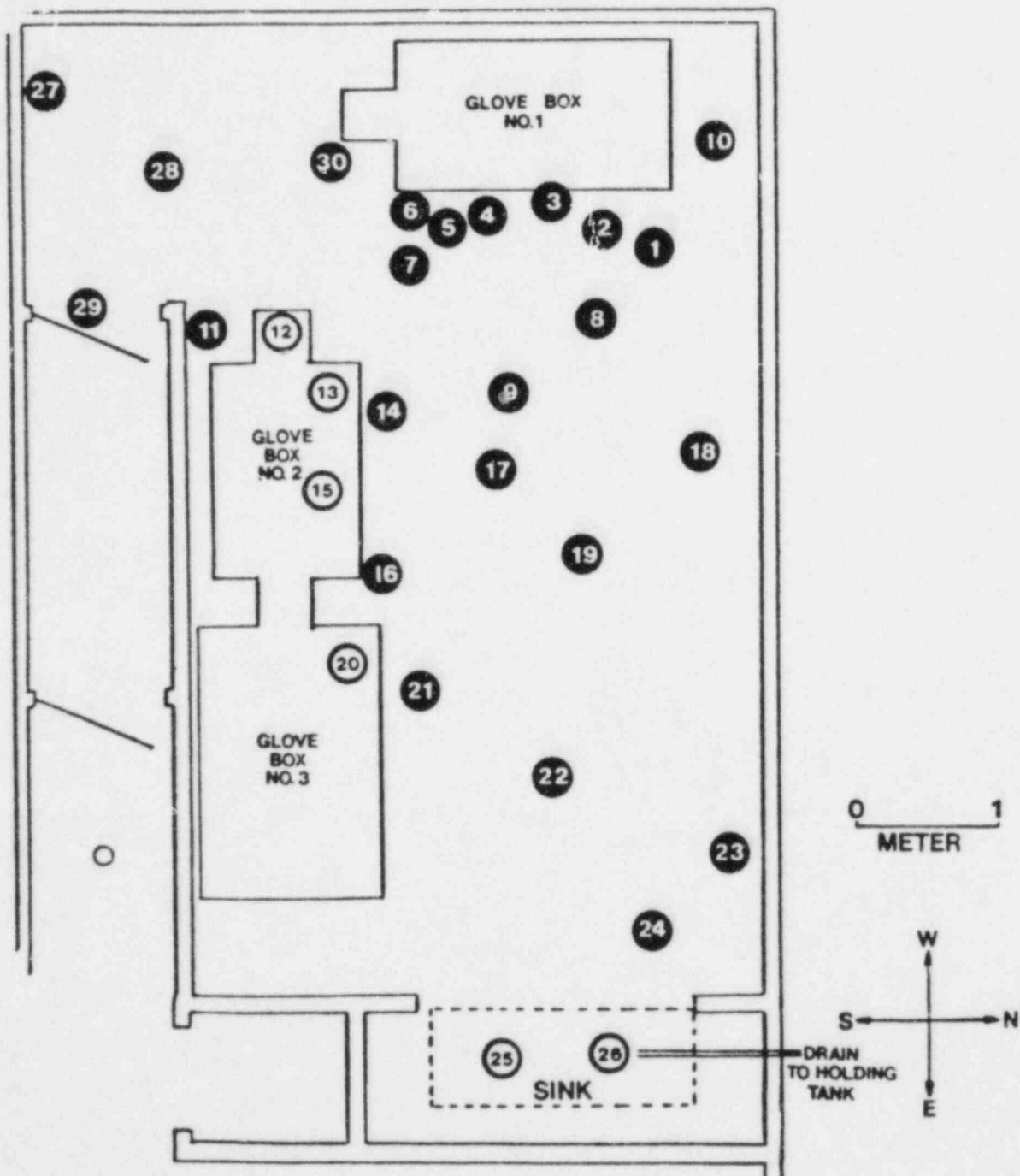


Locations of Wall Measurements in Unrestricted Area. (Measurements performed approximately 1 m above floor.)

CONTAMINATION MEASUREMENTS ON WALLS  
IN UNRESTRICTED AREA

Location No.	Alpha Contamination	
	Total (dpm/100 cm <sup>2</sup> )	Transferable (dpm/100 cm <sup>2</sup> )
1	143	<MDA
2	78	2.9
3	143	1.4
4	130	<MDA
5	91	<MDA
6	<MDA	<MDA
7	91	1.4
8	91	<MDA
9	<MDA	<MDA
10	104	4.3
11	104	<MDA
12	143	<MDA
13	91	<MDA
14	208	<MDA
15	<MDA	<MDA
16	208	<MDA
17	91	2.9
18	117	<MDA
19	117	<MDA



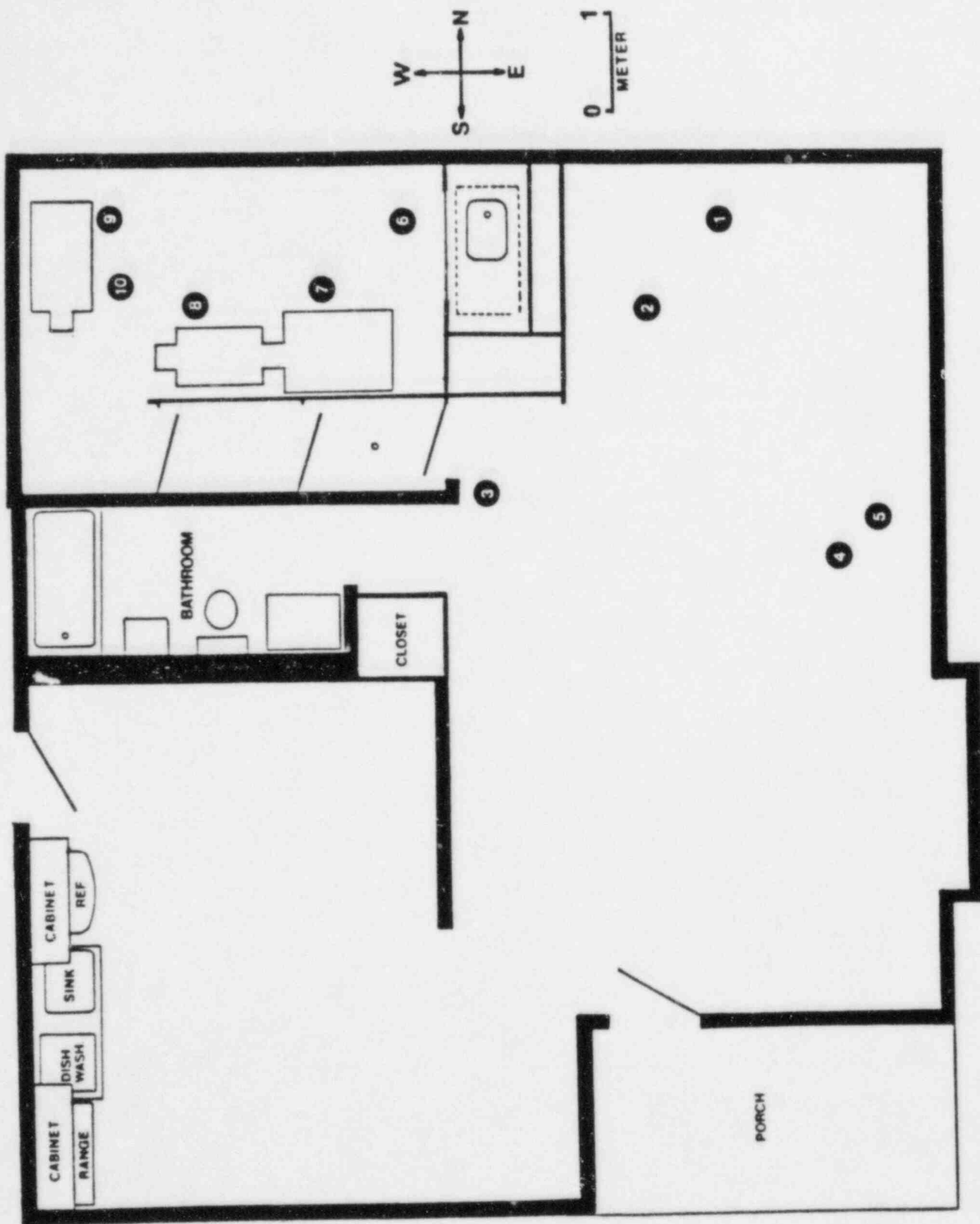


Locations of Floor Measurements in Restricted Area.

# CONTAMINATION MEASUREMENTS ON RESTRICTED AREA FLOOR

Location No.	Alpha Contamination	
	Total (dpm/100 cm <sup>2</sup> )	Transferable (dpm/100 cm <sup>2</sup> )
1	8,760	
2	1,430,000	18,300
3	81,400	3,320
4	184,000	a
5	1,290,000	36,700
6	679,000	1,660
7	347,000	a
8	5,560	a
9	3,610	a
10	5,640	a
11	5,380	a
12	5,820	231
13	53,100	a
14	138,000	1,440
15	4,500	a
16	7,640	a
17	8,160	a
18	11,500	a
19	5,150	a
20	2,310	a
21	8,740	150
22	12,300	a
23	18,700	a
24	37,200	263
25	4,030	a
26	8,940	a
27	30,300	a
28	8,790	a
29	9,410	a
30	13,400	494

a) No smears taken.

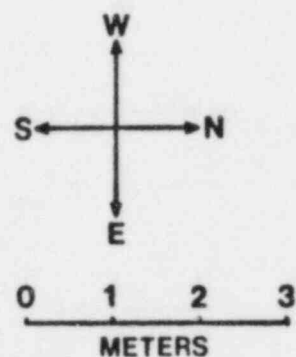
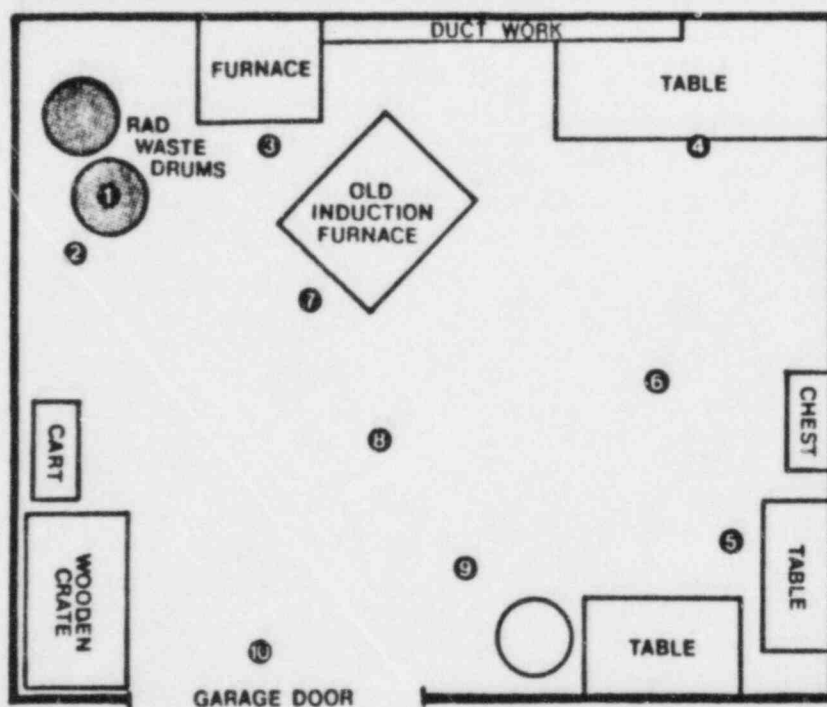


Locations of Paint Scraping Samples, Restricted and Unrestricted Areas.

RESULTS OF PAINT SCRAPINGS ANALYSES COMPARED  
TO SURFACE MEASUREMENTS

Location No.	Alpha Contamination		Am-241 Activity (pCi)
	Total (dpm/100 cm <sup>2</sup> )	Transferable (dpm/100 cm <sup>2</sup> )	
<u>Unrestricted Area</u>			
1	a	a	1.34 x 10 <sup>4</sup>
2	a	a	7.87 x 10 <sup>2</sup>
3	3.82 x 10 <sup>3</sup>	12.9	2.31 x 10 <sup>4</sup>
4	a	a	7.45 x 10 <sup>2</sup>
5	2.86 x 10 <sup>4</sup>	15.7	2.69 x 10 <sup>3</sup>
<u>Restricted Area</u>			
6	3.72 x 10 <sup>4</sup>	2.63 x 10 <sup>2</sup>	3.36 x 10 <sup>4</sup>
7	8.74 x 10 <sup>3</sup>	1.50 x 10 <sup>2</sup>	2.37 x 10 <sup>4</sup>
8	1.38 x 10 <sup>5</sup>	1.44 x 10 <sup>3</sup>	1.22 x 10 <sup>5</sup>
9	1.43 x 10 <sup>6</sup>	1.83 x 10 <sup>4</sup>	4.97 x 10 <sup>5</sup>
10	1.29 x 10 <sup>6</sup>	3.67 x 10 <sup>4</sup>	1.72 x 10 <sup>6</sup>

a) No smears taken.



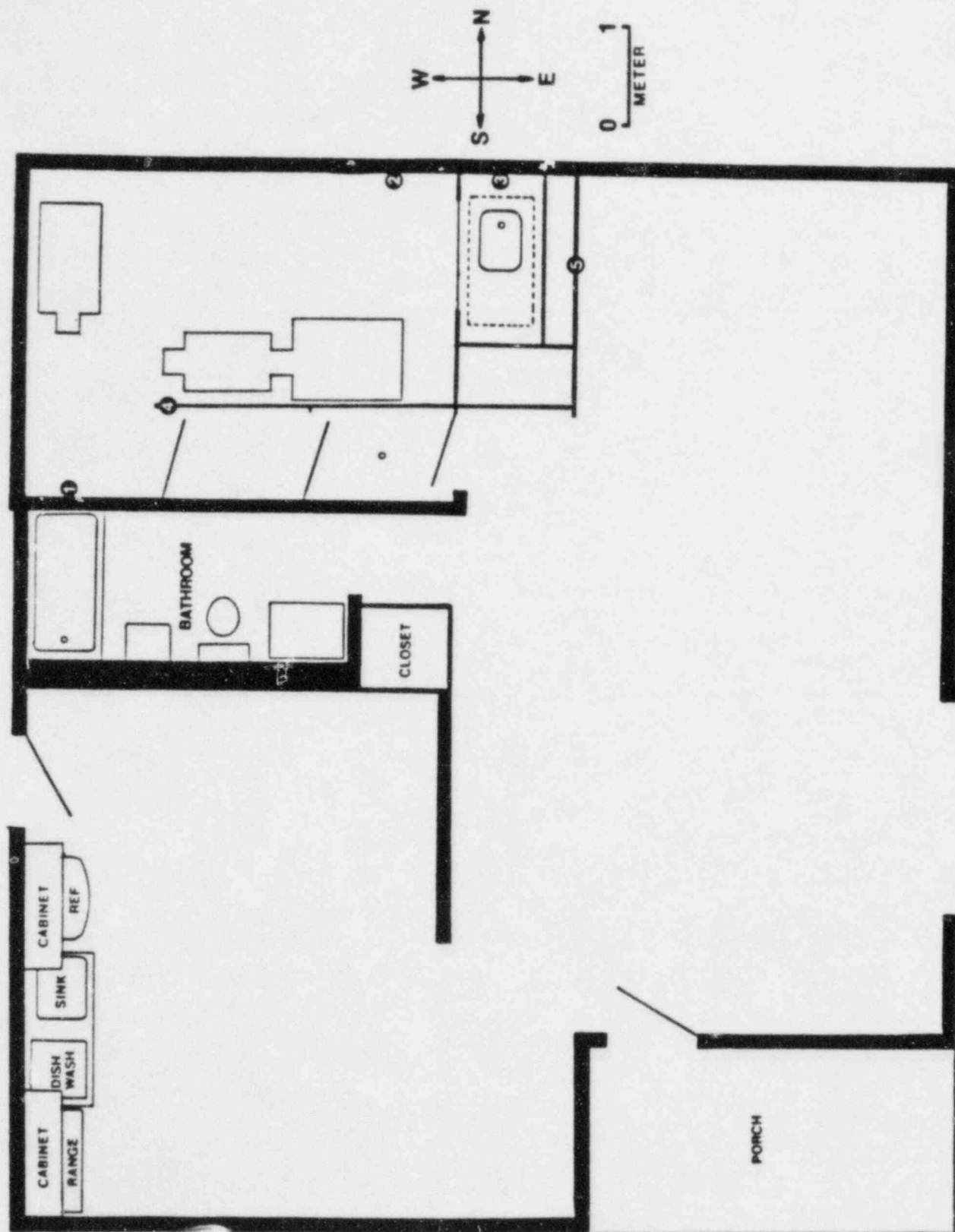
Locations of Measurements in Garage.



# CONTAMINATION MEASUREMENTS IN GARAGE

Location No.	Alpha Contamination	
	Total (dpm/100 cm <sup>2</sup> )	Transferable (dpm/100 cm <sup>2</sup> )
1	711	2.9
2	<MDA	<MDA
3	<MDA	<MDA
4	<MDA	1.4
5	<MDA	<MDA
6	<MDA	1.4
7	<MDA	<MDA
8	<MDA	1.4
9	<MDA	<MDA
10	<MDA	<MDA
Floor Buffer	a	<MDA
Furnace	a	<MDA
Air Sampling	a	a
Pump	a	<MDA

a) Measurements not taken due to poor geometry of object or surface.



Locations of Smears Taken of Floor Between Wall Panels.

# SMEAR MEASUREMENTS BEHIND FLOOR BASEBOARDS

Location No.	Transferable Alpha (dpm/100 cm <sup>2</sup> )
1	25
2	31
3	50
4	25
5	13

APPENDIX B

DECONTAMINATION PLAN AND ESTIMATED COSTS  
PREPARED BY OAK RIDGE ASSOCIATED UNIVERSITIES - AUGUST 1983

DECONTAMINATION PLAN FOR  
HAYNES PROPERTY

I. Site Preparation

- A. Unload and store supplies and equipment.
- B. Set-up and calibrate or checkout health physics support equipment.
- C. Clear weeds and brush from work areas as needed.
- D. Rearrange garage to accept waste storage.
- E. Remove furnishings and carpeting from house.
- F. Remove large northeast window and install weatherproof, quick access covering.
- G. Cover floor of northeast corner with plastic.
- H. Establish north end of house as controlled access area - put up plastic barrier curtain.

II. Training

- A. Review basic health physics practices.
- B. Explain detailed decontamination plan and schedule.
- C. Practice anti-contamination methods; apparel and respirator use, and assign dosimeters.

III. Remove Soil From Burn Area, Tanks, And Drain Lines

- A. Shovel contaminated soil from burn area into 55-gallon drums.
- B. Remove soil from drain lines associated with the holding tank and from around edges of the holding and emergency shower tanks. Place soil in 55-gallon drums.
- C. Collect samples from areas and initiate analysis for effectiveness of cleanup.



#### IV. Remove Waste Lines And Tanks

- A. Remove and store water from drain lines and holding tanks.
- B. Disconnect lines and seal exposed openings.
- C. Excavate tanks.
- D. Prepackage (wrap in plastic) emergency shower tank and store for later disposal.
- E. Add concrete to hood sink holding tank to solidify remaining sediments.

#### V. Prepare Glove Boxes

- A. Remove heavy items from boxes and package separately.
- B. Stabilize interior contamination by spray painting.
- C. Disconnect ductwork.
- D. Seal all openings.
- E. Wipe down exterior of boxes and stands.
- F. Spray paint to fix exterior contamination.
- G. Prepackage boxes in plastic fabric.
- H. Save liquid waste for later processing.
- I. Place other waste in drums.

#### VI. Remove Ventilation System

- A. Dismantle vent ducts on interior of restricted area.
- B. Prepackage HEPA filters and ducts.
- C. Place HEPA filters into Type B container liner
- D. Cover penetration of restricted area wall.

#### VII. Remove Restricted Area Inside Walls

- A. Dismantle hood vent and sink stand. Package in plastic and hold for later monitoring and disposition.
- B. Dismantle east wall of restricted area; hold for later disposition.
- C. Cover remaining floor in restricted area with plastic.

VIII. Remove Glove Boxes

- A. Unbolt or cut stands from glove boxes.
- B. Assure glove box #1 is thoroughly enclosed in plastic.
- C. Remove glove box #1 through front wall opening and place directly into the Type B container liner.
- D. Complete wrapping of glove boxes #2 and #3.
- E. Remove these boxes and place in plywood crates.

IX. Remove Additional Contaminated Equipment And Surfaces From Restricted Area.

- A. Disconnect or remove additional equipment.
- B. Package in plastic.
- C. Remove and place in drums or plywood boxes, depending upon size.

X. Clean Walls And Ceiling Of Restricted Area

- A. Wash down walls and ceiling using common surface cleaning techniques.
- B. Remove sections of surfaces not cleanable.
- C. Cover cleaned surfaces with plastic.
- D. Save liquid waste for later processing.

XI. Clean Floors - Restricted Area

- A. Mop floors to remove loose contamination.
- B. Save liquid waste for later processing.
- C. Scabble entire floor area.
- D. Place concrete chips and other waste in drums or boxes.

XII. Clean Surfaces In Remainder Of House

- A. Wash down walls, ceiling, and other surfaces throughout remainder of house using standard cleaning techniques.
- B. Mop floor.
- C. Scabble floor areas as required.

- D. Save liquid waste for later processing.
- E. Place other waste in drums.

### XIII. Survey and Reclean

Survey all facility surfaces and reclean as necessary.

### XIV. Process Liquid Waste

Commercial agency will process and solidify all liquids generated by decontamination procedures.

### XV. Prepare And Ship Waste

Step 1. Fill voids in container liner with cement. Place liner into Type B cask.

Step 2. Compact dry waste - where appropriate, complete packaging, prepare for shipment.

SAMPLE DECONTAMINATION SCHEDULE

ACTIVITY	Week 1							Week 2							Week 3							Week 4								
	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S		S	M	T	W	T	F	S
Site Preparations	X	X	X																											
Personnel Training	X																													
Remove Soil From Burn Area, Holding Tanks, Drain Lines				X	X																									
Remove Waste Lines And Tanks					X	X		X																						
Prepare Glove Boxes					X																									
Remove Ventilation System								X																						
Remove Restricted Area of Inside Walls									X																					
Remove Glove Boxes										X	X																			
Remove Additional Contam- inated Equipment And Surfaces													X																	
Clean Walls And Ceiling - Restricted Area																X	X													
Clean Floor - Restricted Area																	X	X												
Clean Surfaces In Rest Of House																		X	X											
Survey And Reclean																								X	X					
Process Liquid Waste																										X	X			
Prepare And Ship Waste										X																		X	X	

COST ESTIMATES FOR DECONTAMINATING  
AND DECOMMISSIONING HAYNES PROPERTY

The information presented in this section is based on the decontamination plan developed in Appendix . That plan assumes optimum utilization of equipment, supplies, and personnel; incidents, accidents, unanticipated contamination, and unforeseen schedule delays and interruptions would result in increased manpower and equipment rental costs. It should be noted that procedures and scheduling priorities may vary, depending upon the organization performing this work. This estimate is, however, considered a good approximation of the total cost for this operation.

The unit cost figures used for this estimate were obtained from open literature and through direct contacts with vendors and service organizations. Total costs for this operation are as follows:

LABOR	\$ 47,780
MATERIAL	1,505
CONTRACTED EQUIPMENT AND SERVICES	9,085
WASTE DISPOSAL	
Packaging	13,665
Liquid Processing	5,875
Transport and Burial	<u>25,754</u>
SUBTOTAL	103,664
25% CONTINGENCY	<u>25,916</u>
TOTAL	\$129,580



APPENDIX C

RESULTS OF AIR SAMPLES TAKEN IN  
RESTRICTED AREA OF FACILITY

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

LABORATORY ANALYSIS REPORT

\*\*\*\*\*

DATE: 04/01/85 08:25:16  
 TITLE: J.C.HAYNES HOT LAB AIR SAMPLES  
 INSTRUMENT: CANBERRA ALPHA/BETA SYSTEM  
 SAMPLES FROM: J.C.HAYNES  
 SAMPLE TYPE: AIR FILTERS  
 COLLECTED BY: CANIANO-AXELSON  
 COLLECTED ON: 3/26/85 3/27/85

ERRORS ARE AT THE 95% (2 SIGMA) CONFIDENCE LEVEL

\*\*\*\*\*

	LIVE TIME (MIN)	ACTIVITY (DPM)	COUNTS ALPHA	COUNTS BETA	EFFICIENCY	+/-ERROR	%ATTEN
BACKGROUND :	10		0	9			
ALPHA SOURCE:	9.78471	9120	25835	6665	.364102	.0116	0
BETA SOURCE:	9.98375	25787	1950	74302	.296146	.0091	0

	ALPHA	BETA
LC: CRITICAL LEVEL (DPM)	0	2.36626
LD: DETECTION LIMIT (DPM)	.750822	5.65564
LOSS DUE TO CROSSTALK	.205133	.0254583

ALPHA					BETA				
COUNTS	DPM	ERROR	uCi/UNIT	ERROR	COUNTS	DPM	ERROR	uCi/UNIT	ERROR
SAMPLE=85-128 DESCRIPTION:									
POS. = 4 LIVE TIME (MIN)= 9.99897 VOLUME= 3.39802E+06 - CC									
124.1	42.9	10.2	5.69E-12	1.4E-12*	33.1	3.5	1	4.64E-13	
SAMPLE=85-129 DESCRIPTION: no times or flow rates provided									
POS. = 5 LIVE TIME (MIN)= 9.9868 VOLUME= 1 - SAMPLE									
1584.1	548.2	91.3	2.47E-04	4.1E-05*	401.1	14.6	1	6.57E-06	
SAMPLE=85-130 DESCRIPTION:									
POS. = 6 LIVE TIME (MIN)= 9.9987 VOLUME= 8.49505E+06 - CC									
156.1	53.7	12.1	2.85E-12	6.4E-13*	68.1	6.5	12.3	3.47E-13	6.5E-13

\*\*\*\*\*

## APPENDIX D

### RESULTS OF SMEAR SAMPLES ON DIAMONDS



Department of Energy  
Albuquerque Operations  
Dayton Area Office  
P.O. Box 66  
Miamisburg, Ohio 45342

April 1, 1985

Mr. William L. Axelson  
United States Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

Dear Mr. Axelson:

At your request, the Dayton Area Office, USDOE, has asked our operating contractor, Monsanto Research Corporation, to identify the type of contamination and the source of such contamination on the diamonds "acquired" during the DOE/MRC Radiological Assistance response to your agency's request on March 26, 1985. These diamonds have been analyzed by D. G. Draper, Health Physicist, Monsanto Research Corporation, and the source of contamination identified as Am-241. Subsequently, these diamonds were further analyzed for Am-241 content, and wipes taken previously of these diamonds by NRC personnel were alpha counted at Mound. The following summarizes the results:

ID Description	Am-241 Content	NRC wipe (cpm)
1 jagged	140,000 dpm	650
2 largest	7,000 dpm	251
3 medium	6,000 dpm	38
4 smallest	800 dpm	76

As you are aware, current guidelines indicate that there is no exempt possession quantity for Am-241. NRC Reg Guide 1.86 Table 1, Acceptable Surface Contamination Levels indicate that the maximum allowable removable Am-241 is 300 dpm/100 sq cm. Each diamond is considerably smaller than 100 sq cm total surface area. Therefore, in Mr. Draper's opinion, each of the diamonds exceeds a level which would allow them to be used unconditionally.

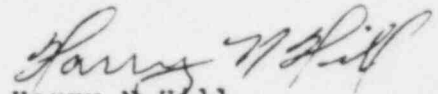
Accordingly, DOE/MRC recommends that the diamonds be thoroughly decontaminated by an approved agency in a licensed facility until the decontamination results in a demonstrated reduction of activity to allowable levels as stipulated in NRC Reg Guide 1.86.

APR 4 1985

Per your request, we have packaged the diamonds individually and labeled the package with a Radioactive Material sticker. They have been placed in a secure storage area at the Mound Facility pending disposition instructions from your office.

Please contact Mr. David Ingle, AC (513) 865-3597, to coordinate further action related to the return of the diamonds to your agency.

Sincerely,

  
Harry N. Hill  
Area Manager

cc: J. H. Ware, DAO  
H. L. Turner, MRC  
D. G. Draper, MRC  
R. A. Neff, MRC  
H. E. Meyer, MRC  
P. C. Adams, MRC  
D. C. Ogden, FBI, Columbus  
P. Niessen, USDOE/Chicago Operations Office

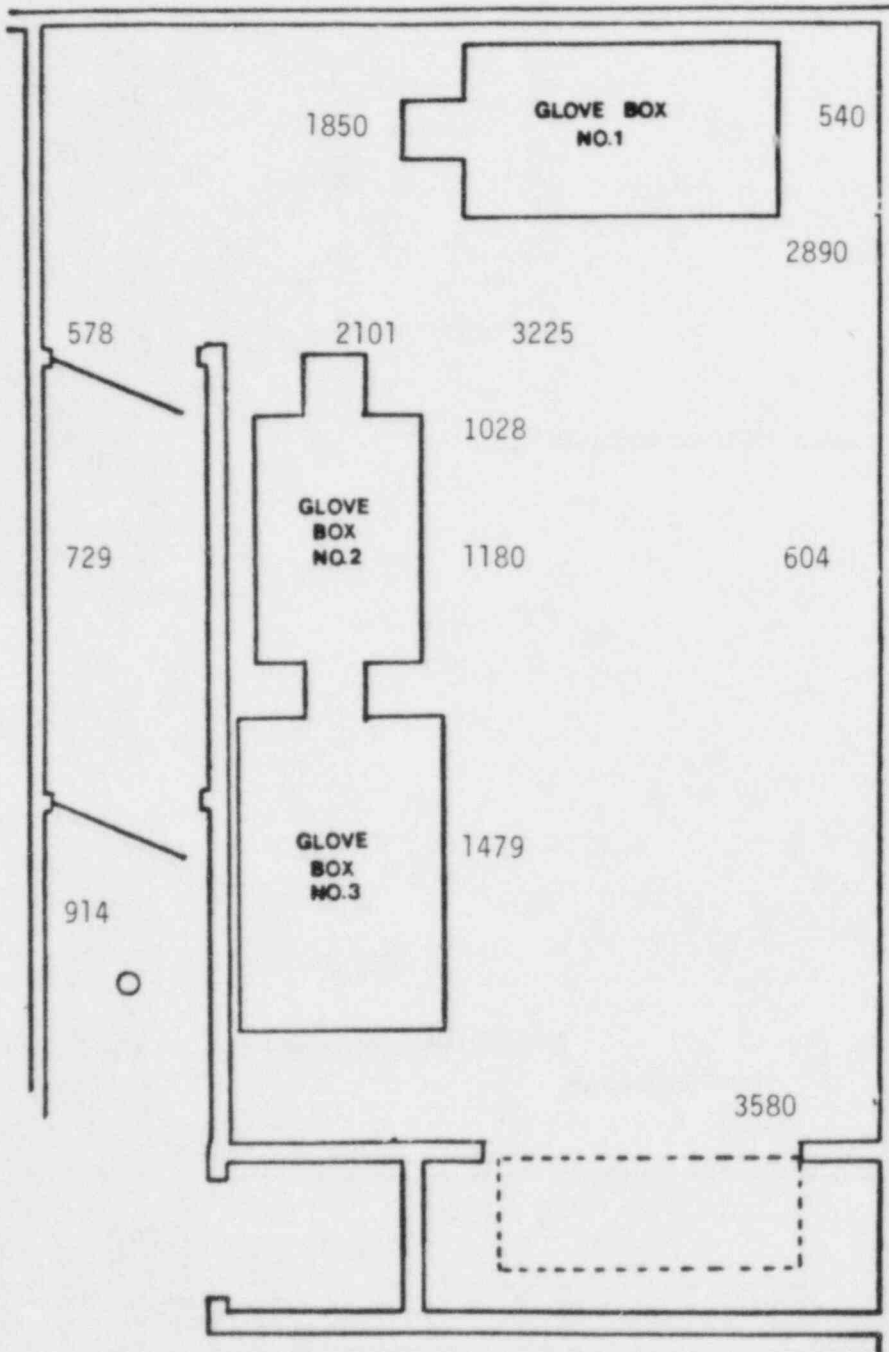
APPENDIX E

RESULTS OF NRC SURVEYS PERFORMED AT  
FACILITY ON MARCH 27, 1985



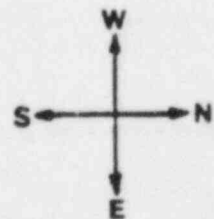
RESTRICTED AREA

SMEAR SURVEY



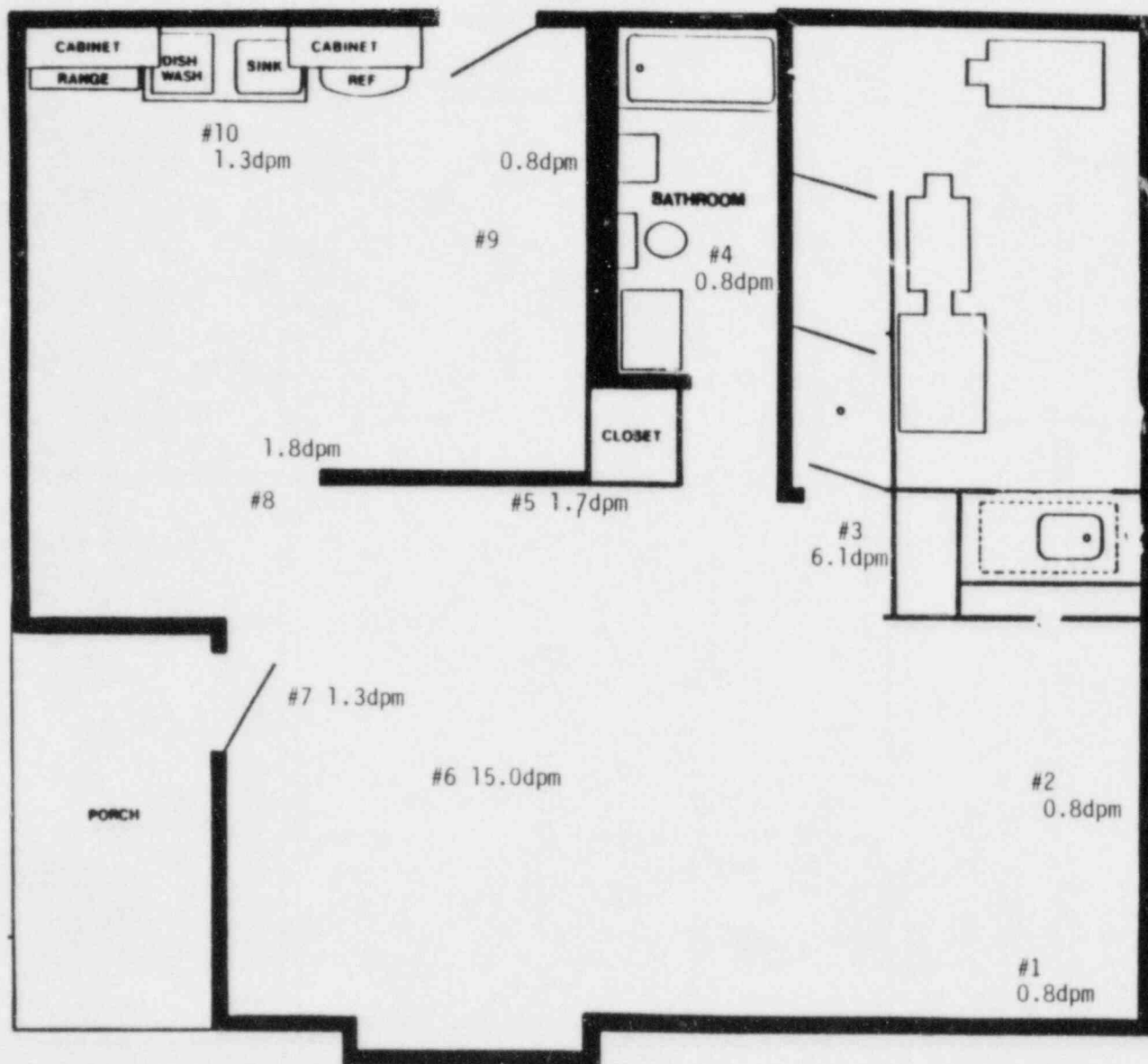
March 27, 1985  
Surveyed by:  
W. L. Axelson  
R. J. Caniano  
J. R. Mullauer

0 1  
METER

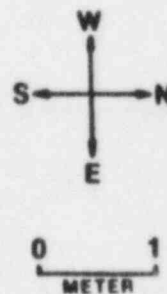


All readings in disintegrations per minute (dpm).

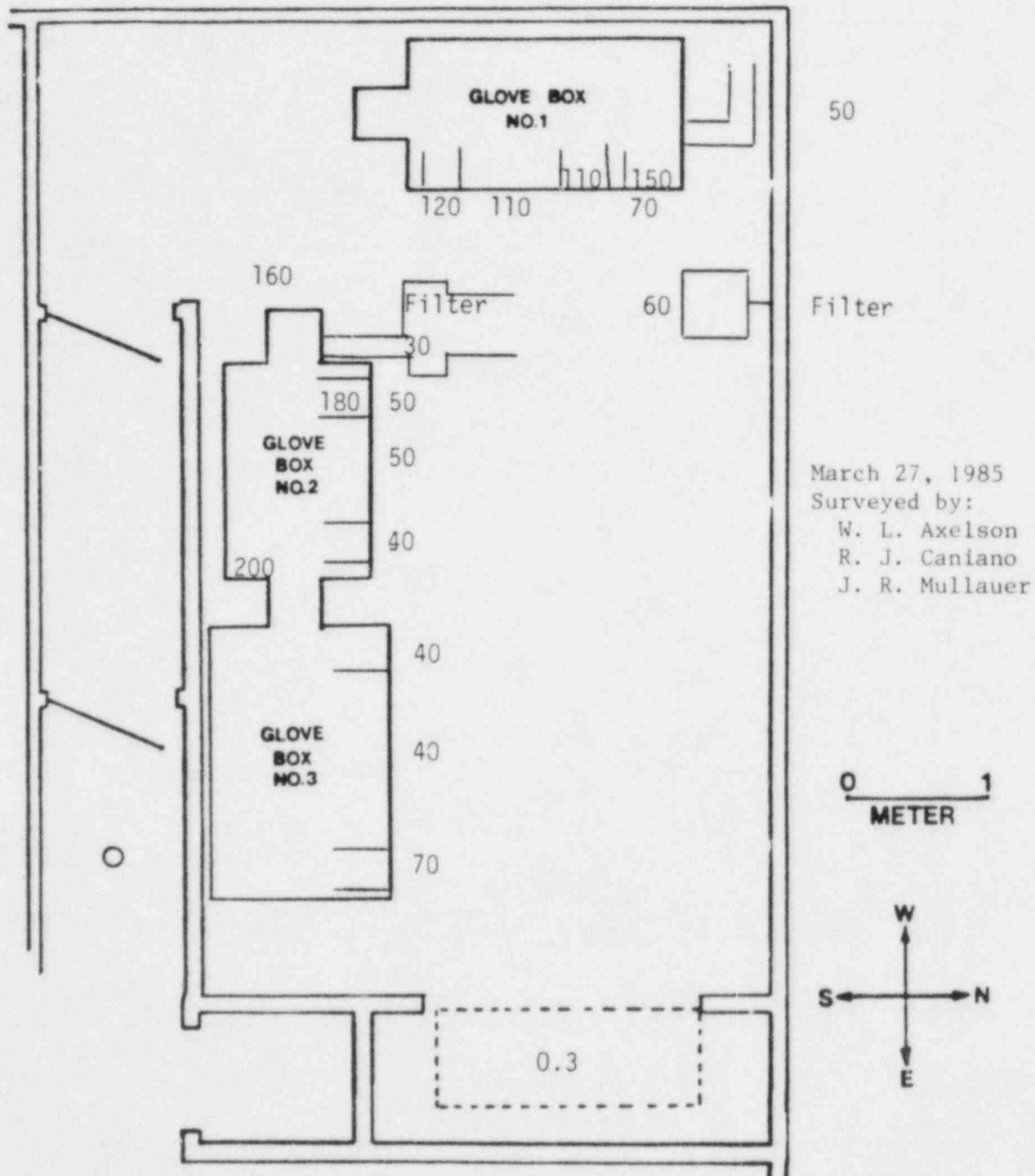
# UNRESTRICTED AREA SMEARS



March 27, 1985  
Exit Survey  
Surveyed by:  
R. J. Caniano  
J. R. Mullauer  
R. E. Burgin

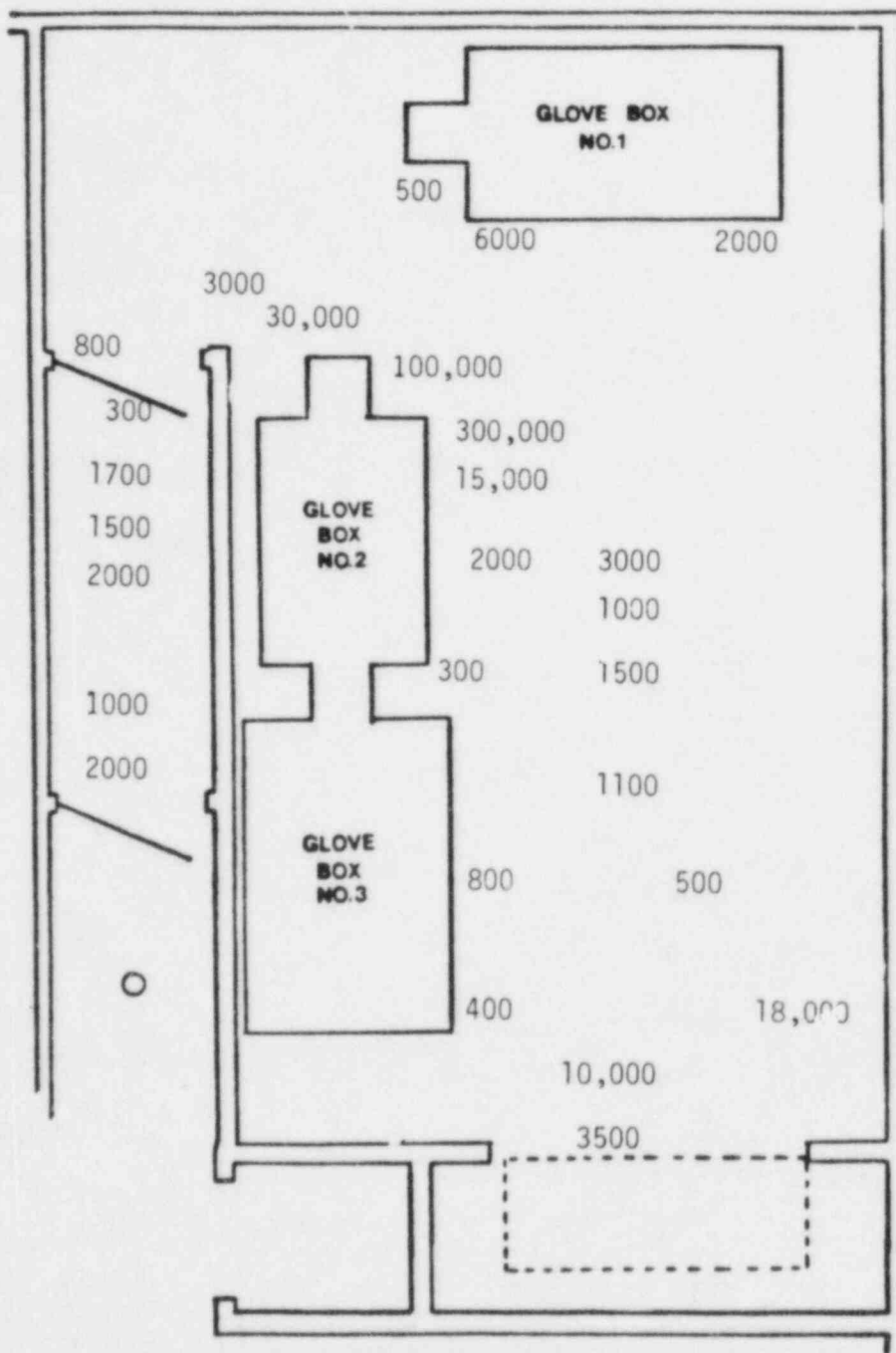


RESTRICTED AREA  
DIRECT GAMMA SURVEY



\*All readings in mR/hr.

RESTRICTED AREA  
DIRECT ALPHA SURVEY



March 27, 1985  
 Surveyed by:  
 W. L. Axelson  
 R. J. Caniano  
 J. R. Mullauer

\*All readings in counts per minute (50% eff).

APPENDIX F

ANALYSIS OF CONTAINERS CONFISCATED ON MARCH 26, 1985



Department of Energy  
Albuquerque Operations  
Dayton Area Office  
P.O. Box 66  
Miamisburg, Ohio 45342

April 24, 1985

Mr. William L. Axelson  
United States Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

Dear Mr. Axelson:

Attached is a copy of a memorandum describing the results of the initial measurements conducted of the material "acquired" during the DOE/MRC Radiological Assistance response to your agency's request on March 26, 1985.

If you need further information, please contact D. S. Ingle, (513) 865-3597.

Sincerely,

*Harry N Hill*  
Harry N Hill  
Area Manager

Attachment: 1 cy

cc: J. H. Ware, DAO, w/cy  
H. L. Turner, MRC, w/cy  
D. G. Draper, MRC, w/cy  
R. A. Neff, MRC, w/cy  
D. C. Ogden, FBI-Columbus, w/cy  
P. Niessen, DOE/CH, w/cy

APR 25 1985



TO : W. W. Rodenburg, D. A. Rakel  
DATE : April 12, 1985  
SUBJECT : Calorimetry and Gamma-Ray  
Spectroscopy Results  
REFERENCE :

cc : J. F. Lemming  
R. E. Vallée  
G. R. Gartrell  
P. W. Gibbs  
File (2)

TO : W. H. Smith

Calorimetry and gamma-ray spectroscopy measurements were made on the samples identified as CAN-1-DOE and CAN-2-DOE. The calorimetry measurement showed the two samples together emitted a total of 0.3526 watts of thermal power on April 8, 1985. That equates to 3.087 grams (specific power = 0.11423\* watts/g Am-241) or 10.56 curies (half-life = 433.6\* years) of Am-241. The uncertainty of the measurement is plus or minus one percent at the one sigma level. The gamma-ray data acquired for each sample included the energy range from 20 to 1056 keV. The gamma-rays identified in these spectra are attributed to the decay of Am-241.

W W Rodenburg  
W. W. Rodenburg

D. A. Rakel  
D. A. Rakel

ag

\*American National Standard Institute N15.22-1975, "Calorimetric Assay of Plutonium Bearing Solids".

APPENDIX G

DESCRIPTION OF CONTENTS FOUND IN CONFISCATED CONTAINER



Department of Energy  
Albuquerque Operations  
Dayton Area Office  
P.O. Box 66  
Miamisburg, Ohio 45342

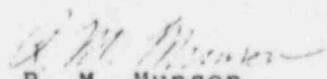
May 7, 1985

Mr. William L. Axelson  
United States Nuclear Regulatory Commission  
Region III  
799 Roosevelt Road  
Glen Ellyn, Illinois 60137

Dear Mr. Axelson:

Pursuant to your request, container #2 seized by NRC/FBI during recent recovery of Americium 241 was opened at Mound on May 3, 1985. The attached report, with accompanying photographs, summarizes actions taken by DOE/MRC personnel and the results of the container investigation. If we can be of further assistance please contact D. S. Ingle, FTS 774-3597.

Sincerely,

  
R. M. Munson  
Acting Area Manager

Attachments: as stated

cc: G. R. Gartrell, DAO, w/cy  
J. H. Ware, DAO, w/cy  
H. L. Turner, MRC, w/cy  
D. G. Draper, MRC, w/cy  
R. A. Neff, MRC, w/cy  
B. R. Kokenge, MRC, w/cy  
H. L. Anderson, MRC, w/cy  
J. K. Crawford, MRC, w/cy  
D. C. Ogden, FBI-Columbus, w/cy  
P. Niessen, DOE/CH, w/cy

Subject: Recovery of Americium-241

Date: May 6, 1985

Location: Mound, Miamisburg, Ohio

Task: To open Container #2 and identify its contents. Container #2 was the container in which the quart-sized lead lined "pig" recovered from the second site was placed.

Chronology:

1:50 P. M.   o Opened Can #2 and transferred quart-sized lead-lined "pig" to fumehood in PP Building.

2:05 P. M.   o Outer container opened  
                 o Lead lined quart "paint" can inside  
                 o Inside "paint" can was a stainless steel container  
                 o Stainless steel container was opened  
                 o Inside wrapped in plastic bags was double-bagged film container (plastic)

2:18 P. M.   o Film container opened  
                 o Inside was another stainless steel container with inside threaded oversized cap

2:23 P. M.                   o Opened small stainless steel container  
                             o Black particles found in bottom. Quantity of material was very small, probably covered only the bottom of container. Particles appeared to be flakes or chips rather than dust or powder. Readings of approximately 200 mr/hr were reported as coming off of film container. No other material in container.

2:37 P. M.   o Material placed back into original container and sealed.

Contents of Container

- o Quart sized paint can (lead-lined)
- o Stainless steel sleeve with expansion plug
- o Plastic bag "HB 80/24"
- o Plastic bag "HB 80/20"
- o Plastic bag "HB 506FF20"
- o Black film container - gray lid
- o Black tape sealant
- o Stainless steel container w/brass lid 1-1/2 cm diameter
- o Black flakes material 1 cm deep

APPENDIX H

PROPOSED DECONTAMINATION PLAN PREPARED  
BY OAK RIDGE ASSOCIATED UNIVERSITIES - 1985

## DECON PLAN FOR HAYNES-NEWARK LAB. EQUIP.

Build plastic rooms in end of living room.

Install backup blower (if needed).

Cut off water supply going to the lab area outside of the lab (probably in the front room).

Modify electricity being fed into the active lab to eliminate shock or fire hazard.

- A. Cut off power to electrical outlets and lights.
- B. Mount portable lights with extension cords.
- C. Power backup blower.

Install air monitoring equipment.

Gather up and bag all items on the floor and on top of things, general house cleaning in lab.

#### Sink and Hood

- A. Monitor and fix contamination.
- B. Remove drain, cap openings.
- C. Remove exhaust duct up to filter.
- D. Wrap hood in plastic for removal.
- E. Move from present location (closer to Box 1).

Remove or replace sink hood HEPA filter.

Remove existing wall, presently behind sink hood.

Wrap for removal from the hot area the disconnected hood, put into a crate or store in holding area.

Put down floor covering to prevent additional contamination during box contents bag out, glove changes, and breechments.

Box 1 contents removal and inspection.

- A. Change gloves, cover all glove ports not used.
- B. Put bag on glove port to remove contents into (this bag must include all items to be put into the box).

APR 24 1985



C. Examine all items inside the box, monitor as they are passed out into the bag.

D. Wipe down the box interior, spray with varnish, dry overnight.

NOTE: Bag in silver tape or masking tape  
absorbent material  
wipes  
paint  
cleaning solution (only amount needed)  
bootie bags

Box 2-3 Contents removal and inspection  
(Repeat Box 1 procedure)

E. Prepare for possible liquid held in drain pipe.

Disconnect all water and electrical feeds to the boxes (cut off close to boxes, package liner for removal).

NOTE: Water lines will be full of water.

Unbolt and separate Box 2 from Box 3 (Not sure if boxes are welded to support stands).

Separate Box 2 from exhaust system. Remove exhaust filter and duct to the tee at the main duct. Monitor, package for removal.

Remove Box 2 from stand, tape windows, and wrap box in plastic remove from room.

Cut support frame for Box 2 from Box 3, monitor, and package for removal.

Box 3 if box cannot be separated from its base shorten legs as much as possible, package for shipment, tape windows, check floor under box legs. Paint spots to prevent spreading contamination.

Box 3 wrap and remove from restricted area (3 layers reinforced poly. All seams taped.)

Separate Box 1 from exhaust system.

A. Remove duct to small HEPA filter.

B. Remove, monitor, package HEPA filter.

C. Remove duct to final HEPA filter.

Remove Box 1 from its stand. Wrap in plastic removal from restricted area.

Outside final packaging of Box 1.

Removal of Box 1 support stand from restricted area. Check spots where stand was sitting. Paint to fix contamination.

Remove and replace final HEPA filter used on gloveboxes.

Remove remainder of exhaust for boxes, if necessary. Cover openings as required.

Remove any protective coverage used in the restricted area to protect the floor, package for shipment.

Final removal of plastic room contamination, as required.

Removal of restricted area barrier, package for shipment.

ORAU Acceptance & Approval

NOTE: The time estimates do not allow for box content inspection delays, gross releases or glovebox to base separation difficulties.

PHASE II DECONTAMINATION PLAN  
FOR HAYNES PROPERTY

OUTDOOR AREAS

- I. Remove Waste Lines & Holding Tank (200 gallon)
  - A. Allow tank to settle - Do Not Agitate.
  - B. Pump H<sub>2</sub>O into carboys.
  - C. Double wrap carboys in plastic and place in 55 gallon drums. Transport to Battelle.
  - D. Add absorbant material in tank to solidify any remaining liquid.
  - E. Excavate the line from tank to house and remove.
  - F. Dismantle line, double wrap in plastic and package in 55 gallon drum or crates, as required.
  - G. Excavate the tank.
  - H. Excavate all soil from around the tank and line to background levels (obtain soil samples).
  - I. Wrap tank in plastic, place in crates for transport and disposal.
- II. Remove Waste Lines & Holding Tank (55 gallon drum)
  - A. Agitate H<sub>2</sub>O in drum for one hour using bubbler system (agitation will continue throughout H<sub>2</sub>O removal).
  - B. Pump H<sub>2</sub>O into carboys.
  - C. Double wrap carboys in plastic and place in 55 gallon drums. Transport to Battelle.
  - D. Add absorbant material in tank to solidify any remaining liquids.
  - E. Excavate the tank.
  - F. Excavate all soil from around the tank and line to background levels (obtain soil samples).
  - G. Wrap tank in plastic, place in crates for transport and disposal.
- III. Remove Soil from Drain/Leach Field\*
  - A. Collect soil samples in dry well area. Shovel/backhoe contaminated soil from drain area. Remove soil till standing water remains. Collect standing water and analyze.

- B. Place in 5 gallon drums, transport to waste storage area and repackage in 55 gallon drums with a double plastic lining.

#### IV. Outdoor Ventilation System Set Up by J. C. Haynes

- A. Dismantle ventilation system installed by Haynes.
- B. Wrap sections in plastic.
- C. Place in 55 gallon drums or crates for disposal.
- D. Cover penetration of wall in restricted area.

#### V. Roof

- A. Remove one section of roof panel. Double wrap in plastic and ship to ORAU for analysis.
- B. If Am-241 contaminant is present, determine maximum and average contaminant level on roof.
- C. Apply for waiver to contamination limits from NRC to allow roof to remain. (Contamination is fixed, not detectable on smears.)
- D. If waiver denied, remove roof and package as contaminated waste.

### INDOOR AREAS

#### I. Unrestricted Area

- A. Grid and survey former kitchen, living room and bathroom areas
- B. Remove carpeting if present, survey and dispose of in the required manner.
- C. Decontaminate surfaces as required. (Use Decon Solution/Marine Strip.)
- D. Cover all walls and ceilings with kraft paper.
- E. Dispose of all wastes as required.

#### II. Tents

- A. Survey tents 1, 2, and 3 and package as contaminated or regular waste as required.
- B. Survey and dispose of floor coverings within the tent area as appropriate.
- C. Reconstruct a single tent wall covering the entrance to the hot lab.
- D. Proceed with steps I. A thru I. E.

III. Hot Lab (Respirators may be required - Check with Team Leader prior to entry)

A. Ceiling and wall surfaces

1. Check for removable contamination.
2. If readily removable, use Decon solution and wipe down surfaces.  
NOTE: Use very minimal amounts of solution.
3. Remove wall and ceiling panels and package as contaminated waste.
4. All wipes/cleaning materials and solutions should be packaged as radioactive waste.

B. Floor Surface

1. Check for removable and fixed contamination.
2. Clean with Decon solution. NOTE: Use minimal amount of solution.
3. Apply strippable coatings. Let dry overnight.
4. Use pick-ax or sledge hammer and break up floor surface.
5. Remove concrete residue and package as waste.
6. Reapply strippable coating. Let dry overnight.
7. Cut coating and remove.
8. Survey surface for fixed and removable contamination.
9. Decon or reapply strippable coating as necessary.
10. Package all contaminated materials as waste.
11. Cover clean areas with kraft paper.
12. All wipes/cleaning materials and solutions should be packaged as radioactive waste.
13. Pump floor wells dry; place liquid waste in 5 gallon containers.
14. Fill each well with vermiculite.
15. Cap each well and seal with silicone rubber.
16. Remove wells from floor, double bag and package as waste.

#### IV. Attic

A. Check attic surfaces for contamination (removable and fixed).

B. Remove contaminated materials and package as waste.

NOTE: decontamination will not be attempted.

#### V. Plumbing

A. Check all plumbing lines, showers, etc.

B. If contaminated, remove lines, double wrap in plastic and make proper disposal.

#### VI. Garage

A. Survey walls, ceilings, floors, all surfaces and clean as required.

### FINAL SURVEY PLAN

#### I. Outdoor Areas

A. Remove all waste from site.

B. Perform walkover survey using existing grid system.

C. Collect soil samples at 10 m intervals.

#### II. House

A. Remove kraft paper from all surfaces.

B. Re-scan all surfaces using:

1. Alpha survey meter.
2. NaI survey meter or  $\mu$ R meter.
3. Use smears in each grid block.

#### III. Garage

A. Re-scan all surfaces using:

1. Alpha survey meter.
2. NaI survey meter or  $\mu$ R meter.
3. Use smears in each grid block.



APPENDIX I

NEWSPAPER ARTICLES AND NRC PRESS RELEASES



## UNITED STATES NUCLEAR REGULATORY COMMISSION

OFFICE OF PUBLIC AFFAIRS, REGION III  
799 Roosevelt Road, Glen Ellyn, Illinois 60137

NEWS ANNOUNCEMENT: 85-~~18~~ 15  
CONTACT: Jan Strasma 312/790-5674  
Russ Marabito 312/790-5667

### NEWARK, OHIO MAN ARRESTED FOR ILLEGAL POSSESSION OF RADIOACTIVE MATERIAL

The following information was provided to Columbus, Ohio news media on March 26, 1985, by the NRC, the FBI, and the State of Ohio:

Terence D. Dinan, Special Agent in charge, Central Ohio, Federal Bureau of Investigation, and James G. Keppler, Regional Administrator, Nuclear Regulatory Commission (NRC), today announced the arrest of a Newark, Ohio resident for illegal possession of radioactive material and making false statements to the NRC. A substantial amount of the substance was recovered. Arrested was John C. Haynes, age 45, of 1268 Countryside, Newark, Ohio. Haynes was arrested by agents of the FBI at his residence early on March 26, 1985.

In related searches conducted by FBI and NRC personnel and U.S. Department of Energy personnel, approximately 20-25 curies of americium-241 was recovered. Some of the americium-241 was recovered at a facility in the Newark, Ohio area that was being utilized by Haynes as a special laboratory. The rest was located at the residence of an associate in Heath, Ohio.

According to James G. Keppler, americium-241 is a man-made radioactive material which is potentially hazardous in powder form if it is inhaled by an individual. It is not a significant radiation hazard outside the body.

Haynes was initially licensed by the former Atomic Energy Commission (predecessor to the NRC) in 1970 to possess the americium-241 for use in irradiating gemstones to cause a color change. Since 1981 however, his NRC license has permitted only storage of a small amount of americium-241 in the form of limited contamination of equipment in his facility.

Ohio Governor Richard F. Celeste directed the Ohio Disaster Services Agency and the Ohio State Highway Patrol to support the federal operation by providing radiation monitoring personnel and escorting the shipment of the recovered radioactive material.

The role of the state involvement as directed by the Governor was to insure the safety and welfare of residents in the immediate area surrounding Haynes' facility and during transport of the radioactive material.

According to state and federal personnel, at no time was there a hazard to area residents during the arrest and related activities.

-More-

24-hour security will be maintained at the Haynes facility by the Licking County Sheriff's Office through an agreement with the NRC. Plans for the disposition of laboratory equipment will be made in the near future according to Keppler. The americium-241 seized by federal agents has been transported for storage to the Mound Laboratory, a federal Department of Energy facility in Miamisburg, Ohio.

Dinan said that Haynes appeared before U.S. Magistrate Mark R. Abel on March 26, 1985, and was released on his own recognizance. Dinan said that if convicted, Haynes faces a total of 12 years in jail, and a \$20,000 fine.

Both Mr. Dinan and Mr. Keppler agreed that the success of today's operation was due to a great extent upon the cooperation of various state and local authorities, including the Ohio Disaster Services Agency, Ohio State Highway Patrol, and Licking County Sheriff Gary Billy.

Participating in the operation were a team of 13 NRC staff members from the NRC's Office of Investigation and from the Regional Office in Glen Ellyn, Illinois.

####

March 27, 1985

# Radioactive material is seized — carefully

By MICHAEL TAYLOR  
C-J Staff Writer

NEWARK — A 45-year-old jeweler from Newark was arrested yesterday and charged with illegal possession of radioactive material and making false statements to the Nuclear Regulatory Commission.

Authorities said John C. Haynes, 1238 Country Side, had been using the radioactive material as part of an operation to alter the color of diamonds to enhance their value.

Haynes was arrested at his residence at about 8:01 a.m. by FBI agents and personnel from the NRC in connection with his use of a sub-

stance known as Americium 241, a man-made radioactive material.

In searches conducted by the FBI, NRC personnel and representatives from the U.S. Department of Energy, about 20 to 25 curies of Americium 241 were recovered from a lab on Parr Road in Licking County owned by Haynes and at the residence of an associate in Heath. Authorities would not identify the associate or disclose the address.

Jan Strasma, public affairs officer for the NRC Chicago Regional Office, said that the 20 to 25 curies of Americium seized would be roughly equivalent in volume to about 6 sugar cubes.

The Americium 241 seized was to be transported for storage to the Mound Laboratories, a Department of Energy facility in Miamisburg.

Gov. Richard F. Celeste directed the Ohio Disaster Services Agency and the Ohio Highway Patrol to support the federal operation by providing radiation monitoring personnel and escorting the shipment.

At no time was there a hazard to the area residents during the arrest and related activities, state and federal authorities said.

Haynes appeared late yesterday afternoon before U.S. Magistrate Mark R. Abel, who released him on his own recognizance. Haynes is to

appear for a preliminary hearing before Abel on April 5.

According to an affidavit filed in U.S. District Court, a confidential source advised NRC staff on Feb. 18 that Haynes had been using Americium 241 for about a year to alter the color of diamonds.

In 1970, Haynes was granted a license to possess small amounts of Americium for use in irradiating gemstones to change their color.

But on April 28, 1982, the NRC amended Haynes' license to allow him only to store the substance in his lab.

Strasma said the NRC had amended the license because of

problems Haynes was having in properly handling the substance. Haynes was issued an order in 1984 to clean up his laboratory, but Haynes responded that he was financially unable to comply, Strasma added.

Haynes declined to comment on the charges against him after his hearing in federal court.

But in a brief statement to Abel during the hearing, Haynes cited problems he had with the NRC with the licensing requirements.

"I wasn't able to maintain the paperwork and handle the red tape

required to maintain a license," Haynes said.

Haynes is the part-owner of a jewelry business in Heath known as J.C. Haynes Co.

One spokesman said that it did not appear that any diamond was still dangerously radioactive.

According to NRC officials, Americium 241 is a potentially hazardous carcinogen in powder form if it is released into the air and inhaled.

If convicted of the charges against him, Haynes faces a total of 12 years in jail and a \$20,000 fine.

# Radioactive powder seized

By Starita Smith  
Dispatch Police Reporter

NEWARK, Ohio — A small green house with firewood piled on the porch, a small tractor parked in front and two old cars on blocks in the yard seems an unlikely place to find diamonds and radioactive material.

But that house, at 6532 Parr Rd., a dirt and gravel road that twists through the hills in Franklin Township southeast of Newark, was the site of a laboratory. There, 45-year-old John Charles Haynes worked for years on a process to remove flaws and change the color of diamonds by immersing them in a man-made radioactive powder, federal authorities said.

About 30 officers from federal, state and county agencies seized the powder, called Americium 241, in raids on the laboratory and at a house in suburban Heath Tuesday.

**HAYNES WAS** arrested by FBI agents at his home at 1268 Country Side Dr., Newark, about 8 a.m. Tuesday, an FBI spokesman said. He is charged with illegal possession of a radioactive material and making false

statements to the Nuclear Regulatory Commission. If convicted, Haynes faces a 12-year prison sentence and a \$20,000 fine.

After a hearing before U.S. Magistrate Mark R. Abel Tuesday, Haynes, who operates J. C. Haynes Jewelers in Heath, was released on his own recognizance.

At his home Tuesday night, Haynes refused to comment.

FBI and the Nuclear Regulatory Commission spokesmen said they seized quantities of Americium 241 at Haynes' laboratory about 8 miles southeast of Newark and in an associate's house in Heath.

Jan Strausma, an NRC public affairs officer said, "The volume we took is about the same as that of a half-dozen sugar cubes. It is like chalk dust."

**STRAUSMA** and other officials stressed that at no time were residents in the areas where Haynes kept the Americium 241 in danger. The substance is hazardous only in its powdered form, he said.

"If the powder gets in the air and is inhaled and it gets into the lungs, it can



Dispatch photo by Ken Chamberlain

## Licking County lab where radioactive chemical was seized

be cancer-causing. There could be a problem if there was a fire or a tornado and it got into the air," Strausma said.

In 1970, Haynes first obtained a permit from the then Atomic Energy Commission to use Americium 241. In 1981, that permit was revoked when the federal government changed the rules for possession of radioactive materials, an FBI spokesman said.

Federal officials said they do not know where Haynes got his supply of the powder, which Strausma said is a product of nuclear reactors.

**HAYNES, WHO** already has a patent for a process for irradiating gemstones, sometimes disposed of the Americium 241 by shipping it to a commer-

cial radioactive waste plant in Morehead, Ky., Strausma said.

Although the diamonds seized Tuesday were not for sale, the process Haynes was perfecting had the potential for growing into a profitable business, authorities said.

FBI supervisor Doug Ogden said, "He could remove the flaws in a diamond, so if you didn't know it wasn't perfect, you would think it was worth a lot more than it was. Once the diamonds are decontaminated, they are very safe."

The diamonds and radioactive powder were taken to the federal Department of Energy's laboratory in Miami, Ohio.





## UNITED STATES NUCLEAR REGULATORY COMMISSION

OFFICE OF PUBLIC AFFAIRS, REGION III  
799 Roosevelt Road, Glen Ellyn, Illinois 60137

NEWS ANNOUNCEMENT: 85-18  
CONTACT: Jan Strasma 312/790-5674  
Russ Marabito 312/790-5667

### NRC AND EPA ANNOUNCE CLEANUP PLANS FOR CONTAMINATED LABORATORY NEAR NEWARK, OHIO

The Nuclear Regulatory Commission Region III, and the U.S. Environmental Protection Agency Region V today announced that cleanup activities have been scheduled at the laboratory-facility of John C. Haynes in rural Licking County, Ohio. Initial site work will begin April 17, 1985, at the Haynes facility on Parr Road, about 10 miles southeast of Newark, Ohio, with actual cleanup to begin the week of April 22.

The laboratory is contaminated with americium-241, a manmade radioactive material which Mr. Haynes used in experiments to cause color changes in gemstones. This contamination could represent a significant public health hazard in the event of fire or vandalism, according to the NRC staff.

The cleanup work will be performed by personnel from Oak Ridge National Laboratory, Oak Ridge, Tennessee, and Battelle Memorial Institute, West Jefferson, Ohio, and is being financed by emergency funds from the EPA's Superfund. The project is expected to cost about \$150,000 and take two to four weeks. Once the cleanup is completed, EPA procedures require that it recover the costs of the cleanup from Mr. Haynes.

The State of Ohio has been informed of the planned cleanup and has cooperated fully in the project.

On April 5, 1985, the NRC issued an Order to Mr. Haynes requiring him to permit NRC entry to the laboratory, and removal of radioactive material and contaminated equipment. An NRC Order was also issued to Mr. Haynes in 1984, requiring the cleanup of the facility, but he responded that he was financially unable to perform the work.

Mr. Haynes was licensed in 1970 by the former Atomic Energy Commission for the possession and use of radioactive americium-241 which he utilized to induce color changes in gemstones. In 1981 his NRC license was restricted to the storage only of a limited quantity of americium-241 in the form of contamination of equipment in his laboratory. The restriction was imposed because of repeated violations of NRC safety regulations.

On March 26, 1985, Haynes was arrested by agents of the Federal Bureau of Investigation on charges of unauthorized possession and use of radioactive material and for making false statements to the NRC. A quantity of americium-241---approximately 10 curies---was seized at that time; this quantity was far in excess of the limited amount permitted in his NRC license.

Subsequent radiation surveys of the laboratory indicate that substantially greater contamination is present than that which was measured during an extensive survey in 1983.

####

April 16, 1985

**BIBLIOGRAPHIC DATA SHEET**

NUREG-1153

SEE INSTRUCTIONS ON THE REVERSE

2. TITLE AND SUBTITLE

Inspection Report of Unauthorized Possession and Use of  
Unsealed Americium-241 and Subsequent Confiscation

J.C. Haynes Company, Newark, Ohio

5. AUTHOR(S)

Region III (R.J. Caniano)

7. PERFORMING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)

Region III  
Division of Radiation Safety and Safeguards  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555

10. SPONSORING ORGANIZATION NAME AND MAILING ADDRESS (Include Zip Code)

Same as 7 above

12. SUPPLEMENTARY NOTES

13. ABSTRACT (200 words or less)

This U.S. Nuclear Regulatory Commission report documents the circumstances surrounding the March 26, 1985, confiscation and subsequent decontamination activities related to the use of unauthorized quantities of americium-241 at the John C. Haynes Company (licensee) of Newark, Ohio. It focuses on the period from early February to July 26, 1985. The incident started when NRC Region III received information that John C. Haynes possessed unauthorized quantities of americium-241 and was conducting unauthorized activities (diamond irradiation). By July 26, 1985, the decontamination activities at the licensee's laboratory were concluded. The licensee's actions with diamond irradiation resulted in contamination in restricted and unrestricted areas of the facility. The confiscation and decontamination activities required the combined efforts of NRC, Federal Bureau of Investigation, U.S. Department of Energy, Oak Ridge Associated Universities, the State of Ohio, and the U.S. Environmental Protection Agency. The report describes the factual information and significant findings associated with the confiscation and decontamination activities.

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