

ACTION DESCRIPTION MEMORANDUM

PROPOSED DECONTAMINATION OF THREE BUILDINGS AT THE  
UNIVERSITY OF CHICAGO CONTAMINATED AS A RESULT  
OF PREVIOUS MED/AEC ACTIVITIES

Prepared by  
Environmental Research Division  
Argonne National Laboratory  
Argonne, Illinois

December 1983

Prepared for  
U.S. Department of Energy  
Oak Ridge Operations  
Technical Services Division  
Oak Ridge, Tennessee

CONTENTS

	<u>Page</u>
Summary of Proposed Action . . . . .	1
Setting . . . . .	1
Background and Need for Action . . . . .	2
Proposed Remedial Action . . . . .	3
Potential Issues . . . . .	4
Figures . . . . .	6
Tables . . . . .	7
References . . . . .	8

SUBJECT: Proposed Decontamination of Three Buildings at the University of Chicago Contaminated as a Result of Previous MED/AEC Activities

### Summary of Proposed Action

As part of its Formerly Utilized Sites Remedial Action Program (FUSRAP), the U.S. Department of Energy (DOE), Oak Ridge Operations, proposes to decontaminate those areas of three buildings at the University of Chicago that are radioactively contaminated as a result of programs conducted by the Manhattan Engineer District (MED) and the Atomic Energy Commission (AEC). The three buildings to be decontaminated are Eckhart Hall, Ryerson Physical Laboratory, and Jones Chemical Laboratory. The contamination in these buildings is located in several laboratories and adjoining areas, but the concentrations of radioactivity are fairly low except for isolated small areas. The purpose of decontamination and restoration is to reduce the amount of residual radioactivity to levels below the established cleanup criteria, thereby permitting unrestricted use.

Specific project actions will include:

- Identification of all areas requiring decontamination.
- Decontamination of identified areas.
- Packaging of all radioactive waste generated by decontamination in approved containers.
- Disposal of all waste generated; the radioactive waste will be transported to and disposed in an approved facility, and all non-radioactive waste will be transported to and disposed in a nearby sanitary landfill.
- Restoration of the facilities as appropriate for intended future uses.
- Certification that the radioactivity levels meet criteria for unrestricted use.
- Radiological assessment of the underground sewers connected to these three buildings that may be radioactively contaminated.

### Setting

The University of Chicago is a private university located in the Hyde Park-Kenwood area of the city of Chicago. The Hyde Park-Kenwood neighborhood covers an area of about 400 ha (1000 acres) and is a residential community of more than 45,000 people, 11 km (7 mi) south of the Chicago downtown business district. The university covers an area of about 70 ha (172 acres) and has an

enrollment of about 8000 students. The university was founded in 1891 and contains buildings with architectural styles representing the past nine decades. Six properties on campus are listed in the National Register of Historic Places (see Table 1).

As part of FUSRAP, the U.S. Department of Energy, Oak Ridge Operations, is proposing to decontaminate those portions of three buildings at the University of Chicago that are radioactively contaminated as a result of programs conducted by MED and AEC. The three buildings to be decontaminated--i.e., Eckhart Hall, Ryerson Physical Laboratory, and Jones Chemical Laboratory--are Gothic style and are located near the center of the campus (Figure 1). Eckhart Hall and Ryerson Physical Laboratory are connected to each other, and Jones Chemical Laboratory is connected to Searle Chemistry Laboratory and Kent Chemical Laboratory. Many of the buildings in this portion of the campus are currently being renovated.

The radiation intensity in these buildings is quite low; the highest exposure rate measured in radiological surveys conducted in 1976 and 1977 was 16 mR/h in contact with a building surface (in Ryerson Physical Laboratory). At only one location in the three buildings was an elevated exposure rate found at a distance of one meter from the surface. This location, in the basement corridor of Ryerson Physical Laboratory, had a reading of 0.1 mR/h at one meter above the floor (U.S. Dep. Energy 1982a). Although the amount of contamination is quite low and does not present an immediate hazard, remodeling or demolition activities could allow contamination that is now fixed to be released to the environment, resulting in a potential health hazard.

#### Background and Need for Action

The University of Chicago was one of the focal points for activities conducted in support of development of the atomic bomb during World War II. The first contract with the university was initiated by the Office of Scientific Research and Development (OSRD) in January 1942. In June 1942, the MED was established within the U.S. Army Corps of Engineers; the contract with the University of Chicago was transferred from OSRD to MED on May 15, 1943.

The primary goal of the work performed at the university was to develop methods for the production and purification of plutonium. Because plutonium is produced when uranium absorbs neutrons, this work necessitated the construction of a facility that would maintain a self-sustaining nuclear chain reaction and, in turn, provide an intense source of neutrons. The first chain-reacting "pile" was constructed of uranium and graphite beneath the west stands of Stagg Field under the direction of Dr. Enrico Fermi. A self-sustaining condition was achieved on December 2, 1942, thereby demonstrating the feasibility of this technology for producing plutonium.

Additional research and development programs were conducted for MED throughout World War II to support the atomic bomb project. Various laboratories and facilities at the university were used for these activities. On January 1, 1947, the AEC, a civilian organization, succeeded the military MED as the governmental organization in charge of nuclear programs. Research activities continued at the University of Chicago under AEC. Research conducted under MED/AEC during the 1940s and 1950s included development of a

process for producing high-purity uranium compounds, testing of uranium metal, research associated with operation of the pile, and plutonium separation (U.S. Dep. Energy 1980a).

At the completion of these MED/AEC research activities, the facilities were decontaminated so that they met health and safety criteria then in use. However, radiological criteria, guidelines, and proposed guidelines for returning sites to unrestricted use have become more stringent as concern about the effects of low-level radiation has increased and instrumentation for detecting and measuring low levels of radiation has become more sensitive. Accordingly, Eckhart Hall, Ryerson Physical Laboratory, and Jones Chemical Laboratory were resurveyed in 1976 and 1977 to determine the extent of existing contamination (U.S. Dep. Energy 1982a, 1982b, 1982c). These surveys indicated that residual contamination in these three buildings exceeds currently accepted criteria.

#### Proposed Remedial Action

The U.S. Department of Energy is proposing to decontaminate those portions of Eckhart Hall, Ryerson Physical Laboratory, and Jones Chemical Laboratory at the University of Chicago that are radioactively contaminated as a result of previous MED/AEC activities. The contamination is widespread throughout several laboratories and adjoining areas; however, the concentrations of radioactivity are fairly low except for isolated small areas (U.S. Dep. Energy 1980b).

The results of the three radiological surveys conducted in 1976 and 1977 will be used as guides to locate contaminated areas. In addition, all areas suspected of being radioactively contaminated as a result of MED/AEC activities will be surveyed as part of this action to ensure that all suspect areas are identified. Standard techniques will be utilized to decontaminate the areas identified. For example, special cleaners will be used to remove the contamination while leaving the surface material intact; in situations where this is not possible, the surface material will be removed by brushing, grinding, spalling, sawing, etc., as appropriate. If necessary, entire components may be removed as radioactive waste. Decontamination will continue until residual radioactivity levels are as low as reasonably achievable (ALARA) and meet criteria developed for FUSRAP. The criteria to be utilized are based on levels proposed by the American National Standards Institute and are summarized in a report of the U.S. Department of Energy (1983).\*

All radioactive waste resulting from decontamination will be packaged in DOE-approved containers for shipment offsite to an approved disposal site. Use of the Hanford site near Richland, Washington, is currently planned.

---

\*The state of Illinois also has surface contamination limits for releasing facilities for uncontrolled use (Ill. Dep. Public Health 1974). These limits are similar to those developed for FUSRAP but are not radionuclide-specific. The state of Illinois criteria are less stringent than the strictest criteria for FUSRAP--i.e., those for "Group 1 radionuclides" (see U.S. Dep. Energy 1983). Because the three University of Chicago buildings are contaminated with Group 1 radionuclides, it will be necessary to decontaminate to levels more stringent than the state limits to meet the FUSRAP cleanup criteria.

Decontamination of these three buildings is expected to generate approximately 17 m<sup>3</sup> (600 ft<sup>3</sup>) of low-activity radioactive waste. This volume of waste can be accommodated in a single shipment to the disposal site. All nonsalvageable or otherwise unusable nonradioactive waste will be disposed along with other University of Chicago waste in a local sanitary landfill.

After the affected areas have been decontaminated, the areas will be restored in a manner consistent with their intended future uses. Technicians and tradespeople employed by the University of Chicago will be used for this purpose to the extent practicable. If necessary, additional specialized workers will be employed to perform selected tasks. All restoration will be subject to concurrence by the university prior to implementation.

It is expected that decontamination will be initiated during the month of December 1983, starting with Eckhart Hall. This facility should be completed by February 1984. Work on the Ryerson Physical Laboratory will begin in February 1984, with completion by April 1984. Jones Chemical Laboratory will be the final building to be decontaminated and is expected to be finished by August 1984.

Following completion of decontamination and restoration, the affected areas of the three buildings will be surveyed to ensure compliance with FUSRAP cleanup criteria. If necessary, additional decontamination and restoration of selected areas will be performed.

A radiological assessment of the underground sewers connected to these three buildings will be performed as a part of this action to ascertain the extent of sewer contamination and associated radiological risks. There are no plans at present to decontaminate any of these underground sewers.

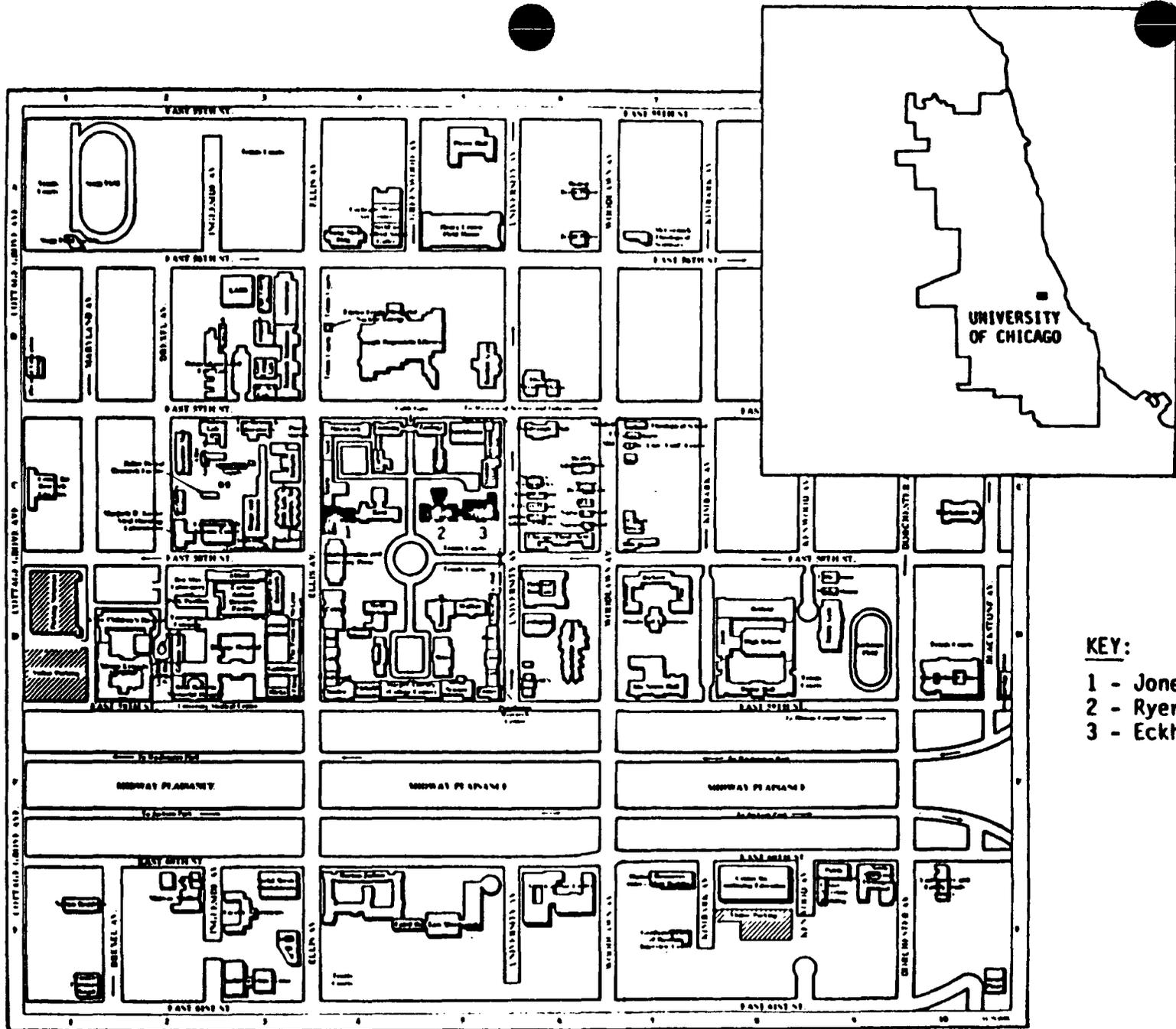
#### Potential Issues

Potential issues associated with the proposed action are the following:

1. Disruption of ongoing research programs and classes at the University of Chicago.
2. Increased radiological risks associated with decontamination and transport of radioactive waste to an approved disposal site.
3. Public concerns about the adequacy of the decontamination criteria and the techniques used to achieve these levels.
4. Radiological risks associated with contaminated sewers that will not be cleaned as part of this action.
5. Possible damage to Room 405 of Jones Chemical Laboratory, which has been designated by the U.S. Department of the Interior as a Registered National Historic Landmark. This room is the laboratory where plutonium was first isolated (August 18, 1942) and weighed (September 10, 1942).

The U.S. Department of Energy believes that none of these potential issues involve significant environmental impacts for the following reasons:

1. In order to avoid or at least minimize disruption of scheduled classes and other ongoing university activities, decontamination and restoration will be conducted on a flexible work schedule utilizing evenings, weekends, and holiday periods to the extent that is necessary. This work schedule will be prepared in consultation with administrative officers of the University of Chicago.
2. Decontamination of the three buildings will be conducted in compliance with DOE guidelines and will utilize standard health-physics practices. All radioactive waste-handling and transportation activities will be in compliance with DOE guidelines and applicable state requirements. The small volume of radioactive waste (17 m<sup>3</sup>) can be transported in one shipment. Compliance with these guidelines will ensure that no workers or members of the general are exposed to unacceptable levels of risk.
3. Recent public awareness of the existing contamination in these three buildings has resulted in a significant amount of local interest, e.g., newspaper articles and local and national television coverage. The local news media and public officials will be informed of the purpose of all intended activities and the results of these activities. The proposed action should tend to lower public concerns because it is a demonstration that DOE and the University of Chicago are taking action to further safeguard public health and safety even though the existing situation presents no immediate hazard. The cleanup criteria will ensure the future safety of the general public since these criteria were developed using conservative assumptions and include an appropriate margin of safety. The decontamination procedures to be utilized are proven techniques that have been shown to be effective in cleaning up radioactively contaminated facilities to the levels required.
4. It is not possible at this time to estimate the radiological risks associated with the contaminated sewers. An assessment of this risk will be performed using data that will be gathered as a part of this action. Future actions will be taken to decontaminate the sewers if the risk assessment indicates that such actions are required.
5. All reasonable efforts will be made during decontamination and restoration to minimize disturbance of university facilities. Extreme care will be taken during work in the vicinity of Room 405 of Jones Chemical Laboratory to ensure that this historical landmark is not damaged or degraded in any manner.



**KEY:**  
1 - Jones  
2 - Ryerson  
3 - Eckhart

Figure 1. Location of Eckhart Hall, Ryerson Physical Laboratory, and Jones Chemical Laboratory at the University of Chicago.

Table 1. Properties at the University of Chicago Listed in the National Register of Historic Places

Property	Notoriety	Date Listed
SITE OPPOSITE THE ENRICO FERMI INSTITUTE, 5630 South Ellis Avenue	Site of the first controlled, self-sustaining nuclear chain reaction. Now marked by Henry Moore's sculpture "Nuclear Energy".	10/15/66
FREDERICK C. ROBIE HOUSE, 5757 South Woodlawn Avenue	House designed by Frank Lloyd Wright, completed in 1909. The archetype for the prairie house design which revolutionized the architecture of the American home.	10/15/66
LORADO TAFT MIDWAY STUDIOS, 6016 South Ingleside Avenue	Constructed in 1929 by Lorado Taft from sections of the first campus studio that was built in 1906. The original brick barn continued to be Taft's private sculpture studio until his death in 1936.	10/15/66
ROOM 405, GEORGE HERBERT JONES CHEMICAL LABORATORY, 5747 South Ellis Avenue	Room where a group of scientists under the direction of Dr. Glenn T. Seaborg first isolated (August 18, 1942) and weighed (September 10, 1942) plutonium.	5/28/67
FRANK R. LILLIE HOUSE, 5801 South Kenwood Avenue	Designed by Irving and Allen Pond; regarded as an architectural landmark.	5/11/76
CHARLES HITCHCOCK HALL, 1009 East 57th Street	Designed by Dwight H. Perkins and constructed in 1902. This building combines the neo-Gothic architecture of nearby buildings with a "prairie" motif.	12/30/74

II-47

7

References

- Illinois Department of Public Health. 1974. Rules and Regulations for Protection Against Radiation. Springfield, IL.
- U.S. Department of Energy. 1980a. A Background Report for the Formerly Utilized Manhattan Engineer District/Atomic Energy Commission Sites Program. DOE/EV-0097. Washington, DC.
- U.S. Department of Energy. 1980b. Description of the Formerly Utilized Sites Remedial Action Program. ORO-777. Oak Ridge Operations, Oak Ridge, TN.
- U.S. Department of Energy. 1982a. Radiological Survey of Ryerson Physical Laboratory, the University of Chicago, Chicago, Illinois, September 11-25, 1976. DOE/EV-0005/23. Prepared by Health Physics Section, Argonne National Laboratory, Argonne, IL.
- U.S. Department of Energy. 1982b. Radiological Survey of Eckhart Hall, the University of Chicago, Chicago, Illinois, September 14, 1976 - March 22, 1977. DOE/EV-0005/24. Prepared by Health Physics Section, Argonne National Laboratory, Argonne, IL.
- U.S. Department of Energy. 1982c. Radiological Survey of the George Herbert Jones Chemical Laboratory, the University of Chicago, Chicago, Illinois, June 13-17, 1977. DOE/EV-0005/26. Prepared by Health Physics Section, Argonne National Laboratory, Argonne, IL.
- U.S. Department of Energy. 1983. Radiological Guidelines for Application to DOE's Formerly Utilized Sites Remedial Action Program. ORO-831. Oak Ridge Operations, Oak Ridge, TN.