DOE/CD-ETEC-029

CERTIFICATION DOCKET

FOR THE RELEASE OF BUILDING 029 AT THE ENERGY TECHNOLOGY ENGINEERING CENTER

APRIL 1997

U.S. DEPARTMENT OF ENERGY
OAKLAND OPERATIONS OFFICE
ENVIRONMENTAL RESTORATION

CERTIFICATION DOCKET

FOR THE RELEASE OF BUILDING 029 AT THE ENERGY TECHNOLOGY ENGINEERING CENTER

APRIL 1997

UNITED STATES DEPARTMENT OF ENERGY
HEADQUARTERS

OFFICE OF ENVIRONMENTAL RESTORATION

NORTHWESTERN AREA PROGRAMS

19901 GERMANTOWN ROAD

GERMANTOWN, MARYLAND 20585

Foreword

The purpose of this docket is to document the successful decontamination and decommissioning of Building 029 at the Energy Technology Engineering Center (ETEC) at the Santa Susana Field Laboratory, Area IV for unrestricted use. Material in this docket consists of documents supporting the DOE certification that conditions at ETEC Building 029 are in compliance with applicable DOE and proposed Environmental Protection Agency and Nuclear Regulatory Commission standards and criteria established to protect human health, safety, and the environment. A notice of certification of the radiological condition of the property was published in the Federal Register on April 8, 1997. A copy of the notice, official correspondence, release criteria, project report, radiological surveys, and an independent verification report are compiled in this docket.

CONTENTS

EXHIBIT I

DOCUMENTS SUPPORTING THE CERTIFICATION FOR THE UNRESTRICTED USE OF BUILDING 029 AT THE ENERGY TECHNOLOGY ENGINEERING CENTER

DOE F 1325.8
(8-89)

United States Government | Department of Energy

memorandum

DATE: January 23, 1997

REPLY TO
ATTN OF: DOE Oakland Operations Office/ER

SUBJECT: Release of Decontaminated Building 029 without Radiological Restrictions at the Energy Technology Engineering Center.

TO: Donald Williams, EM-44

The Oakland Operations Office (OAK) has implemented environmental restoration projects at the Energy Technology Engineering Center (ETEC) as part of the Environmental Restoration Program (ERP) per Headquarters Northwestern Area Program Office direction. The objective of the program is to identify and cleanup or otherwise control facilities where residual radioactive contamination remains from activities carried out under contract to the Atomic Energy Commission and the Energy Research and Development Administration during the early years of the Nation's atomic energy program.

The Energy Technology Engineering Center performed testing of equipment, materials, and components for nuclear and energy related programs. These nuclear energy research and development programs began in 1946 and ended in 1995. Numerous buildings and land areas became radiologically contaminated as a result of facility operations and site activities. One such area that has been designated for cleanup under the ERP is Building T029.

Building T029, the Radiation Measurements Facility (later called the Old Calibration Facility), was a steel frame structure with corrugated metal siding and roofing constructed in 1959. The facility was used for the storage and use of radioactive sources to calibrate radiation detection instruments. All of the sources were fully encapsulated and leaked tested at least every six months. The only known release incident occurred in March 1964 when a radium-226 source was dropped in a below-grade source storage well. The plastic secondary encapsulation cracked and a small amount of radium contaminated the storage well. Results of radiation surveys conducted in 1974 and 1988 on Building T029, not including the storage well, concluded that no radiation levels were above background.

All sources were removed from Building T029 in 1974. The source storage well was removed and adjacent concrete flooring and underlying soil were disposed of.

The Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education (ORISE) has completed independent verification of the Building decontamination project.

Post remedial action surveys have demonstrated, and the DOE Oakland Operations Office hereby certifies, that the subject property is in compliance with DOE decontamination criteria and standards established to protect members of the general public and occupants of the property.

Final project closeout documents have been submitted to your office under separate cover.

DOE/OAK requests approval for release of this property without radiological restrictions to Rockwell International, in accordance with the closeout provisions of the contract, and authorization to remove this facility from the DOE/OAK real property records.

Michael Lopez
ETEC PM
Environmental
Restoration Division

STATEMENT OF CERTIFICATION: Energy Technology Engineering Center, Building 029

The U.S. Department of Energy, Oakland Operations Office, Environmental Restoration Division, has reviewed and analyzed the radiological data obtained following decontamination of the Energy Technology Engineering Center Building 029. Based on this analysis of all data collected, the Department of Energy (DOE) certifies that the following property is in compliance with DOE decontamination criteria and standards. This certification of compliance provides assurance that future use of the property will result in no radiological exposure above applicable guidelines established to protect members of the general public or site occupants. Accordingly, the property specified below is released from DOE's Environmental Restoration Program.

Property owned by Rockwell International Corporation:

Building 029, at the Energy Technology Engineering Center, located in a portion of Tract "A" of Rancho Simi, in the County of Ventura, State of California, as per map recorded in Book 3, Page 7 of Miscellaneous Records of Ventura County.

CERTIFICATION:

Roger Liddle, Director, ERD

1/23/97
Date

DOE F 1325.8
(8-89)
EFG (07-90)

United States Government | Department of Energy

memorandum

DATE: FEB 21 1997

REPLY TO
ATTN OF: EM-44 (D. Williams, 903-8173)

SUBJECT: Draft Certification Docket for Building 029 at the Energy Technology Engineering Center

TO: Assistant General Counsel for Environment, GC-51

I am requesting your review and concurrence of the attached package concerning the cleanup of contamination associated with the former Atomic Energy Commission and Energy Research and Development Administration (AEC/ERDA) activities at Building 029 at the Energy Technology Engineering Center (ETEC) near Chatsworth, California.

The Office of Northwestern Area Programs has implemented a decontamination and decommissioning project at ETEC as part of the Environmental Restoration Program. The objective of the program is to identify and clean up or otherwise control sites where residual radioactive contamination remains from activities carried out under contract to AEC/ERDA during the early years of the Nation's atomic energy program. In September 1989, Building 029 was formally designated by the Department of Energy (DOE) for cleanup.

ETEC Building 029 was constructed in 1959 as a facility for calibration of radiation detection instruments. In 1964, release of radioactivity from a radium-226 sealed source caused localized contamination of the below-grade source storage well. Outside of this inaccessible area, radiation surveys performed in 1974 and 1988 showed that radiation levels in Building 029 corresponded to normal background levels at ETEC. All sources were removed by 1974. Post-decontamination surveys completed in 1993 demonstrated, and DOE's Oakland Operations Office has certified, that the decontamination project resulted in compliance with DOE decontamination criteria and standards established to protect members of the general public and occupants of the building. Further, future use of the property will result in no radiological exposure above applicable radiological guidelines to the general public or the building occupants.

A draft Federal Register Notice has been prepared as part of the docket and will also be transmitted to the Office of Federal Register for approval after we have received your concurrence on the docket.

The final Federal Register Notice and Certification Statement will be compiled in final docket form by the Office of Northwestern Area Programs and will be made available for public review in DOE Reading Rooms and local libraries.

Your review and comments are requested by March 10, 1997. Mr. Don Williams of my staff is the point-of-contact and can be reached at 903-8173.

Sally A. Robison

Sally A. Robison, Ph.D.
Director
Office of Northwestern Area Programs
Environmental Restoration

Attachment

DOE F 1326.8
(8-89)
E.G. (07-90)

United States Government | Department of Energy

memorandum

DATE: MAR 19 1997

REPLY TO ATTN OF: EM-44 (D. Williams, 301-903-8173)

SUBJECT: Recommendation for Certification of Cleanup at Building 029 at the Energy Technology Engineering Center

TO: Acting Deputy Assistant Secretary for Environmental Restoration, EM-40

I am attaching for your signature a Federal Register Notice concerning the cleanup of contamination associated with the former Atomic Energy Commission and Energy Research and Development Administration (AEC/ERDA) activities at Building 029, at the Energy Technology Engineering Center (ETEC), near Chatsworth, California.

The Oakland Operations Office has implemented a decontamination and decommissioning project at ETEC as part of the Environmental Restoration Program. The objective of the program is to identify and clean up or otherwise control sites where residual radioactive contamination remains from activities carried out under contract to AEC/ERDA during the early years of the Nation's atomic energy program. In September 1989, Building 029 was formally designated by the Department of Energy (DOE) for cleanup under Environmental Restoration.

ETEC Building 029 was constructed in 1959 as a facility for calibration of radiation detection instruments. In 1964, release of radioactivity from a radium-226 sealed source caused localized contamination of the below-grade source storage well. All sources were removed by 1974. Outside the inaccessible area, radiation surveys performed in 1974 and 1988 showed that radiation levels in Building 029 corresponded to normal background levels at ETEC. Final radiological and independent verification surveys completed in 1993 demonstrated, and DOE's Oakland Operations Office has certified, that the decontamination project resulted in compliance with DOE decontamination criteria and standards established to protect members of the general public and occupants of the building. Further, future use of the property without radiological restrictions will result in no exposure above applicable radiological guidelines to the general public and occupants of the building.

This office is preparing the certification docket for the subject property and Building 028. The completed docket will be provided to the Oakland Operations Office for their use in preparation of similar dockets for future property releases. The Federal Register Notice will be part of the docket.

I recommend that you sign the attached Federal Register Notice, as well as the transmittal memorandum to the Federal Liaison Officer (Clara Barley, GC-75). The documents transmitted with the certification statement and the Federal Register Notice will be compiled in final docket form by the Office of Northwestern Area Programs and will be made available for public review in DOE Reading Rooms and local libraries.

Sally A. Robison

Sally A. Robison, Ph.D.
Director
Office of Northwestern Area Programs
Environmental Restoration

Attachment

E.G. 107-90)

United States Government Department of Energy

memorandum

DATE: March 28, 1997

REPLY TO ATTN OF: EM-44 (D. Williams, 301-903-8173)

SUBJECT: Federal Register Notice for Certification of Cleanup of Building 029 at the Energy Technology Engineering Center

TO: Clara Barley, GC-75

Attached are the original and three copies of the signed Federal Register Notice certifying the completion of remedial action at Building 029 located at the Energy Technology Engineering Center. This surplus building was decontaminated by the Department's Environmental Restoration Program. The attached Notice has been reviewed by and concurred in by the Office of General Counsel (GC-51), and a copy of that concurrence is also attached for your information and use.

Also attached for your signature is the letter to transmit the disk containing the Federal Register Notice to the Office of the Federal Register.

Please forward the attached Notice to the Federal Register for publication.

James J. Fiore
Acting Deputy Assistant Secretary
for Environmental Restoration

3 Attachments

Department of Energy
Washington, DC 20585

Mr. Raymond A. Mosley
Director, Office of the Federal Register
National Archives and Records Administration
Washington, D.C. 20408

Dear Mr. Mosley:

This letter is to certify that the enclosed disk is a true copy of the Certification of the Radiological Condition of Building 029 at the Energy Technology Engineering Center located near Chatsworth, California. The disk should be used by the Government Printing Office in preparing the document for publication in the Federal Register.

Sincerely,

James J. Fiore
Acting Deputy Assistant Secretary
for Envionmental Restoration

Clara Barley
DOE Federal Register Liaison
Officer

Enclosure

U.S. Department of Energy

DOCKET NO. ETEC-029

Certification of the Radiological Condition of Building 029 at the Energy Technology Engineering Center near Chatsworth, California

AGENCY: U.S. Department of Energy, Office of Environmental Restoration

ACTION: Notice of Certification

SUMMARY: The Department of Energy (DOE) has completed radiological surveys and taken remedial action to decontaminate Building 029 located at the Energy Technology Engineering Center (ETEC) near Chatsworth, California. This property was found to contain radioactive materials from activities carried out for the Atomic Energy Commission and the Energy Research and Development Administration (AEC/ERDA), predecessor agencies to DOE. Although DOE owns the majority of the buildings and equipment, a subsidiary of Rockwell International, Rocketdyne, owned the land. Rocketdyne has recently been sold to Boeing North American Incorporated.

FOR FURTHER INFORMATION CONTACT:

Don Williams, Program Manager
Office of Northwestern Area Programs
Office of Environmental Restoration (EM-44)
U.S. Department of Energy
Washington, D.C. 20585

SUPPLEMENTARY INFORMATION:

DOE has implemented environmental restoration projects at ETEC (Ventura County, Map Book 3, Page 7, Miscellaneous Records) as part of DOE's Environmental Restoration Program. One objective of the program is to identify and clean up or otherwise control facilities where residual radioactive contamination remains from activities carried out under contract to AEC/ERDA during the early years of the Nation's atomic energy program.

ETEC is comprised of a number of facilities and structures located within Administrative Area IV of the Santa Susana Field Laboratory. The work performed for DOE at ETEC consisted primarily of testing of equipment, materials, and components for nuclear and energy related programs. These nuclear energy research and development programs, conducted by Atomics International under contract to AEC/ERDA, began in 1946. Several buildings and land areas became radiologically contaminated as a result of facility operations and site activities. Building 029 is one ETEC area that has been designated for cleanup under the DOE Environmental Restoration Program. Other areas undergoing decontamination will be released as they are completed and are verified to meet established cleanup criteria and standards for release without radiological restrictions as established in DOE Order 5400.5.

Building 029 is located in the north-eastern section of ETEC with access by way of 10th Street, which intersects "G" Street just southwest of Building 064. An asphalt concrete roadway (10th Street) runs directly to the facility.

Constructed in 1959 as an open bay facility, Building 029 is a Butler-type building with a steel frame and corrugated metal siding and roofing. The building is 20 ft. x 40 ft. with a 12-ft. eave height. It is a single room with no office, support laboratory, rest room areas, or installed air conditioners. The ceiling and walls are insulated with a 1-inch thick fiberglass mat. The concrete floors were originally covered with asphalt tile; however, the tile has now been removed.

From 1959 to 1974, Building 029 was used as a facility for calibrating radiation detection instruments. In 1959 and in subsequent years, it was known as the "Radiation Measurements Facility" or the "Old Calibration Facility."

Calibration sources were housed within Building 029. Radium-226, and later cesium-137, sources were housed inside a source storage well made from a 12-inch diameter, 10-ft. long Schedule-20 galvanized pipe casing which was installed below grade. The sources were attached to nylon strings and were guided through three 1-inch diameter Pyrex tube thimbles within Schedule-40

galvanized pipes which were embedded evenly within the casing, with concrete as embedment. The encapsulated cobalt-60 sources were housed separately in a 12-inch diameter pipe which extended 10 ft. below grade and 4 ft. above grade. Above grade, the pipe was enclosed with lead shielding and covered by a 77-inch square concrete rolling door. The neutron sources were housed in a 3 ft. x 3 ft. x 2 ft. deep pit, with a graphite neutron exposure block.

All of the sources were fully encapsulated, leak-tested at least every six months in compliance with State of California Radiation Control Regulations, and subsequently removed from Building 029. Thus, apart from one incident involving the dropping of a radium-226 capsule (described below), there is no known cause for radioactive contamination in the facility.

Radioactivity was released from one of the radium-226 source capsules (Source No. 1) on March 23, 1964, when this source became detached from the nylon string and fell into the bottom of the source thimble. The 13-ft. fall cracked the outer plastic encapsulation surrounding the inner capsule and released some loose radium-226. Release of radioactivity was primarily confined to the well and the source thimble. An April 10, 1964, report describing the incident, the subsequent recovery of the source, and the decontamination of the area outside the well is found in Reference 11, Appendix A, of the Final Decontamination and Radiological Survey report.

Operation of the facility continued by replacing all the radium-226 sources with two cesium-137 sources. On November 20, 1970, the 4.6 curie cesium-137 source was accidently dropped 10 ft. to the bottom of the well. No contamination release occurred. When all sources were removed from Building 029 in 1974, a radiation survey was performed which showed that the facility was free of radiological contamination except for the interior of the radium-226 storage well. In 1988, the radium-226 storage well was excavated along with the radium-226 source holder, and both were disposed of as low-level radioactive waste. This work was performed and paid for by Rockwell/Rocketdyne.

Rockwell/Rocketdyne performed an additional radiological survey in 1990. In 1993, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed an independent verification of the decontamination work performed by Rockwell/Rocketdyne in 1988. Post-decontamination surveys have demonstrated that Building 029 is in compliance with DOE decontamination criteria and standards for release without radiological restrictions. The State of California Department of Health Services has concurred that the proposed release guidelines provide adequate assurance for release without further radiological restrictions. In the event of property transfer, DOE intends to comply with applicable Federal, State, and local requirements.

No appreciable personnel radiation exposure was anticipated or encountered from decontamination activities for Building 029.

Building 029 decommissioning costs were funded by Rockwell International and complete cost records are unavailable.

The certification docket will be available for review between 9:00 a.m. and 4:00 p.m., Monday through Friday (except Federal holidays), in the U.S. DOE Public Reading Room located in Room 1E-190 of the Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C. Copies of the certification docket will also be available at the following locations: DOE Public Document Room, U.S. Department of Energy, Oakland Operations Office, the Federal Building, 1301 Clay Street, Oakland, California; California State University, Northridge, Urban Archives Center, Oviatt Library, Room 4, 18111 Nordhoff, Northridge, California; Simi Valley Library, 2629 Tapo Canyon Road, Simi Valley, California; and the Platt Branch, Los Angeles Public Library, 23600 Victory Boulevard, Woodland Hills, California.

DOE has issued the following statement of certification:

STATEMENT OF CERTIFICATION: Energy Technology Engineering Center, Building 029

The U.S. Department of Energy (DOE), Oakland Operations Office, Environmental Restoration Division, has reviewed and analyzed the radiological data obtained following decontamination of Building 029 at the Energy Technology Engineering Center. Based on analysis of all data collected and the results of independent verification, DOE certifies that the following property is in compliance with DOE radiological decontamination criteria and standards as established in DOE Order 5400.5. This certification of compliance provides assurance that future use of the property will result in no radiological exposure above applicable guidelines established to protect members of the general public or site occupants. Accordingly, the property specified below is released from DOE's Environmental Restoration Program.

Property owned by Boeing North American Incorporated:

Building 029, at the Energy Technology Engineering Center (situated in Area IV of the Santa Susana Field Laboratory), located in a portion of Tract "A" of Rancho Simi, in the County of Ventura, State of California, as per map recorded in Book 3, Page 7 of Miscellaneous Records of Ventura County.

Issued in Washington, D.C., on March 28, 1997.

James J. Fiore
Acting Deputy Assistant Secretary
for Environmental Restoration

DOE F 1325.8
(08-93)

United States Government | Department of Energy

memorandum

DATE: APR 22 1997

REPLY TO ATTN OF: EM-44 (D. Williams, 903-8173)

SUBJECT: Release of Decontaminated Building 029 without Radiological Restrictions at the Energy Technology Engineering Center

TO: R. Liddle, Oakland Operations Office

We have completed our review of all documents related to the remediation, final survey, certification, release limits, and independent verification of Building 029 at the Energy Technology Engineering Center. We have determined that decontamination of this property has been completed in compliance with the established criteria and standards as required by Department of Energy (DOE) guidelines and Orders, is consistent with other appropriate Nuclear Regulatory Commission guidelines, and is protective of public health and the environment. Therefore, approval is granted to release subject property to Boeing North American Incorporated without radiological controls pursuant to DOE Order 5400.5, Chapter IV. This property should be removed from the DOE Real Property Inventory in accordance with
DOE Order 4300.

In accordance with DOE Order 5820.2A, Section V, the data package compiled for this project must be retained permanently in the Oakland Operations Office (OAK) files.

We recommend that a letter be forwarded to Boeing North American Incorporated requiring prior DOE-OAK notification of any activity which could potentially recontaminate the subject property until final release of the remaining ETEC properties has been completed. Please provide us with a copy of the letter, as well as the distribution list, for our files.

Sally A. Robison

Sally A. Robison, Ph.D.
Director
Office of Northwestern Area Programs
Environmental Restoration

corrugated metal siding and roofing. The building is 20 ft. x 40 ft. with a 12-ft. eave height. It is a single room with no office, support laboratory, rest room areas, or installed air conditioners. The ceiling and walls are insulated with a 1-inch thick fiberglass mat. The concrete floors were originally covered with asphalt tile; however, the tile has now been removed.

From 1959 to 1974, Building 029 was used as a facility for calibrating radiation detection instruments. In 1959 and in subsequent years, it was known as the "Radiation Measurements Facility" or the "Old Calibration Facility."

Calibration sources were housed within Building 029. Radium-226, and later cesium-137, sources were housed inside a source storage well made from a 12-inch diameter, 10-ft. long Schedule-20 galvanized pipe casing which was installed below grade. The sources were attached to nylon strings and were guided through three 1-inch diameter Pyrex tube thimbles within Schedule-40 galvanized pipes which were embedded evenly within the casing, with concrete as embedment. The encapsulated cobalt-60 sources were housed separately in a 12-inch diameter pipe which extended 10 ft. below grade and 4 ft. above grade. Above grade, the pipe was enclosed with lead shielding and covered by a 77-inch square concrete rolling door. The neutron sources were housed in a 3 ft. x 3 ft. x 2 ft. deep pit, with a graphite neutron exposure block.

All of the sources were fully encapsulated, leak-tested at least every six months in compliance with State of California Radiation Control Regulations, and subsequently removed from Building 029. Thus, apart from one incident involving the dropping of a radium-226 capsule (described below), there is no known cause for radioactive contamination in the facility.

Radioactivity was released from one of the radium-226 source capsules (Source No. 1) on March 23, 1964, when this source became detached from the nylon string and fell into the bottom of the source thimble. The 13-ft. fall cracked the outer plastic encapsulation surrounding the inner capsule and released some loose radium-226. Release of radioactivity was primarily confined to the well and the source thimble. An April 10, 1964, report describing the incident, the subsequent recovery of the source, and the decontamination of the area outside the well is found in Reference 11, Appendix A, of the Final Decontamination and Radiological Survey report.

Operation of the facility continued by replacing all the radium-226 sources with two cesium-137 sources. On November 20, 1970, the 4.6 curie cesium-137 source was accidently dropped 10 ft. to the bottom of the well. No contamination release occurred. When all sources were removed from Building 029 in 1974, a radiation survey was performed which showed that the facility was free of radiological contamination except for the interior of the radium-226 storage well. In 1988, the radium-226 storage well was excavated along with the radium-226 source holder, and both were disposed of as low-level radioactive waste. This work was performed and paid for by Rockwell/Rocketdyne.

Rockwell/Rocketdyne performed an additional radiological survey in 1990. In 1993, the Environmental Survey and Site Assessment Program of the Oak Ridge Institute for Science and Education performed an independent verification of the decontamination work performed by Rockwell/Rocketdyne in 1988. Post-decontamination surveys have demonstrated that Building 029 is in compliance with DOE decontamination criteria and standards for release without radiological restrictions. The State of California Department of Health Services has concurred that the proposed release guidelines provide adequate assurance for release without further radiological restrictions. In the event of property transfer, DOE intends to comply with applicable Federal, State, and local requirements.

No appreciable personnel radiation exposure was anticipated or encountered from decontamination activities for Building 029.

Building 029 decommissioning costs were funded by Rockwell International and complete cost records are unavailable.

The certification docket will be available for review between 9:00 a.m. and 4:00 p.m., Monday through Friday (except Federal holidays), in the U.S. DOE Public Reading Room located in Room 1E–190 of the Forrestal Building, 1000 Independence Avenue S.W., Washington, D.C. Copies of the certification docket will also be available at the following locations: DOE Public Document Room, U.S. Department of Energy, Oakland Operations Office, the Federal Building, 1301 Clay Street, Oakland, CA; California State University, Northridge, Urban Archives Center, Oviatt Library, Room 4, 18111 Nordhoff, Northridge, CA; Simi Valley Library, 2629 Tapo Canyon Road, Simi Valley, CA; and the Platt Branch, Los Angeles Public Library, 23600 Victory Boulevard, Woodland Hills, CA.

DOE has issued the following statement of certification:

Statement of Certification: Energy Technology Engineering Center, Building 029

The U.S. Department of Energy (DOE), Oakland Operations Office, Environmental Restoration Division, has reviewed and analyzed the radiological data obtained following decontamination of Building 029 at the Energy Technology Engineering Center. Based on analysis of all data collected and the results of independent verification, DOE certifies that the following property is in compliance with DOE radiological decontamination criteria and standards as established in DOE Order 5400.5. This certification of compliance provides assurance that future use of the property will result in no radiological exposure above applicable guidelines established to protect members of the general public or site occupants. Accordingly, the property specified below is released from DOE's Environmental Restoration Program.

Property owned by Boeing North American Incorporated:

Building 029, at the Energy Technology Engineering Center (situated in Area IV of the Santa Susana Field Laboratory), located in a portion of Tract "A" of Rancho Simi, in the County of Ventura, State of California, as per map recorded in Book 3, Page 7 of Miscellaneous Records of Ventura County.

Issued in Washington, D.C., on March 28, 1997.

James J. Fiore,

Acting Deputy Assistant Secretary for Environmental Restoration.

Statement of Certification: Energy Technology Engineering Center, Building 029

The U.S. Department of Energy, Oakland Operations Office, Environmental Restoration Division, has reviewed and analyzed the radiological data obtained following decontamination of the Energy Technology Engineering Center Building 029. Based on this analysis of all data collected, the Department of Energy (DOE) certifies that the following property is in compliance with DOE decontamination criteria and standards. This certification of compliance provides assurance that future use of the property will result in no radiological exposure above applicable guidelines established to protect members of the general public or site occupants.

Accordingly, the property specified below is released from DOE's Environmental Restoration Program.

Property owned by Rockwell International Corporation:

Building 029, at the Energy Technology Engineering Center, located in a portion of Tract "A" of Rancho Simi, in the County of Ventura, State of California, as per map recorded in Book 3, Page 7 of Miscellaneous Records of Ventura County.

Certification:

Dated: January 23, 1997.

Roger Liddle,

Director, ERD.

[FR Doc. 97–8936 Filed 4–7–97; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. RP97–110–001]

Black Marlin Pipeline Company; Notice of Compliance Filing

April 2, 1997.

Take notice that on March 31, 1997, Black Marlin Pipeline Company (Black Marlin) tendered for filing as part of its FERC Gas Tariff, first Revised Volume No. 1, the tariff sheets identified on attachment A to the filing.

Black Marlin states that the instant filing is in compliance with the Commission's order issued March 4, 1997 in Docket No. RP97–110–000 (March 4 Order) and with Order No. 587–B issued January 30, 1997 in Docket No. RM96–1–003.

Black Marlin states that the instant filing is to (i) make effective the changes to the General Terms and Conditions (GTC) of Black Marlin's Tariff which are necessary to implement Gas Industry Standards Board (GISB) standards which were approved on a pro forma basis in the March 4 Order and to comply with certain other changes required by the March 4 Order, (ii) incorporate the GISB data dictionary standards not previously incorporated by Black Marlin, and (iii) incorporate the GISB Electronic Delivery Mechanism (EDM) standards adopted by the Commission in Order No. 587–B, all as required by the March 4 Order.

In addition, in compliance with Order No. 587–B, Black Marlin states that it is filing a complete table showing for each GISB standard adopted by the Commission in Order Nos. 587 and 587–B, the complying tariff sheet.

Any person desiring to protest said filing should file a protest with the Federal Energy Regulatory Commission, 888 First Street, NE, Washington, DC, 20426, in accordance with the Commission's Rules and Regulations and Order No. 587. All such protests should be filed on or before April 21, 1997. Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Copies of this filing are on file with the Commission and are available for public inspection in the Public Reference Room.

Lois D. Cashell,

Secretary.

[FR Doc. 97–8890 Filed 4–7–97; 8:45 am]

BILLING CODE 6717–01–M

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. ER97–1629–000]

Boston Edison Company; Notice of Filing

April 2, 1997.

Take notice that on March 18, 1997, Boston Edison Company tendered for filing a Certificate of Concurrence in the above-referenced docket.

Any person desiring to be heard or to protest said filing should file a motion to intervene or protest with the Federal Energy Regulatory Commission, 888 First Street, NE., Washington, DC 20426, in accordance with Rules 211 and 214 of the Commission's Rules of Practice and Procedure (18 CFR 385.211 and 18 CFR 385.214). All such motions or protests should be filed on or before April 15, 1997. Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a motion to intervene. Copies of this filing are on file with the Commission and are available for public inspection.

Lois D. Cashell,

Secretary.

[FR Doc. 97–8884 Filed 4–7–97; 8:45 am]

BILLING CODE 6717–01–M

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. RP97–302–000]

CNG Transmission Corporation; Notice of Proposed Changes in FERC Gas Tariff

April 2, 1997.

Take notice that on March 31, 1997, CNG Transmission Corporation (CNG), tendered for filing as part of its FERC Gas Tariff, Second Revised Volume No. 1, the following tariff sheets, with an effective date of May 1, 1997:

Twenty-Sixth Revised Sheet No. 32
Twenty-Sixth Revised Sheet No. 33

CNG states that the purpose of this filing is to submit CNG's quarterly revision of the Section 18.2.B. Surcharge, effective for the three-month period commencing May 1, 1997. The charge for the quarter ending April 30, 1997 has been $0.0119 per Dt, as authorized by Commission order dated January 27, 1997 in Docket No. RP97–213. CNG's proposed Section 18.2.B. surcharge for the next quarterly period is $0.0210 per Dt. The revised surcharge is designed to recover $127,460 in Stranded Account No. 858 Costs, which CNG incurred for the period of December, 1996, through February, 1997.

CNG states that copies of this letter of transmittal and enclosures are being mailed to CNG's customers and interested state commissions.

Any person desiring to be heard or to protest this filing should file a motion to intervene or protest with the Federal Energy Regulatory Commission, 888 First Street, N.E., Washington, DC, 20426, in accordance with Sections 385.214 and 385.211 of the Commission's Rules and Regulations. All such motions or protests must be filed in accordance with Section 154.210 of the Commission's Regulations. Protests will be considered by the Commission in determining the appropriate action to be taken, but will not serve to make protestants parties to the proceeding. Any person wishing to become a party must file a motion to intervene. Copies of this filing are on file with the Commission and are available for public inspection in the Public Reference Room.

Lois D. Cashell,

Secretary.

[FR Doc. 97–8892 Filed 4–7–97; 8:45 am]

BILLING CODE 6717–01–M

EXHIBIT II

SITEWIDE RELEASE CRITERIA FOR REMEDIATION OF FACILITIES AT THE SANTA SUSANNA FIELD LABORATORY (INCLUDES ENERGY TECHNOLOGY ENGINEERING CENTER) AND ASSOCIATED DOCUMENTATION

DOE F 1325.8
(8-89)

United States Government **Department of Energy**

memorandum

DATE: 0 9 SEP 1996

REPLY TO
ATTN OF: DOE Oakland Operations Office(ERD)

SUBJECT: Radiological Site Release Criteria for ETEC

TO: Sally Robison, EM-44

I am requesting the approval of the radiation site release criteria for the Energy Technology Engineering Center. The release criteria are a critical component in the DOE process for releasing facilities for unrestricted use. The California Department of Health Services has approved the site release criteria in a letter dated August 9 (see attachment 1).

The proposed limits were developed in the following way:

1) Annual exposure dose. Rocketdyne proposes to use a dose limit of 15 mrem/yr to comply with the 100 mrem plus ALARA as required by DOE 5400.5). This limit is also consistent with the anticipated rules of the NRC and EPA.

2) Ambient exposure rate. The proposed limit of 5μR/hr above natural background complies with the limit of 20μR/hr, plus ALARA, as stated in DOE Order 5400.5. This proposed limit is consistent with NRC limits for Rocketdyne facilities at the Santa Susana Field Laboratory. This limit would be imposed for accessible, or potentially accessible, structures and land.

3) Surface contamination. Surface contamination limits comply with DOE Order 5400.5 and specify the potential contaminants present in the Rocketdyne facilities.

4) Generic Limits for Soil and Water. The generic limits for soil and water were established using the DOE pathway analysis code RESRAD.

09/16/96

The proposed site release criteria are included in "Proposed Sitewide Release Criteria for Remediation of Facilities at the SSFL", Revision A, N001SRR140127.

Your approval is requested by September 16,1996.

Laurence McEwen
Acting Director
Environmental
Restoration Division

Attachments

cc: R. Liddle, ESO
M. Lopez, ERD
D. Williams, EM-443

96-ER-095/

DOE F 1325.8
(08-93)

United States Government **Department of Energy**

memorandum

DATE: SEP 17 1996

REPLY TO ATTN OF: EM-44 (D. Williams, 903-8173)

SUBJECT: Sitewide Limits for Release of Facilities Without Radiological Restriction

TO: R. Liddle, Oakland Operations Office

We have reviewed Rocketdyne's proposed sitewide limits for release of facilities at the Santa Susana Field Laboratory (SSFL) without radiological restriction and are satisfied that our previous concerns and comments have been addressed.

The proposed limits are consistent with the Department of Energy (DOE) Order 5400.5 requirement for a Total Effective Dose Equivalent limit of 100 mrem/yr plus As low As Reasonably Achievable (ALARA) for future occupants, the Nuclear Regulatory Commission proposed a radiological guideline of 15 mrem/yr ALARA, and the Environmental Protection Agency proposed a guideline of 15 mrem/yr for release of properties.

Corrective actions taken by Rocketdyne for the sampling and statistical approach to final survey data validation for DOE projects are now comparable to methodologies or standard practices used at other DOE sites and the requirements of Nuclear Regulatory Commission Nuclear Regulation (NUREG)/CR-5489 (Manual for Conducting Radiological Surveys in Support of License Termination).

We also received a copy of the letter from the California Department of Health Services stating concurrence with the proposed release guidelines and the intent to incorporate these guidelines into Rocketdyne's California Radioactive Material License.

Based upon the above information, the proposed sitewide release criteria for remediation of facilities at the SSFL are hereby approved for use.

If you have any questions, please call Mr. Don Williams of my staff at 301-903-8173.

Sally A. Robison, Ph.D.
Director
Office of Northwestern Area Programs
Environmental Restoration

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

PETE WILSON, Governor

DEPARTMENT OF HEALTH SERVICES
714/744 P STREET
P.O. BOX 942732
SACRAMENTO, CA 94234-7320

(916) 323-2759

96ETEC-DRF-0455

August 9, 1996

Ms. Majelle Lee, Program Manager
Environmental Management
Rocketdyne Division
Rockwell International Corporation
P. O. Box 7930
Canoga Park, CA 91309-7930

Subject: Authorized Sitewide Radiological Guidelines for Release of Unrestricted Use

Dear Ms. Lee:

This letter is to acknowledge the receipt of your letter dated June 28, 1996 requesting concurrence of the above subject. The above mentioned letter and its attachments have been reviewed by the staff of this office. The Radiologic Health Branch (RHB) concurs that the proposed release guidelines provide adequate assurance for the release of the facilities and properties at Rocketdyne's Santa Susana Field Laboratory (SSFL) and DeSoto sites without further radiological restrictions. Your letter dated June 28, 1996 with attachments will be incorporated into Rocketdyne's California Radioactive Material License # 0015-70 upon receipt of a commitment letter signed by Mr. Phil Rutherford.

If you have any questions concerning this matter, please feel free to call Mr. Stephen Hsu of this office at (916) 322-4797.

Sincerely,

Gerard Wong, Ph.D., Chief
Radioactive Material Licensing Section
Radiologic Health Branch

Rockwell International
Rocketdyne Division

SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO. SEE SUMMARY OF CHG	NUMBER
96469	69100	25	26	A	N001SRR140127

PROGRAM TITLE
Radiological Remediation

DOCUMENT TITLE
Proposed Sitewide Release Criteria for Remediation of Facilities at the SSFL

DOCUMENT TYPE
Safety Review Report

KEY NOUNS
Release, Criteria, Guidelines, Soil, Contamination

ORIGINAL ISSUE DATE
3-11-96

REL. DATE
8-22-96 MAC

APPROVALS

	DATE
P. D. Rutherford	3/7/96
M. E. Lee	3/8/96
C. M. Jones	3/11/96

PREPARED BY/DATE

	DEPT	MAIL ADDR
B. M. Oliver 3/7/96	641	T100
R. J. Tuttle	641	T100

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

DISTRIBUTION

*	NAME	MAIL ADDR
*	G. G. Gaylord	AA24
*	P. H. Horton	T038
*	G. Subbaraman	T038
*	S. R. Lafflam	AA24
*	R. A. Marshall	T038
*	R. M. Moore	T038
*	B. M. Oliver (2)	T100
*	R. J. Tuttle	T100
*	F. C. Dahl	T100
*	P. S. Olson	T038
*	P. D. Rutherford	T387
*	M. E. Lee	T038
*	C. M. Jones	FA68
*	Rad. Rem. Library	T100

* COMPLETE DOCUMENT
NO ASTERISK, TITLE PAGE/SUMMARY OF CHANGE PAGE ONLY

ABSTRACT

At several locations at the Santa Susana Field Laboratory (SSFL), low levels of radioactive contamination in buildings and in soil have occurred and have been or will be cleaned up for eventual release for use without radiological restrictions. For this purpose, a complete set of proposed guideline values for approval by DOE for DOE facilities at the SSFL has been developed, and are presented in this report. The various categories of release guidelines include; 1) annual expected dose, 2) soil and water concentration guidelines, 3) surface contamination guidelines, and 4) ambient gamma exposure rate. The proposed guidelines were obtained from regulatory values where available. Where not available, for example for soil, guidelines were calculated by use of the DOE computer code, RESRAD. For these calculations, the proposed annual dose is 15 mrem/year, which is consistent with proposed EPA and NRC guidelines and ALARA principles. The radionuclide guidelines presented in this report are applicable to DOE-optioned facilities and land and other radiological areas.

RESERVED FOR PROPRIETARY/LEGAL NOTICES

RECEIVED 3SEP96

12-84

Rockwell

No. N001SRR140127
Page 1.1

REV	SUMMARY OF CHANGE	APPROVALS AND DATE
A	Section 2: Section reworded to include a reference to ALARA. Dose limit changed to 15 mrem/yr, with new justification. Reference to EPA ALARA analysis included. All references to "without consideration of costs" have been removed. Section 3.2: Reference to topography of region included as additional justification for exclusion of the family farm scenario. Section 3.3 - Shielding Parameter: Shielding calculations revised to reflect a two story residential structure (of the same total floor area), and an effective dose point location midway from the center to the edge of the structure for each story. Residential occupancy realistically apportioned between the first and second stories. Sections 3.4 and 3.5: DOE values for Radium and Thorium are specified instead of the more restrictive RESRAD values. Tables 3 and 4 values have been updated to reflect the new shielding calculations and the 15 mrem/y annual dose limit. Section 6.0: First paragraph revised and combined with second paragraph. Sections 6.1, 6.2, and 6.3: Words added to explain the sampling procedure. Specifically, that sample locations are biased towards areas of known higher readings, or areas of potential contamination. Appendix A: Updated.	B. M. Oliver 8/13/96 R. J. Tuttle 8/14/96 P. D. Rutherford 8/14/96 M. E. Lee 8/14/96 C. M. Jones 8/14/96 MAG Rel: 8-22-96

TABLE OF CONTENTS

LIST OF TABLES

1. INTRODUCTION

At several locations at the Santa Susana Field Laboratory (SSFL), low levels of radiological contamination in buildings and in soil have occurred and have been or will be cleaned up for eventual release for use without radiological restrictions. The DOE requirements for allowable residual radioactivity in sites suitable for release without radiological restrictions ("unrestricted release") are established in DOE Order 5400.5 (Ref. 1). Specific guidelines are given in 5400.5 for surface contamination and for direct gamma exposure. However, except for radium and thorium in soil, no specific guidelines are provided for residual contamination in soil or water. It has become clear that a set of DOE-authorized limits for the SSFL would greatly facilitate the process of determining that a facility is acceptably clean, and verifying this with a confirmatory survey. Approval of such a set of authorized limits is provided for in DOE Order 5400.5, Chapter IV, Section 5, and in draft 10 CFR 834.301(c).

The purpose of this report is to develop a set of proposed guideline values for approval by DOE for the release without radiological restriction of DOE facilities at the SSFL. The various categories of release guidelines include; 1) annual expected dose, 2) soil and water concentration guidelines, 3) surface contamination guidelines, and 4) ambient gamma exposure rate. The guidelines presented in this report are for residual radioactivity above background. When feasible, the local background activity of the suspect radionuclides should be determined and these background values subtracted from the measured release survey data.

The goal for these limits is to provide assurance that reasonable future uses of the property will not result in individual doses exceeding 15 millirem per year. This is consistent with current EPA and NRC guidance, and is supported by a generic cost-benefit analysis presented in Reference 2.

2. ANNUAL DOSE LIMITATION

DOE Order 5400.5 specifies a base Total Effective Dose Equivalent (TEDE) limit of 100 millirem per year for any potential future occupant of a remediated site. The Order also requires the use of the As Low As Reasonably Achievable (ALARA) principle to establish Authorized Limits at a level that is below the base limit. Rocketdyne is proposing to apply a value of 15 millirem per year for the calculation of derived limits for the cleanup of DOE sites at the SSFL, consistent with EPA and NRC guidance. A limit of 15 millirem per year (mrem/year) is adopted to assure that future uses will contribute small doses compared to natural background doses, which are in the range of 250-400 mrem/year (Ref. 3). This limit is considered to be as low as reasonably achievable below the basic DOE dose limit of 100 mrem/year. The 15 mrem/year value corresponds to a calculated increased lifetime cancer risk to a potential future user of the site of 3×10^{-4}.

For any reasonable assigned cost per person-rem, further reduction of anticipated dose due to exposure to residual radioactivity at the site is difficult to justify. For example, the EPA proposed TEDE of 15 mrem/year was arrived at after extensive ALARA analysis of cleanup costs and benefits at sixteen "Reference Sites" representing a wide range of conditions found at contaminated sites throughout the United States. Their analyses assumed a residential use of the decontaminated sites, and their conclusions were that the 15 mrem/year limit represented the most effective value considering all the technical and socio-political issues involved.

Furthermore, at the SSFL, conservative choices in the development, measurement, and interpretation of limits and final surveys provide a firm bias towards overestimation of the remaining risk. These include, 1) a conservative residential scenario for the pathway analyses, 2) use of calibration sources that tend to underestimate the detector efficiency for the likely contaminants, and 3) both qualitative and quantitative tests that provide assurance that the decommissioned facility is suitable for release without radiological restrictions.

3. SOIL AND WATER GUIDELINES

Since there are no federal or state regulatory limits for soil contamination for many of the potential or actual radionuclides of concern at SSFL, site-specific guidelines must be developed. This development is done, as required by the DOE Order, by use of a "pathways" analysis program, which estimates the radiological dose (total effective dose equivalent) that a future user of the property might receive, considering the residual radioactivity and various conditions of use. An effort is made to make these use conditions as reasonable for the use and the local area as can be achieved, without greatly over-estimating or under-estimating potential doses.

To establish these guidelines for cleanup operations at SSFL, the pathways analysis program RESRAD (Ref. 4), developed at Argonne National Laboratory (ANL) for use by DOE, has been used to calculate single radionuclide guidelines for the radionuclides of potential concern at SSFL.

For soil, a dose limit of 15 millirem per year is used. For consideration of radiological contamination in water, which may be collected from wells, sumps, below-grade seepage, or surface water, concentration guidelines were calculated from the Dose Conversion Factors (DCFs) in RESRAD, using the EPA limit of 4 millirem per year for ingested drinking water (Ref. 5), and the EPA assumed intake of water, 2 liters per day. These limits are more restrictive than those imposed on releases from operating facilities, as provided by DOE Order 5400.5 (Ref. 1), NRC (Ref. 6), the State of California (Ref. 7), and EPA for uranium mines and mills (Ref. 8).

3.1 Pathway Analysis

Pathways analysis involves calculating the doses received by a person through several pathways: direct radiation exposure; inhalation of airborne radioactivity; drinking water containing radioactivity; eating foods that have accumulated radioactivity, through uptake of water with radioactivity from the soil, or with airborne radioactivity deposited on the foliage; and ingestion of small amounts of contaminated soil.

The pathways analysis program RESRAD, now in Version 5.61, was developed in the late 1980's for DOE by Argonne National Laboratory for the purpose of performing pathways analysis for a broad range of applications. Considerable flexibility is provided in the program for representing the site-specific conditions of exposure, to permit making the calculation as reasonable for the application as is possible.

Four general types of use may be considered for land for the purpose of calculating dose, other than the obvious zero-dose case of non-use. These may be identified as the industrial scenario, the wilderness scenario (or recreational, such as a park or golf course), the residential scenario, and the family farm scenario. Within these general use scenarios, choices are made for occupancy time (indoors and outdoors), water use, and food sources. Further choices are made to represent the contamination situation, geology, and hydrology. The program comes with a

complete set of generally conservative default values, and these may be changed as appropriate to reflect local reality in terms of usage practices and physical conditions, to produce a realistic pathways analysis for the specific site. The default values and the values actually used by the program in the analysis are listed in the output for each calculation, so departures from the default set are well recorded. The printed results from the calculations described in this report are stored in the Environmental Remediation (ER) library file.

The family farm, on which family members spend 100% of their time, drinking water from the surface or from wells, eating vegetables and fruit grown on the land and irrigated with the same water, raising their meat, milk, and fish on that land, is not a reasonable scenario for the site. Although commercial farming is practiced in low-lying valley and coastal areas west of the facility, the rugged nature and topography of the SSFL, combined with poor soil quality, would reasonably preclude a family farm activity on the site. Further, recent land use trends in the area have been to conversion of previous farming property to other non-farming uses. Thus, the industrial, wilderness, and residential scenarios are all perhaps equally probable for the future of the site, and should be the scenarios considered.

3.2 Property Usage Scenarios

The basic usage conditions (per year) modeled in these calculations, for each of the three realistic scenarios, are summarized in Table 1. A complete listing of all RESRAD input data, for the three scenarios, is given in Appendix A. Discussion on specific RESRAD input parameters is given below in Section 3.3

Table 1. Property Usage Conditions for Three Realistic Scenarios

	Industrial	Wilderness	Residential
Occupancy, indoors (hours/year)	1752	0	4380
Occupancy, outdoors (hours/year)	350	876	2190
Occupancy, off site (hours/year)	6664	7890	2190
Drinking water (liters/year)	0	0	510
Fruit, vegetables, grain (kg/year)	1.6	1.6	16
Leafy vegetables (kg/year)	0	0	1.4
Cover thickness (meters)	0	0	0
Contamination area (m^2)	10000	10000	10000
Contamination thickness (meters)	1	1	1
Depth to water table (meters)	5	5	5

3.3 RESRAD Input Parameters

Default values provided in RESRAD are considered to be conservative estimates intended for use when no site-specific information is available. Users of the program are encouraged, however, to use input data that most closely reflects actual conditions existing on their site. As

part of several earlier efforts at the SSFL, a number of screening evaluations were performed using the RESRAD code to determine which of the approximately 80 input parameters required by RESRAD were of significance to the general SSFL area. These screening evaluations also were useful in determining conservative site-specific values for input to the code, when the default values were not used. In general, changes to most of the parameters were found to have a negligible effect on the final results because certain dose pathways were either not applicable or negligible for the given scenarios.

Contaminated Zone Parameters: Default values for the area of contamination (10,000 m^2) and the length parallel to aquifer flow (100 m) were assumed. For the depth of contamination, a conservative value of 1 meter is assumed. Measurements conducted at the site have indicated historical maximum values ranging from about 0.4 to 0.6 m for this parameter.

Occupancy Parameters: The default RESRAD values for occupancy of a residence on an affected site are 50% of the time spent indoors and 25% of the time spent outdoors, on the site. Thus, 25% of the time the occupancy is assumed to be off site. For the residential scenario, assuming 8,760 hours in a year, this translates into 4,380 hours spent indoors, 2,190 hours spent outdoors on the site, and 2,190 hours spent off site. For the industrial scenario, the corresponding percentages are assumed to be 20%, 4%, and 76% respectively. For the wilderness scenario, the corresponding percentages are 0%, 10%, and 90%.

Shielding Factors: The annual dose estimates calculated by RESRAD from either direct exposure or by inhalation (dust) are functions of two "structural" shielding parameters and the fraction of time an individual is assumed to spend inside a structure built on the site. Both shielding factors range from 0 to 1, and may be changed by the user to more appropriately match actual site conditions. For inhalation, the RESRAD default is 0.4, and this value is assumed for the present evaluations. For direct gamma exposure, the RESRAD default is 0.7, which is a rather conservative estimate of gamma shielding by a structure. For the present calculations, this latter value was adjusted from the default, for both the industrial and residential scenarios, to account for local construction practice which dictate a minimum 4-inch (0.1 m) concrete slab under the structure.

The gamma shielding factor used as input to RESRAD was calculated by modeling a typical two-story residential structure, and a single story industrial structure using the computer code MicroShield[1]. MicroShield is a point-kernel gamma shielding code developed for IBM-compatible personal computers, based on the mainframe code ISOSHLD. For the residential structure, a conservative lower bound footprint (area) value of 93 m^2 (1,000 ft^2) was assumed. For the industrial structure, a 186 m^2 (2,000 ft^2) area was assumed. A circular area was used with MicroShield to obtain maximum code accuracy with minimum computational time.

---

[1] MicroShield, Version 4.0, Grove Engineering, Inc., 15215 Shady Grove Road, Suite 200, Rockville, MD 20850.

Screening calculations indicated no significant differences between the results for circular and square areas of the same volume.

In all cases the contaminated soil was assumed to have a density of 1.5 g/cm^2, and a thickness of 1 meter. Dose calculations were performed for two vertical distances (1m for the ground floor and 3.6 m for the second story) and for three radial distances (center, midpoint, and edge of structure). The isotopic mix input to MicroShield was the same as that used for the present RESRAD calculations, with a concentration of 1 pCi/g for each isotope. Resulting gamma energy groups for this isotope mix ranged from 0.1 to 1.5 MeV. A factor of 0.89 was used to account for gamma shielding from a typical structural wall composed of approximately 1 inch of stucco and 5/8 inch of drywall, and a window area of approximately 10% of the wall area.

Effective gamma shielding factors obtained from the MicroShield calculations are given in Appendix A. For the residential scenario (the most credible), it is assumed that 12 hours are spent inside the structure per day. If it is further assumed that 8 of these hours are spent upstairs in a bedroom, 4 hours are spent downstairs in a family room, and that a person (on average) is located at the midpoint between the center and the edge of the structure, then the effective gamma shielding factor would be: (0.67)(0.61) + (0.33)(0.31) = 0.51. For the industrial scenario, the value is 0.25, which is the shielding value at the midpoint location for the single story structure.

Table 2. Gamma Shielding Factor Calculations for Typical SSFL Structure

Radial Location	Gamma Shielding Factor	
	1st Floor	2nd Floor
Residential Structure (93 m^2 footprint, two story)		
Center	0.27	0.57
Midpoint[a]	0.31	0.61
Perimeter[b]	0.57	0.71
Industrial Structure (186 m^2 footprint, single story)		
Center	0.22	-
Midpoint[a]	0.25	-
Perimeter[b]	0.58	-

[a]Midpoint between the center and the perimeter of the structure
[b]Edge of the structure.

It should be noted, that these values do not take into account any out-structures such as garages and patios, both of which would result in additional gamma shielding, and both of which would almost certainly be part of any residences built on the site.

Dietary Parameters: Default RESRAD input values for food and water consumption are based on the family farm scenario, where a significant portion of the diet is grown or raised on the site. For the three credible scenarios considered here, these parameters were adjusted as follows: for the residential scenario, it is conservatively assumed that a small fraction (10% of that grown on a family farm) of the fruit and leafy vegetables consumption would be from material grown on site. The values used are 16 kg/year per person and 1.4 kg/year per person, respectively. It was further assumed that water for the residence would be obtained from a well on the site (510 liters/year per person).

For the industrial and wilderness scenarios, it was assumed that no water would be used that was taken from the site; thus, all water pathways were suppressed with the exception of a secondary pathway via plant ingestion. In the industrial case, bottled drinking water is supplied. Since essentially all surface water at present is a result of the current industrial operations, no surface water would be available in the wilderness scenario. It is also assumed that perhaps 1% of the family farm fruit consumption value might be collected from wild sources, thus, 0.14 kg/year is used for these scenarios.

Contaminated Zone Hydrology Data: The SSFL facility is located in the Simi Hills in eastern Ventura County, California. The Simi Hills are in the northern part of the Transverse Range geomorphic province, and are composed primarily of exposures of the Upper Cretaceous Chatsworth Formation. This formation is a marine turbidite sequence of sandstone with interbedded siltstone/mudstone and minor conglomeratic lenses. The Chatsworth Formation is at least 1,800 m thick in locations east and north of the Facility.

The principal geologic units at the SSFL are the Chatsworth Formation and the shallow alluvium which overlies the Chatsworth Formation in some parts of the Facility, notably in Area IV of the SSFL where the decommissioning and decontamination of nuclear sites is taking place. This layer is Quaternary alluvium consisting of mixtures of unconsolidated sand, silt, and clay, and would include the contaminated zone. Drill holes indicate that the layer may be as thick as 6 meters in some locations.

The density of this alluvium layer is approximately 1.5 g/cm^3. The total and effective porosity of the contaminated zone are assumed to be 0.43 and 0.20 based on the average of data for sand, silt, and clay as given in the RESRAD manual. Precipitation at the facility is measured annually by a rain gauge located in the northeastern portion of the SSFL (Ventura County Rain Gauge Number 249). Based on measured data since 1959, the mean annual precipitation at the SSFL is approximately 18.6 inch, or 0.47 meters. In general, the majority of the precipitation occurs during the months of January through March.

Saturated Zone Hydrology Data: There are two groundwater systems at the SSFL: 1) a shallow system in the surficial alluvium and the underlying zones of weathered sandstone and siltstone/claystone, and isolated shallow fracture systems; and 2) a deeper regional system in the fractured Chatsworth Formation. The shallow zone is discontinuous, with depths to groundwater ranging from land surface to over 9 m. For the present study, we assume that this shallow region most conservatively represents the saturated zone, with an average depth to the water table of about 5 m. Hydraulic conductivity in the saturated zone generally ranges from about 30 to 3,000 m/year. Here, the higher value has been assumed.

Typical pumping rates for deep wells in the Chatsworth Formation (rock) range from 60 to 70 m^3/year up to a maximum of about 300 m^3/year. For the shallow (alluvium) region, however, pumping rates are significantly lower, typically about 35 m^3/year. Further, in the shallow region, many wells would be dry for a good fraction of the year as the replenishment rate is generally low. Water table drop rates, therefore, would range up to 10 m as a result of on-site pumping. Without pumping, however, no data is available on any inherent lowering of the water table. For conservatism, therefore, the default value of 0.001 m/year has been assumed.

Radon Pathway: Two default values were modified for the radon pathway. The thickness of the foundation was set at 0.1 m (4 inches) to correspond to the gamma shielding calculations discussed above. Also, the depth below ground surface was also set at 0.1 m, as basement structures are not typical for the local area.

3.4 Calculated Soil and Water Guidelines from RESRAD

The guidelines calculated from the RESRAD code for various single radionuclides are listed in Table 3 for comparison of the three scenarios. Values for each of the scenarios were determined from separate RESRAD calculation runs using the input parameters given in Appendix A. Water guideline values in Table 3 were calculated from the dose conversion factors used in RESRAD for ingestion, using an EPA value of 2 liters/day total water consumption (per person) from the site, and an EPA dose limit of 4 mrem/year (Ref. 5).

For radionuclides specifically regulated by the EPA (and the State of California), the Safe Drinking Water Act (and CCR Title 22) limits were used. These are (in pCi/l):

H-3	20,000
Combined Ra-226 and Ra-228	5
Sr-90	8
Gross alpha (not including radon and uranium)	15
Gross beta	50
Uranium (U-234 + U-235 + U-238)	20

For U-234, U-235, and U-238, DOE imposes the EPA regulations in 40 CFR 192 (and parts 190 and 440). Similarly, for Ra-226, Th-228 and Th-232, DOE imposes the limits in DOE Order 5400.5.

3.5 Proposed Soil and Water Guidelines

Based on the data in Table 3, proposed conservative guidelines, consistent with the several applicable regulations governing residual radioactivity discussed above, are listed in Table 4. With the exception of uranium, radium, and thorium, the proposed soil guidelines are those calculated from RESRAD for the residential use scenario. For uranium, proposed guidelines are those adopted by the NRC (30, 30, and 35 pCi/g for U-234, U-235, and U-238, respectively, see

Table 3. RESRAD-Calculated Single Isotope Guidelines Values

	Soil Guidelines (pCi/g)			
Radionuclide	**Industrial**	**Wilderness**	**Residential**	**Water (pCi/l)[a]**
Am-241	120	162	5.44	1.50
Co-60	10.9	9.83	1.94	204
Cs-134	18.7	16.9	3.33	74.7
Cs-137	51.9	46.7	9.20	110
Eu-152	25.3	22.8	4.51	845
Eu-154	23.0	20.7	4.11	573
Fe-55	2,370,000	4,780,000	629,000	9,020
H-3	129,000	129,000	31,900	85,600[b]
K-40	162	147	27.6	294
Mn-54	34.4	30.9	6.11	1,980
Na-22	13.0	11.7	2.31	476
Ni-59	1,390,000	1,560,000	151,000	26,100
Ni-63	511,000	572,000	55,300	9,490
Pu-238	140	192	37.2	1.71
Pu-239	127	175	33.9	1.55
Pu-240	127	175	33.9	1.55
Pu-241	4,740	6,430	230	79.9
Pu-242	133	183	35.5	1.63
Ra-226	0.520	13.6	0.199	4.12[b]
Sr-90	370	376	36.0	35.8[b]
Th-228	14.8	14.7	2.81	6.78
Th-232	7.94	7.98	1.53	2.01
U-234	519	647	106	19.3[b]
U-235	163	160	32.1	20.5[b]
U-238	399	445	90.9	20.4[b]

[a]Water guidelines calculated from RESRAD ingestion dose conversion factors, assuming the EPA dose limit of 4 mrem/year (see text).

[b]For these radionuclides, the EPA Safe Drinking Water Act or the State of California CCR Title 22 limits should be used (see Table 4).

Table 4. Proposed Soil and Water Guidelines for SSFL Facilities

Radionuclide	Soil Guidelines (pCi/g)	Water (pCi/l)
Am-241	5.44	1.5
Co-60	1.94	200
Cs-134	3.33	75
Cs-137	9.20	110
Eu-152	4.51	840
Eu-154	4.11	570
Fe-55	629,000	9,000
H-3	31,900	20,000[a]
K-40	27.6	290
Mn-54	6.11	2,000
Na-22	2.31	480
Ni-59	151,000	26,000
Ni-63	55,300	9,500
Pu-238	37.2	1.7
Pu-239	33.9	1.6
Pu-240	33.9	1.6
Pu-241	230	80
Pu-242	35.5	1.6
Ra-226	5[c] and 15[c]	4.1
Sr-90	36.0	8[a]
Th-228	5[c] and 15[c]	6.8
Th-232	5[c] and 15[c]	2.0
U-234	30[b]	
U-235	30[b]	total uranium 20[a]
U-238	35[b]	
Gross alpha (not including radon and uranium)		15[a]
Gross beta		50[a]

[a]State of California Maximum Contaminant Levels, CCR Title 22
[b]Generally more conservative NRC limits for uranium isotopes are proposed.
[c]DOE Order 5400.5 limits are proposed (5 pCi/g averaged over first 15 cm of soil depth and 15 pCi/g averaged over 15 cm layers below the top 15 cm).

Ref. 9). For radium and thorium, DOE Order 5400.5 limits are proposed (5 pCi/g averaged over first 15 cm of soil depth and 15 pCi/g averaged over 15 cm layers below the top 15 cm, see Ref. 1). Guidelines established from the residential use scenario are the most restrictive of the three scenarios considered.

The choice of a basic dose limit of 15 mrem/year for all pathways combined leads to lower limits than would result from the use of the dose limits established by the EPA for the uranium fuel cycle (Ref. 10) and by DOE for unrestricted release of contaminated property (Ref. 1). The water guidelines are those calculated from the RESRAD dose conversion factors, using the EPA values for the basic dose limit and daily water intake, with the Maximum Contaminant Levels (MCL) specified for certain radionuclides by the State of California (Ref. 11).

4. SURFACE CONTAMINATION GUIDELINES

Surface contamination limits are specified in Figure IV-1 of Chapter IV in DOE Order 5400.5. For SSFL facilities, these limits have been modified by specifying the potential contaminants present in the Rockwell facilities, and eliminating those that are not pertinent. The proposed guidelines are given in Table 5. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

Table 5. Proposed Surface Contamination Guidelines for SSFL Facilities

Radionuclide	Average over 1 m^2 (dpm/100 cm^2)	Maximum in 100 cm^2 (dpm/100 cm^2)	Removable (dpm/100 cm^2)
Plutonium, Radium	100	300	20
Thorium	1,000	3,000	200
Uranium	5,000	15,000	1,000
Mixed fission products	5,000	15,000	1,000
Activation products	5,000	15,000	1,000
Tritium	-	-	10,000

As included in Table 5, Pu, Ra, U, Th, mixed fission products, and activation products, refer to those forms of radioactive material that comprise the residual activity at the SSFL. Plutonium is predominately Pu-239; Radium is Ra-226. It is assumed that thorium is sufficiently aged that all daughters are in equilibrium, Th-natural. Uranium will occur in depleted, normal, or enriched forms; U-233 is not present. Mixed fission products include Sr-90 and Cs-137 as components of the mixture. Possible activation products include Co-60, Fe-55, Mn-54, Eu-152, Eu-154, Al-26, and similar radionuclides.

Tritium contamination limits are based on interim guidelines for removable surface contamination (Ref. 12). This level of removable contamination insures that any non-removable or volumetric contamination will not cause unacceptable exposures.

These guidelines would be imposed for accessible (or potentially accessible) surfaces and structures.

5. AMBIENT GAMMA EXPOSURE RATE

A guideline of 5 μR/hr above natural background, measured at 1 meter above the surface, is proposed. This value has been imposed by the NRC for decommissioning research reactors (Ref. 13). It is as low as reasonably measurable, due to variations in background, and is significantly lower than the guideline of 20 μR/hr stated in DOE Order 5400.5, Chapter IV, Section 4.c. This guideline would be imposed for accessible (or potentially accessible) structures and land. Our experience has been that this level can be achieved and verified in facilities that would be suitable for continued use.

6. APPLICATION OF GUIDELINES

The guidelines presented above should be used in planning any decontamination effort at the SSFL. Analytical capability for detection of each radionuclide should be, if possible, less than one-tenth of the guideline values. That is, the Minimum Detectable Activity (MDA, our LLD) should be less than 0.1 x guideline. Field measurements used to direct removal of contaminated soil should be capable of practical measurements below the guideline value. Survey measurements and sample analyses should be corrected for the local background activity of each radionuclide.

6.1 Soil Guidelines

Sample analysis is necessary to demonstrate the successful decontamination of soil areas. A qualitative scan will be performed using gamma-sensitive and/or beta-sensitive detectors to identify any significant areas of residual contamination. Soil samples will be taken from locations based on a 3x3 meter master grid. One sample will be taken from within a 1x1 meter grid location in each 3x3-meter section, based either on the qualitative scan survey indications at the area of maximum readings or, if no noticeable readings were found, at the location most likely to have residual contamination, by the surveyor's judgment. This selection assures a reasonably uniform sampling of the ground areas, at a sample density of approximately 11 samples per 100 m^2.

Results from individual samples will be compared with the limit for hotspots of 9-m^2 area, that is, 3.3 x the adopted concentration limit. Averages of adjacent samples, covering 100 m^2, will be compared with the average limit. The overall average, assuming that the individual and 100-m^2 area averages satisfy the applicable limits, will be used for a RESRAD confirmatory calculation. This calculation will be performed to demonstrate that the maximum expected annual dose for the indicated reasonable use scenario for the facility *does not exceed* the proposed 15 mrem/year guideline value.

For mixtures of radionuclides in soil, the "Sum of Fractions" rule is used. The sum of the ratios of concentration of each radionuclide to the corresponding guideline must not exceed 1. This value must be satisfied when samples are averaged over each 100-m^2 region. For cases in which the relative concentrations are known or assumed, this method is used to generate combined radionuclide guidelines for each radionuclide in the mixture.

The guidelines are not intended to be spot limits, and should not be applied to individual measurements. If the specific sampling provides only (or fewer than) one measurement per 100-m^2 area, each measurement becomes, by default, the "average" for that 100-m^2 area, and the guidelines have the effect of acting as spot limits. In cases where an individual sample exceeds the guideline value, additional samples should be taken from within the same 100-m^2 area, and used to define the average contamination in this area.

The maximum concentrations remaining as "hot spots" must have contamination less than that calculated by the hot-spot rule presented in DOE Order 5400.5, Chapter IV, page 4. The average contamination within any area not exceeding 25 m^2 shall not be greater than $\sqrt{100/A}$ guideline, where A is the area in m^2. Reasonable efforts shall be made to remove any soil with contamination that exceeds 30 x guideline (Ref. 4).

6.2 Surface Contamination Guidelines

The proposed surface contamination guidelines would be applied to all accessible surfaces and structures. This would include ceilings, floors, and walls, and other potentially accessible locations such as attics. Where surface contamination by both alpha- and beta-gamma-emitting radionuclides exists, the guidelines established for alpha- and beta-gamma-emitting radionuclides should apply independently. Measurements of average contamination are averaged over an area of 1 m^2. For objects of less surface area, the average should be derived for each such object. The maximum contamination level applies to an area of not more than 100 cm^2. Surfaces of facilities which are likely to be contaminated, but are inaccessible for purposes of measurement, shall be presumed to be contaminated in excess of the applicable limits.

Following a complete qualitative scan of the facility, quantitative surface contamination measurements will be made over a fraction of the structural surfaces, as determined by the designation of the area as affected or unaffected. Affected areas will be surveyed at a nominal fraction of 11%. Unaffected areas will be surveyed at lesser fractions. Locations for the quantitative survey measurements will be based on a 3x3 meter master grid. One sample will be taken from within a 1x1 meter grid location in each 3x3-meter section, based either on the qualitative scan survey indications at the area of maximum readings or, if no noticeable readings were found, at the location most likely to have residual contamination, by the surveyor's judgment. Results from individual locations will be compared with the applicable limits.

Total surface contamination is measured by use of detectors primarily or exclusively sensitive to alpha or beta-gamma radiation. After a qualitative survey of the surfaces of the entire subject area, quantitative measurements are made on 1-m^2 areas selected uniformly throughout the area. These measurements are made with the detectors connected to a scaler set to accumulate counts for a 5-minute period. The detector is slowly scanned over the 1-m^2 grid location and the numerical result, after correction for background, count time, and detector efficiency, yields the 1-m^2 average surface activity. These detectors are calibrated against Th-230 for alpha activity and Tc-99 for beta activity. The emission energies of these radionuclides is generally less than those radionuclides found as contamination at SSFL. This results in an underestimate of the efficiency of the detectors for the actual contaminant radioactivity and hence an overestimate of the actual measurement.

The amount of removable activity per 100 cm^2 of surface area is determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and

measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. Typically at Rocketdyne, a low background gas flow proportional counter is used. When removable contamination on objects of surface area less than 100 cm^2 is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the guidelines for removable contamination.

Smear methods for tritium detection are similar to that described above, with the exception that a wet swipe or piece of Styrofoam should be used. If the property has been recently decontaminated, a follow-up measurement (smears) should be conducted to ensure that there is no build-up of contamination with time.

6.3 Ambient Gamma Exposure

Measurements of the ambient gamma exposure rate provides a useful determination of residual volumetric radioactivity that may not be as easily detected by surface measurements or sampling and analysis. For the purpose of demonstrating suitability for release, this measurement provides an additional test.

The DOE established a limit of 20 μR/hr above natural background for screening radium-contaminated property. The NRC has imposed a 10μR/hr limit on the decommissioning of radioactive materials licensees, and a 5μR/hr limit on the decommissioning of research reactors. The 5 μR/hr limit above natural background is proposed for use at Rocketdyne. Because of the variability and differences in natural background, the limit of 5 μR/hr is about as low as can be reasonably implemented.

Quantitative measurements of the ambient gamma exposure rate will be made over a fraction of the structural surfaces, as determined by the designation of the area as affected or unaffected. Affected areas will be surveyed at a nominal fraction of 11%. Unaffected areas will be surveyed at lesser fractions. Locations for the quantitative survey measurements will be based on a 3x3-meter master grid. One measurement, covering one 1-m^2 grid location, will be made at each grid location chosen for the surface contamination measurements. Results from individual locations will be compared with the applicable limits.

At Rocketdyne, gamma exposure rate is generally measured by use of a 1x1 inch NaI(Tl) detector/photomultiplier probe, connected to a scaler to provide objective numerical values. The detector is placed 1 meter above the local (ground or floor) surface. This instrument is calibrated by reference to a High Pressure Ion Chamber (HPIC) in a background area.

6.4 Statistical Validation of Survey Data

The statistical approach employed at Rocketdyne/ETEC for establishing that survey data meets guideline values is a method referred to as Sampling Inspection by Variables (Ref. 14). This method has been widely applied in industry and the military and is essential where the lot size is impractically large. Application of this method to the remediation of contaminated sites has been discussed in detail elsewhere (see for example, Ref. 15).

In sampling inspection by variables, the number of data points on which measurements are obtained is first chosen to be large so that the parameters of the distribution are likely to have a normal distribution (i.e., Gaussian). The mean of the distribution, $\bar{x}$, and its standard deviation, s, are then related to a "test statistic", TS, as follows:

$$TS = \bar{x} + ks$$

where $\bar{x}$ = average (arithmetic mean of measured values)
s = observed sample standard deviation
k = tolerance factor calculated from the number of samples to achieve the desired sensitivity for the test

TS and $\bar{x}$ are then compared with an authorized acceptance limit, U, to determine acceptance or other plans of action, including rejection of the area as contaminated and requiring further remediation.

The sample mean and standard deviation are easily calculable quantities; the value of k, the tolerance factor, bears further discussion. Of the various criteria for selecting plans for acceptance sampling by variables, the most appropriate is the method of Lot Tolerance Percent Defective (LTPD), also referred to as the Rejectable Quality Level (RQL). The LTPD is defined as the poorest quality that should be accepted in an individual lot. Associated with the LTPD is a parameter referred to as consumer's risk (β), the risk of accepting a lot of quality equal to or poorer than the LTPD (or 10%). NRC Regulatory Guide 6.6 (Ref. 16) states that the value for the consumer's risk should be 0.10. Conventionally, the value assigned to the LTPD has been 10%.

The State of California, Department of Radiological Health Branch, has stated that the consumer's risk of acceptance (β) at 10% defective (LTPD) must be 0.1 (Ref. 17). For those choices of β and LTPD, $K_\beta = K_2 = 1.282$. The number of samples is n. Values of k for each sample size are calculated in accordance with the following equations:

$$k = \frac{K_2 + \sqrt{K_2^2 - ab}}{a}; \quad a = 1 - \frac{K_\beta}{2(n-1)}; \quad b = K_2^2 - \frac{K_\beta^2}{n}$$

where k = tolerance factor,

K_β = the normal deviate exceeded with probability of β, 0.10 (from tables, $K_2 = 1.282$, see Ref. 18),

K_2 = the normal deviate exceeded with probability equal to the LTPD, 10% (from tables, $K_\beta = 1.282$, see Ref. 18)[2], and

n = number of samples.

The statistical criteria for acceptance of a remediated area are presented below.

a) Acceptance: If the test statistic ($\bar{x}$ + ks) is less than or equal to the guideline (U), accept the area as clean. If any single measured value exceeds 80% of the limit, decontaminate that location to as near background as is possible, but do not change the value in the analysis.

b) Collect additional measurements: If the test statistic ($\bar{x}$ + ks) is greater that the limit (U), but $\bar{x}$ itself is less than U, independently resample and combine all measured values to determine if $\bar{x}$ + ks $\leq$ = U for the combined set; if so, accept the area as clean. If not, the area is contaminated and must be remediated.

c) Rejection: If the test statistic ($\bar{x}$ + ks) is greater than the limit (U) and $\bar{x}$ > = U, the region is contaminated and must be remediated.

Thus, based on sampling inspection, we are willing to accept the hypothesis that the probability of accepting an area as not being contaminated which is, in fact, 10% or more contaminated is 0.10. Or in other words, the final survey acceptance criteria corresponds to assuring with 90% confidence that 90% of an area has residual contamination below 100% (a 90/90/100 test) of the authorized limit.

7. REFERENCES

1. "RADIATION PROTECTION OF THE PUBLIC AND ENVIRONMENT," DOE Order 5400.5, U. S. Department of Energy, February 8, 1989.

2. "Regulatory Impact Analysis for Radiation Site Cleanup Proposed Rule - Draft", U. S. Environmental Protection Agency, January 17, 1996.

3. "Health Effects of Exposure to Low Levels of Ionizing Radiation -- BEIR V," Committee on the Biological Effects of Ionizing Radiations, Board on Radiation Effects Research, Commission on Life Sciences, National Research Council. National Academy Press, Washington, 1990.

4. "A Manual for Implementing Residual Radioactive Material Guidelines," DOE/CH/8901, U. S. Department of Energy, June 1989.

5. "National Primary Drinking Water Regulations; Radionuclides," 40 CFR 141.15 and .16, U. S. Environmental Protection Agency, July 18, 1991.

6. "STANDARDS FOR PROTECTION AGAINST RADIATION," 10 CFR 20, U. S. Nuclear Regulatory Commission.

7. "CALIFORNIA RADIATION CONTROL REGULATIONS," CCR 17, State of California Department of Health Services.

8. "ORE MINING AND DRESSING POINT SOURCE CATEGORY," Subpart C--Uranium, Radium and Vanadium Ores Subcategory, 40 CFR 440, U. S. Environmental Protection Agency.

9. "Disposal or Onsite Storage of Thorium or Uranium Wastes from Past Operations," Federal Register . Vol. 46, No. 205, pp. 52061-52063, Friday, October 23, 1981. U. S. Nuclear Regulatory Commission.

10. "ENVIRONMENTAL PROTECTION STANDARDS FOR NUCLEAR POWER OPERATIONS," 40 CFR 190, U. S. Environmental Protection Agency.

11. "Environmental Health, Radioactivity," CCR 22, Article 5. State of California Department of Health Services.

12. "Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material", DOE Memorandum, DOE-OAK, January 5, 1996.

13. "Order Authorizing Dismantling of Facility and Disposition of Component Parts", Docket No. 50-375, Enclosure to NRC Letter dated February 22, 1983, D. Eisenhut to M. Remley.

14. DOE/CH/8901, A Manual for Implementing Residual Radioactive Material Guidelines, T. L. Gilbert, et al., June 1989.

15. "Statistical Treatment of Radiological Survey Data for Cleanup Decisions and Regulatory Compliance", Proc. Spectrum '92 Conference, Boise, Idaho, August 23 - 27, 1992.

16. "Acceptance Sampling Procedures for Exempted and Generally Licensed Items Containing By-Product Material", U. S. Nuclear Regulatory Commission Guide 6.6, dated June 1974.

17. DECON-1, State of California for Decontaminating Facilities and Equipment Prior to Release for Unrestricted Use, dated June 1977.

18. MIL-STD-414, Sampling Procedures and Tables for Inspection by Variables for Percent Defective, June 11, 1957.

Appendix A

Input Parameters for RESRAD Calculations (Sheet 1 of 3)

Parameter	Value Used for Scenario			RESRAD
	Industrial	Wilderness	Residential	Default
Area of contaminated zone (m^2)	1.000E+04	1.000E+04	1.000E+04	1.000E+04
Thickness of contaminated zone (m)	1.000E+00	2.000E+00	1.000E+00	2.000E+00
Length parallel to aquifer flow (m)	1.000E+02	1.000E+02	1.000E+02	1.000E+02
Basic radiation dose limit (mrem/yr)	1.500E+01	1.500E+01	1.500E+01	3.000E+01
Time since placement of material (yr)	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Times for calculations (yr)	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Times for calculations (yr)	3.000E+00	3.000E+00	3.000E+00	3.000E+00
Times for calculations (yr)	1.000E+01	1.000E+01	1.000E+01	1.000E+01
Times for calculations (yr)	3.000E+01	3.000E+01	3.000E+01	3.000E+01
Times for calculations (yr)	1.000E+02	1.000E+02	1.000E+02	1.000E+02
Times for calculations (yr)	3.000E+02	3.000E+02	3.000E+02	3.000E+02
Times for calculations (yr)	1.000E+03	1.000E+03	1.000E+03	1.000E+03
Times for calculations (yr)	3.000E+03	0.000E+00	3.000E+03	0.000E+00
Times for calculations (yr)	1.000E+04	0.000E+00	1.000E+04	0.000E+00
Cover depth (m)	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Density of cover material (g/cm^3)	not used	not used	not used	1.500E+00
Cover depth erosion rate (m/yr)	not used	not used	not used	1.000E-03
Density of contaminated zone (g/cm^3)	1.500E+00	1.500E+00	1.500E+00	1.500E+00
Contaminated zone erosion rate (m/yr)	1.000E-03	1.000E-03	1.000E-03	1.000E-03
Contaminated zone total porosity	4.300E-01	4.300E-01	4.300E-01	4.000E-01
Contaminated zone effective porosity	2.000E-01	2.000E-01	2.000E-01	2.000E-01
Contaminated zone hydraulic conductivity (m/yr)	3.000E+03	3.000E+03	3.000E+03	1.000E+01
Contaminated zone b parameter	5.300E+00	5.300E+00	5.300E+00	5.300E+00
Humidity in air (g/cm^3)	8.000E+00	8.000E+00	8.000E+00	8.000E+00
Evapotranspiration coefficient	5.000E-01	5.000E-01	5.000E-01	5.000E-01
Precipitation (m/yr)	4.700E-01	4.700E-01	4.700E-01	1.000E+00
Irrigation (m/yr)	2.000E-01	2.000E-01	2.000E-01	2.000E-01
Irrigation mode	overhead	overhead	overhead	overhead
Runoff coefficient	2.000E-01	2.000E-01	2.000E-01	2.000E-01
Watershed area for nearby stream or pond (m^2)	1.000E+06	1.000E+06	1.000E+06	1.000E+06
Accuracy for water/soil computations	1.000E-03	1.000E-03	1.000E-03	1.000E-03
Density of saturated zone (g/cm^3)	1.500E+00	1.500E+00	1.500E+00	1.500E+00
Saturated zone total porosity	4.300E-01	4.300E-01	4.300E-01	4.000E-01
Saturated zone effective porosity	2.000E-01	2.000E-01	2.000E-01	2.000E-01
Saturated zone hydraulic conductivity (m/yr)	3.000E+03	3.000E+03	3.000E+03	1.000E+02
Saturated zone hydraulic gradient	2.000E-02	2.000E-02	2.000E-02	2.000E-02
Saturated zone b parameter	5.300E+00	5.300E+00	5.300E+00	5.300E+00
Water table drop rate (m/yr)	1.000E-03	1.000E-03	1.000E-03	1.000E-03
Well pump intake depth (m below water table)	1.000E+01	1.000E+01	1.000E+01	1.000E+01

Input Parameters for RESRAD Calculations (Sheet 2 of 3)

Parameter	Value Used for Scenario			RESRAD Default
	Industrial	Wilderness	Residential	
Model: Nondispersion (ND) or Mass-Balance (MB)	ND	ND	ND	ND
Well pumping rate (m^3/yr)	not used	not used	7.000E+01	2.500E+02
Number of unsaturated zone strata	1	1	1	1
Unsat. zone 1, thickness (m)	4.000E+00	4.000E+00	4.000E+00	4.000E+00
Unsat. zone 1, soil density (g/cm^3)	1.500E+00	1.500E+00	1.500E+00	1.500E+00
Unsat. zone 1, total porosity	4.300E-01	4.300E-01	4.300E-01	4.000E-01
Unsat. zone 1, effective porosity	2.000E-01	2.000E-01	2.000E-01	2.000E-01
Unsat. zone 1, soil-specific b parameter	5.300E+00	5.300E+00	5.300E+00	5.300E+00
Unsat. zone 1, hydraulic conductivity (m/yr)	3.000E+03	3.000E+03	3.000E+03	1.000E+01
Inhalation rate (m^3/yr)	8.400E+03	8.400E+03	8.400E+03	8.400E+03
Mass loading for inhalation (g/m^3)	2.000E-04	2.000E-04	2.000E-04	2.000E-04
Dilution length for airborne dust, inhalation (m)	3.000E+00	3.000E+00	3.000E+00	3.000E+00
Exposure duration	3.000E+01	3.000E+01	3.000E+01	3.000E+01
Shielding factor, inhalation	4.000E-01	4.000E-01	4.000E-01	4.000E-01
Shielding factor, external gamma	2.500E-01	7.000E-01	5.100E-01	7.000E-01
Fraction of time spent indoors	2.000E-01	0.000E+00	5.000E-01	5.000E-01
Fraction of time spent outdoors (on site)	4.000E-02	1.000E-01	2.500E-01	2.500E-01
Shape factor flag, external gamma	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Fruits, vegetables and grain consumption (kg/yr)	1.600E+00	1.600E+00	1.600E+01	1.600E+02
Leafy vegetable consumption (kg/yr)	0.000E+00	0.000E+00	1.400E+00	1.400E+01
Milk consumption (L/yr)	not used	not used	not used	9.200E+01
Meat and poultry consumption (kg/yr)	not used	not used	not used	6.300E+01
Fish consumption (kg/yr)	not used	not used	not used	5.400E+00
Other seafood consumption (kg/yr)	not used	not used	not used	9.000E-01
Soil ingestion rate (g/yr)	3.650E+01	3.650E+01	3.650E+01	3.650E+01
Drinking water intake (L/yr)	not used	not used	5.100E+02	5.100E+02
Contamination fraction of drinking water	not used	not used	1.000E+00	1.000E+00
Contamination fraction of household water	1.000E+00	0.000E+00	1.000E+00	1.000E+00
Contamination fraction of livestock water	not used	0.000E+00	not used	1.000E+00
Contamination fraction of irrigation water	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Contamination fraction of aquatic food	not used	not used	not used	5.000E-01
Contamination fraction of plant food	-1	-1	-1	-1
Contamination fraction of meat	not used	not used	not used	-1
Contamination fraction of milk	not used	not used	not used	-1
Livestock fodder intake for meat (kg/day)	not used	not used	not used	6.800E+01
Livestock fodder intake for milk (kg/day)	not used	not used	not used	5.500E+01
Livestock water intake for meat (L/day)	not used	not used	not used	5.000E+01
Livestock water intake for milk (L/day)	not used	not used	not used	1.600E+02
Livestock soil intake (kg/day)	not used	not used	not used	5.000E-01
Mass loading for foliar deposition (g/m^3)	1.000E-04	1.000E-04	1.000E-04	1.000E-04
Depth of soil mixing layer (m)	1.500E-01	1.500E-01	1.500E-01	1.500E-01
Depth of roots (m)	9.000E-01	9.000E-01	9.000E-01	9.000E-01

Input Parameters for RESRAD Calculations (Sheet 3 of 3)

Parameter	Value Used for Scenario			RESRAD Default
	Industrial	Wilderness	Residential	
Drinking water fraction from ground water	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Household water fraction from ground water	not used	not used	1.000E+00	1.000E+00
Livestock water fraction from ground water	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Irrigation fraction from ground water	not used	not used	not used	1.000E+00
C-12 concentration in water (g/cm^3)	not used	not used	not used	2.000E-05
C-12 concentration in contaminated soil (g/g)	not used	not used	not used	3.000E-02
Fraction of vegetation carbon from soil	not used	not used	not used	2.000E-02
Fraction of vegetation carbon from air	not used	not used	not used	9.800E-01
C-14 evasion layer thickness in soil (m)	not used	not used	not used	3.000E-01
C-14 evasion flux rate from soil (1/sec)	not used	not used	not used	7.000E-07
C-12 evasion flux rate from soil (1/sec)	not used	not used	not used	1.000E-10
Fraction of grain in beef cattle feed	not used	not used	not used	8.000E-01
Fraction of grain in milk cow feed	not used	not used	not used	2.000E-01
Storage times of contaminated foodstuffs (days):				
Fruits, non-leafy vegetables, and grain	1.400E+01	1.400E+01	1.400E+01	1.400E+01
Leafy vegetables	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Milk	not used	not used	not used	1.000E+00
Meat and poultry	not used	not used	not used	2.000E+01
Fish	not used	not used	not used	7.000E+00
Crustacea and mollusks	not used	not used	not used	7.000E+00
Well water	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Surface water	1.000E+00	1.000E+00	1.000E+00	1.000E+00
Livestock fodder	not used	not used	not used	4.500E+01
Thickness of building foundation (m)	1.000E-01	not used	1.000E-01	1.500E-01
Bulk density of building foundation (g/cm)	2.400E+00	not used	2.400E+00	2.400E+00
Total porosity of the cover material	not used	not used	not used	4.000E-01
Total porosity of the building foundation	1.000E-01	not used	1.000E-01	1.000E-01
Volumetric water content of the cover material	not used	not used	not used	5.000E-02
Volumetric water content of the foundation	3.000E-02	not used	3.000E-02	3.000E-02
Diffusion coefficient for radon gas (m/sec):				
in cover material	not used	not used	not used	2.000E-06
in foundation material	3.000E-07	not used	3.000E-07	3.000E-07
in contaminated zone soil	2.000E-06	not used	2.000E-06	2.000E-06
Radon vertical dimension of mixing (m)	2.000E+00	not used	2.000E+00	2.000E+00
Average annual wind speed (m/sec)	2.000E+00	not used	2.000E+00	2.000E+00
Average building air exchange rate (1/hr)	5.000E-01	not used	5.000E-01	5.000E-01
Height of the building (room) (m)	2.500E+00	not used	2.500E+00	2.500E+00
Building interior area factor	0.000E+00	not used	0.000E+00	0.000E+00
Building depth below ground surface (m)	1.000E-01	not used	1.000E-01	-1.000E+00
Emanating power of Rn-222 gas	2.500E-01	not used	2.500E-01	2.500E-01
Emanating power of Rn-220 gas	not used	not used	not used	1.500E-01

EXHIBIT III

INDEPENDENT VERIFICATION DOCUMENTATION OF THE RADIOLOGICAL CONDITION OF BUILDING 029 AT ENERGY TECHNOLOGY ENGINEERING CENTER AFTER DECONTAMINATION AND DECOMMISSIONING

ORISE
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION

ENERGY/ENVIRONMENT SYSTEMS DIVISION

February 5, 1993

Anthony F. Kluk, Ph.D
Director, San Francisco Operations Division
EM-443
Trevion II
U.S. Department of Energy
Washington, DC 20545-0002

SUBJECT: TYPE A VERIFICATION OF BUILDING T029 SANTA SUSANA FIELD LABORATORY, ROCKWELL INTERNATIONAL, CANOGA PARK, CALIFORNIA

Dear Dr. Kluk:

The Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education (ORISE) has conducted a Type A verification of Building T029 which is located at the Santa Susana Field Laboratory (SSFL) in Canoga Park, California. The SSFL is operated by Rockwell International under contract to the Department of Energy (DOE).

Building T029, formerly known as both the Radiation Measurements Facility and the Old Calibration Facility, is located on 10th Street in the western portion of the SSFL (Figure 1). The building measures 12 m x 6 m (40 ft x 20 ft) and formerly housed a radium-226 (Ra-226) storage well and a cobalt-60 (Co-60) source cell. On March 23, 1964, a Ra-226 source developed a leak after being dropped into the storage well. The limited contamination outside of the well was remediated at that time and operations resumed. In 1974, decommissioning was initiated by removal of all radioactive source materials from the building. The building was then used as a storage facility for waste alkali metals until 1988 when a survey identified residual alpha contamination on interior portions of the well, and additional remediation was performed. The remedial actions within the building included removal of the storage well and associated concrete flooring and underlying soils. The Co-60 source cell was also removed. The area was then resurveyed and restored. The results of Rockwell's post-remedial action survey indicated that the facility met all applicable guidelines for release without radiological restrictions. The building is currently used for the storage of RCRA hazardous wastes.

It is the policy of the DOE to perform independent verifications of remedial actions conducted at DOE owned facilities, and ORISE has been designated as the organization responsible for this task at the SSFL.

ESSAP reviewed the decontamination and radiological survey report and supporting documentation prepared by Rockwell and provided the DOE with comments suggested for incorporation into future

documents.[1,2] Overall, the report provided an adequate description of the remedial action conducted and survey procedures used. Statements regarding the final radiological status of the building, relative to the DOE guidelines for release without radiological restrictions, were also provided.[3] The applicable surface contamination guidelines were those for Ra-226 which are:

Total Activity

100 dpm/100 cm^2, average in a 1 m^2 area
300 dpm/100 cm^2, maximum in a 100 cm^2 area

Removable Activity

20 dpm/100 cm^2

The DOE guideline for exposure rate is 20 μR/h above background. However, Rockwell has elected to use a more conservative value of 5 μR/h above background.

The exposure rate data presented by Rockwell met the more restrictive value and satisfies the DOE guideline. Although the decommissioning report did not provide residual surface activity levels for affected portions of the building, past surveillance surveys, conducted by Rockwell, did not identify any direct radiation levels in excess of ambient background. ESSAP also performed scans of the floor surfaces contiguous with the source well's former location using ZnS detectors coupled to ratemeter-scalers. The surface scans did not identify any locations of elevated direct radiation.

It is ESSAP's opinion that Building T029 at the Santa Susana Field Laboratory satisfies the requirements for release without radiological restrictions. This opinion is based on the limited area affected by the Ra-226 leak, the methods employed to remediate the affected area, and the results of the post-remedial action surveys.

Please do not hesitate to contact either Michele Landis at (615) 576-2908 or myself at (615) 576-5073 should you have any questions.

Sincerely,

Timothy J. Vitkus
Environmental Project Leader
Environmental Survey and
Site Assessment Program

TJV:dac

cc: D. McKenzie, DOE/HQ
D. Williams, DOE/HQ
R. Liddle, DOE/SAN
J. Berger, ORISE
J. Beck, ORISE
M. Landis, ORISE
File/357

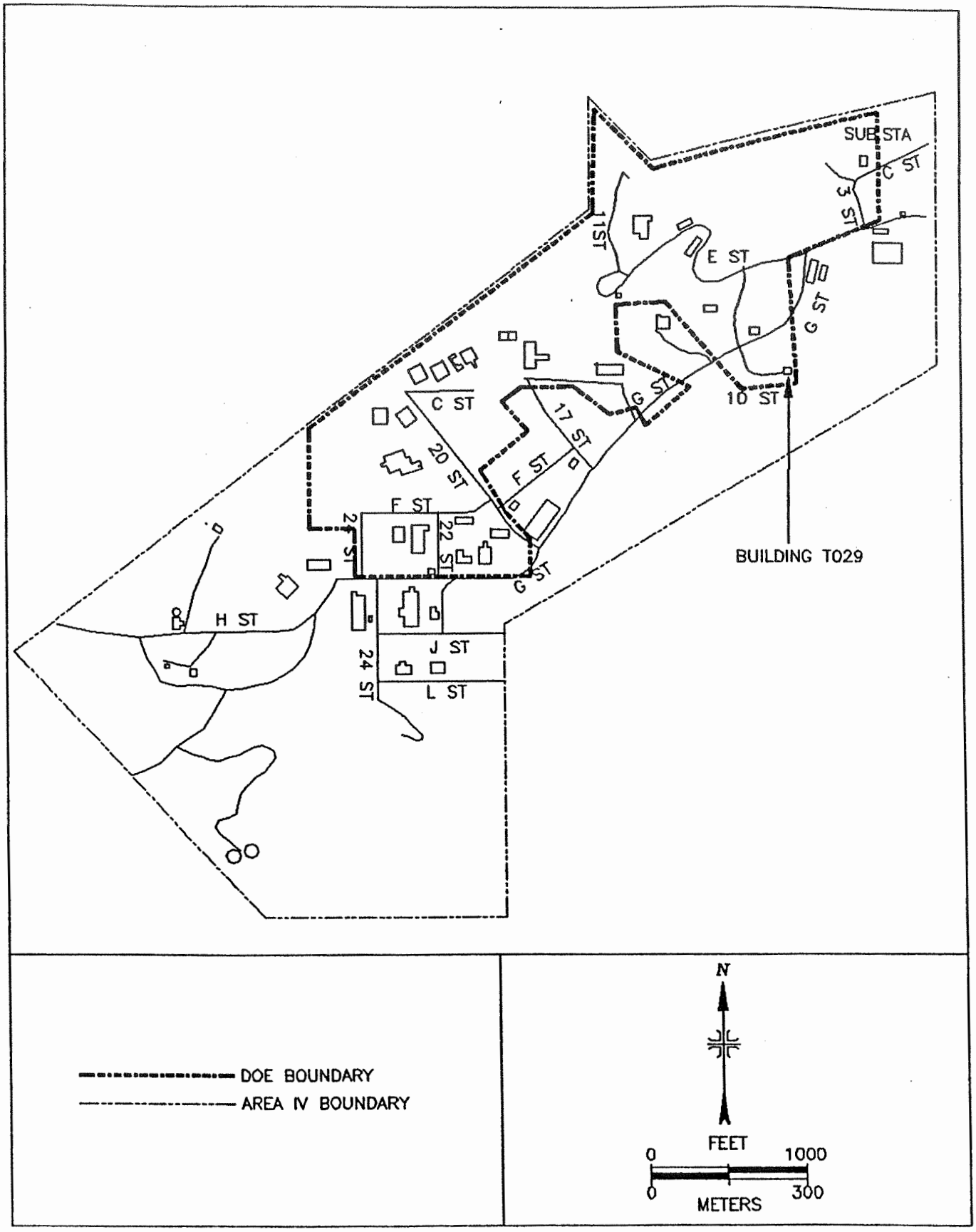


FIGURE 1: Plot Plan of Santa Susana Field Lab Area 4 – Location of Building T029

REFERENCES

1. Subbaraman, G. "Final Decontamination and Radiological Survey of Building T029," Rockwell International Safety Review Report N704SRR99029, June 1990.

2. T.J. Vitkus, Letter to A. Kluk, June 5, 1992, U.S. Department of Energy, Washington, DC.

3. "Radiation Protection of the Public and the Environment," DOE order 5400.5, U.S. Department of Energy, February 8, 1990.

EXHIBIT IV

BUILDING 029 D&D OPERATIONS FINAL REPORT

ENERGY TECHNOLOGY ENGINEERING CENTER

OPERATED FOR THE U.S. DEPARTMENT OF ENERGY
ROCKETDYNE DIVISION, ROCKWELL INTERNATIONAL

No. 029-AR-0001 Rev. ____
Page 1 of 34
Orig. Date 3/28/96
Rev. Date ____

DRR 25467

TITLE: FINAL D&D REPORT FOR BLDG. T029

- APPROVALS -

Originator	A. L. Pascolla	FAC MGR	P. H. Horton
		PROG MGR	M. E. Jensen
		ENVIRO	P. Rutherford
		HS & E	J. Erman C. Fontanilla for J. Erman
		QA	S. Reeder

REV. LTR.	REVISION	APPROVAL/DATE

OFFICIAL COPY

APR 18 1996

NOTICE: THIS COPY SUPERSEDES ALL PRIOR COPIES ISSUED.

CONTENTS

TABLES

FIGURES

FIGURES

1.0 INTRODUCTION AND BACKGROUND

1.1 FACILITY LOCATION

Building T029 is located within Rockwell International's Santa Susana Field Laboratories (SSFL) in the Simi Hills of southeastern Ventura County, California, adjacent to the Los Angeles County Line and approximately 29 miles northwest of downtown Los Angeles. Location of SSFL relative to Los Angeles and vicinities is shown in Figure 1–1. An enlarged map of neighboring SSFL communities is shown in Figure 1–2. Figure 1–3 shows relevant portions of a 1967 edition of the U.S. Geological Survey's (USGS) topographic map of the Calabasas Quadrangle where SSFL is located, with the author's markup of the location of Building T029. Using USGS terminology, the current USGS location description for Building T029 is: Township T2N; Range R17W; and Section 30, Calabasas Quadrangle.

Figure 1–4 is a plot plan of the western portion of SSFL (known as "Area IV") where Building T029 is located. As shown in this figure, access to T029 is by way of 10th Street, which intersects "G" Street just southwest of building T064. An asphalt roadway (10th Street) runs right up to the facility. A portion of the roadway is fenced in as part of the facility. Figure 1–5 is an old photograph of T029 and the surrounding area, looking south–southwest. Figure 1–6 shows the entrance gate on 10th Street and the west wall of T029, and Figure 1–7 shows a close–up view from the south.

1.2 BUILDING CHARACTERISTICS

Constructed in 1959, as an open bay facility, T029 is a Butler–type building with a steel frame and corrugated metal siding and roofing. The building is 20 ft x 40 ft with a 12–ft eave height. It is a single room with no office, support laboratory, rest room areas, or installed air conditioners. The ceilings and walls are insulated with 1–in. thick fiberglass mat. The floors were originally tiled with asphalt tile, the tiles were subsequently removed, and the floor is now a bare concrete slab.

1.3 FACILITY OPERATING HISTORY

From 1959 to 1974, Building T029 was used as a facility for calibrating radiation detection instruments. In 1959, and in subsequent years, it was called the Radiation Measurements Facility and the Old Calibration Facility, respectively. The plot plan shows locations within the building where the calibration sources were housed. Table 1 lists the calibration sources used in the facility, their source strengths and the source calibration dates. Of these, the three Ra–226, and later the two Cs–137 sources were housed inside a source storage well made from a 12–in. diameter, 10 ft long, Schedule–20 galvanized pipe casing which was installed below grade. Figure 1–9 shows details of the Ra–226 source storage well. The sources were attached to nylon strings and were guided through 1–in. diameter pyrex tube thimbles within coaxial, Schedule–40 galvanized pipes which were evenly spaced within the casing and embedded in concrete. The three

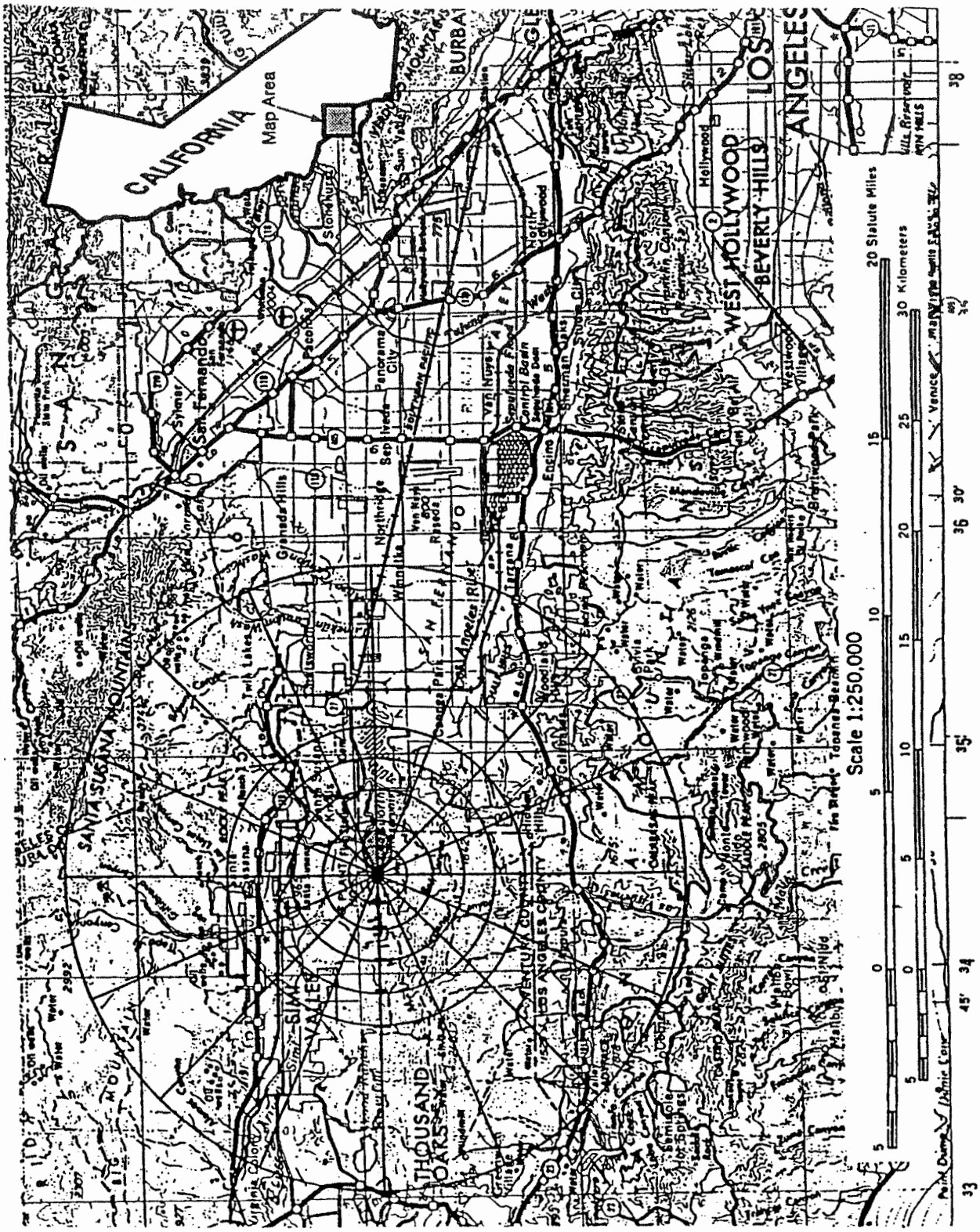


Figure 1–1. Map of Los Angeles Area

Figure 1–2. Map of Neighboring SSFL Communities

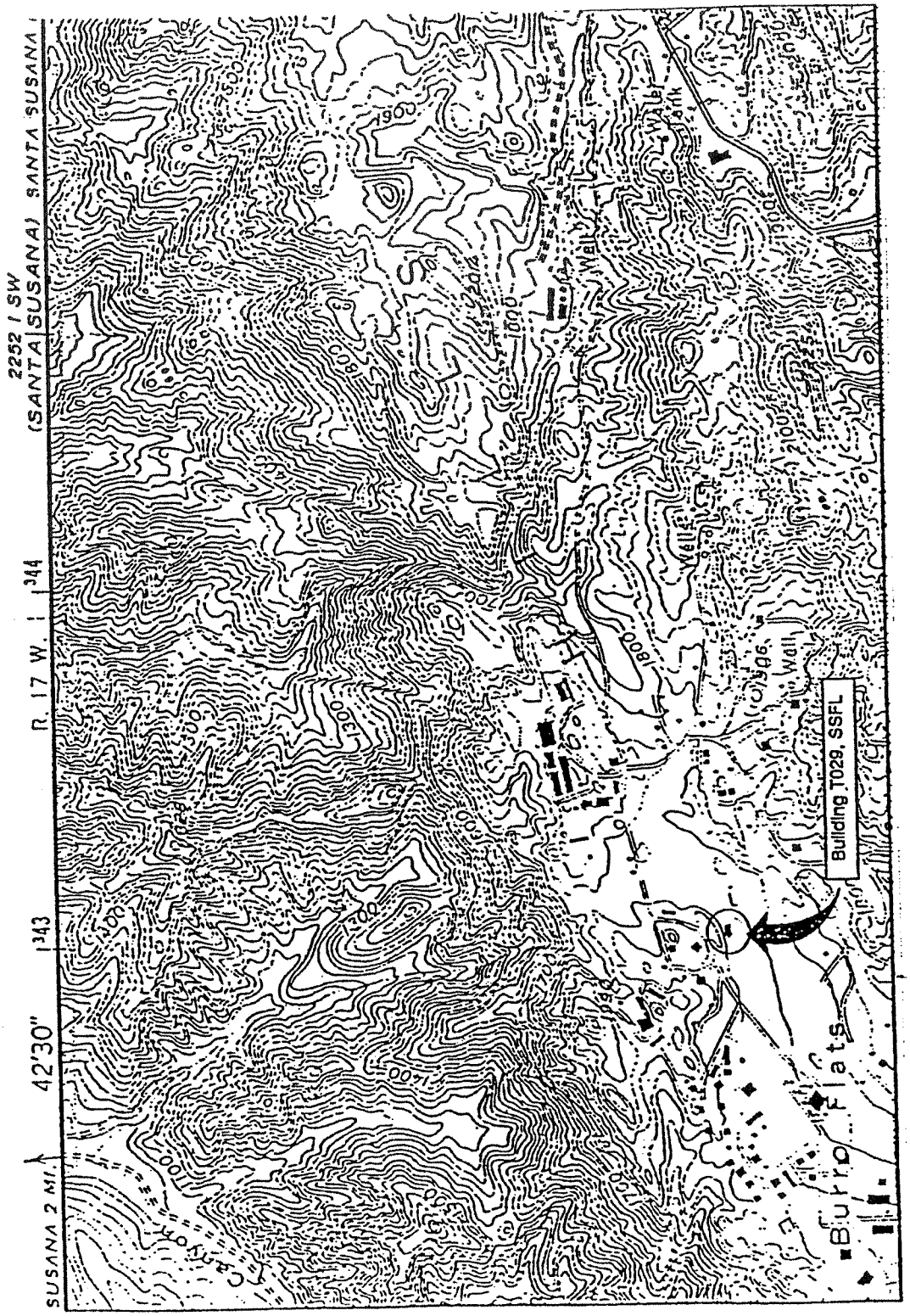


Figure 1–3. USGS Topographic Map of Portions of Calabasas Quadrangle; Bottom Left Area Corresponds to SSFL

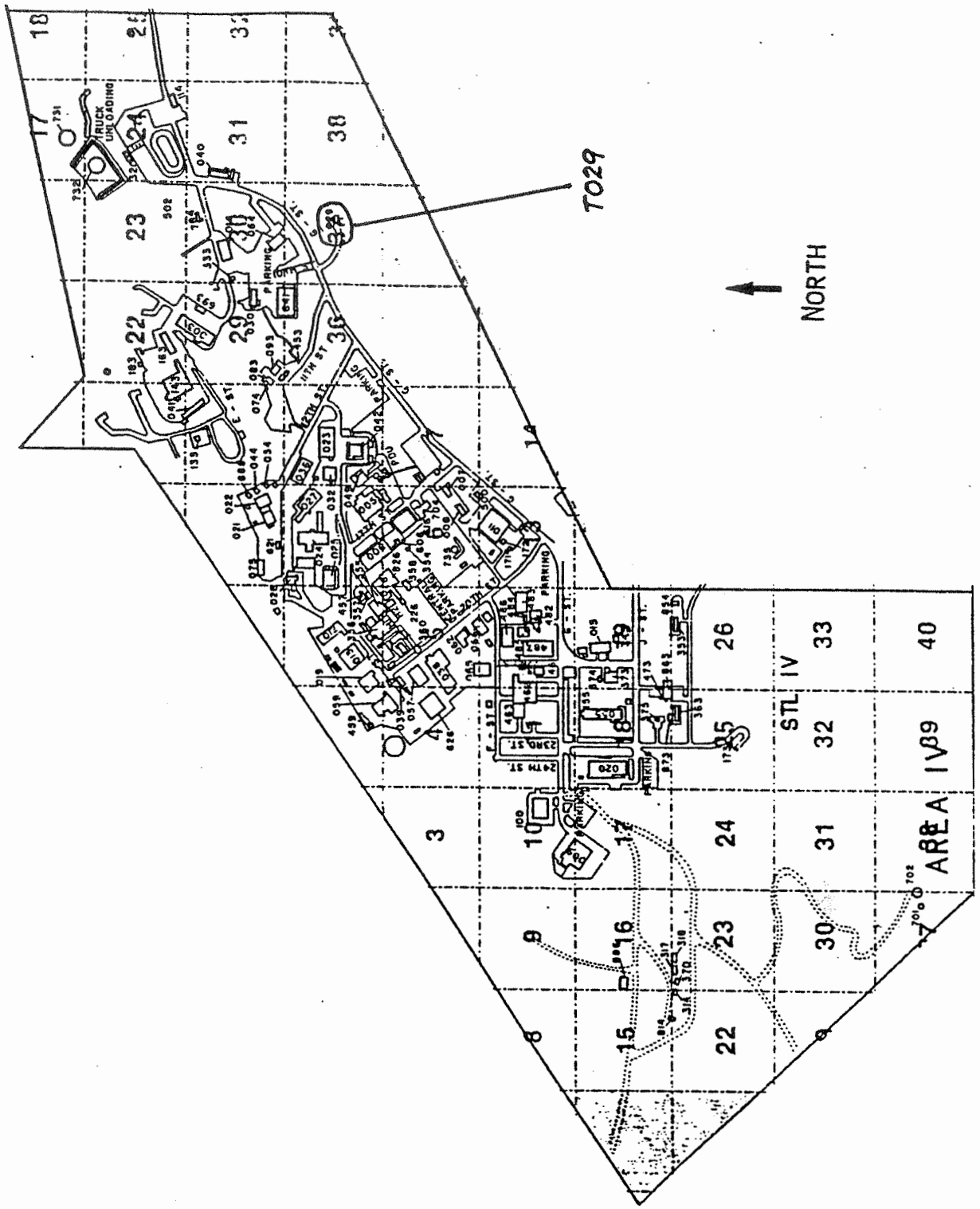


Figure 1–4. SSFL Layout Showing the Location of Building T029

Figure 1-5. Photograph of T029 Looking South Southwest

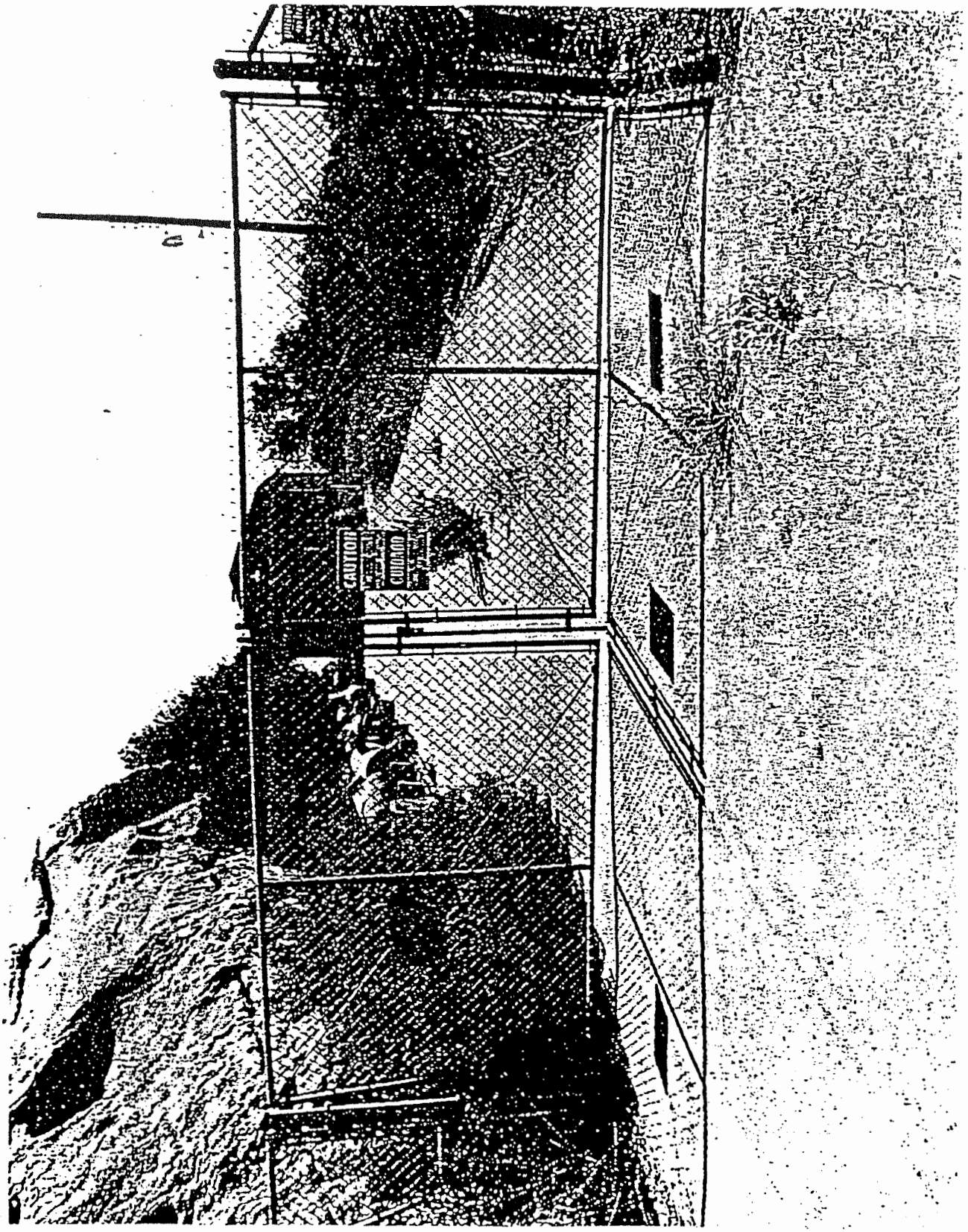


Figure 1–6. Entrance Gate to Building T029, From the West

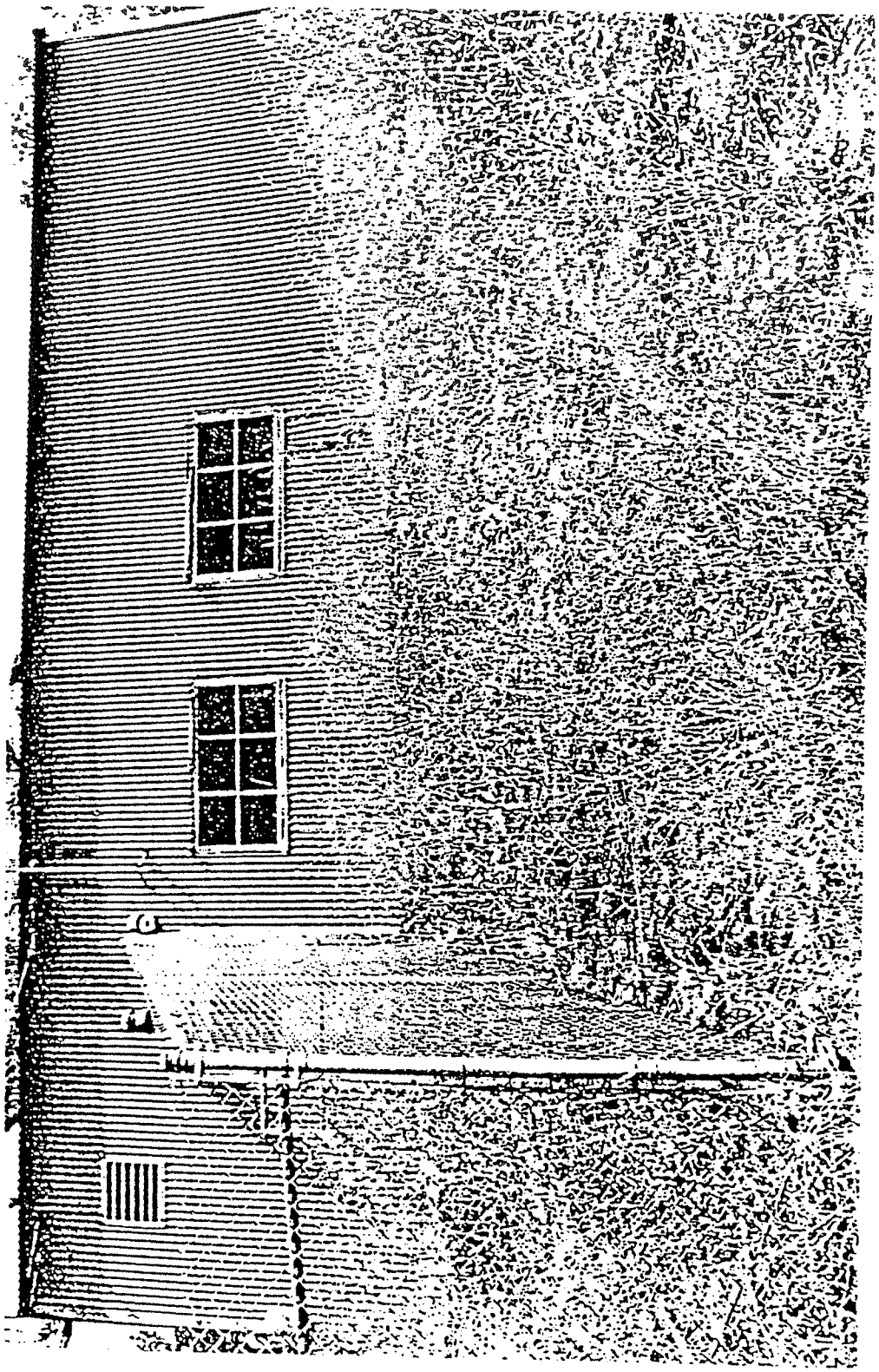


Figure 1–7. Building T029 View From the South (close–up)

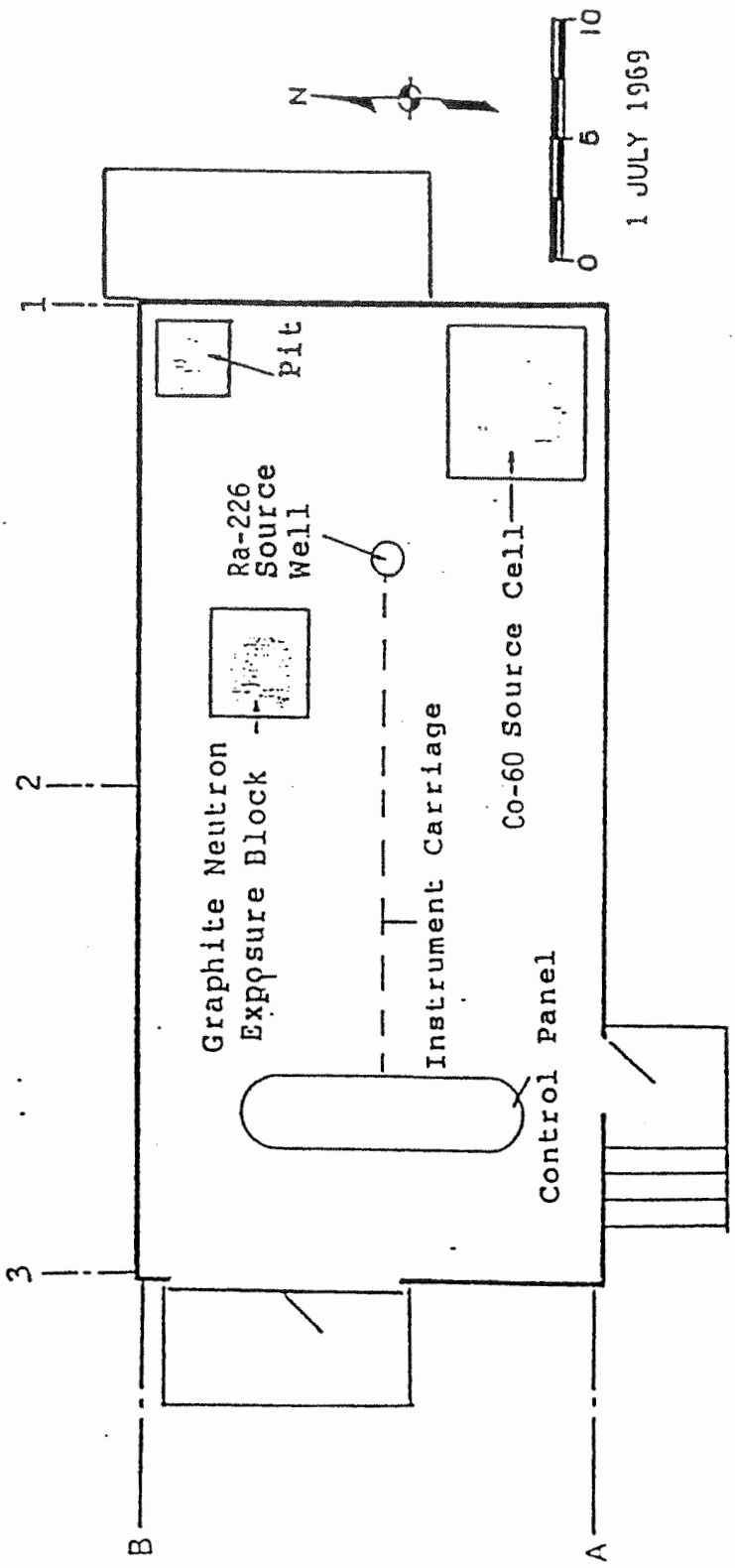


Figure 1–8. Plot Plan of the Radiation Measurements Facility, Building T029

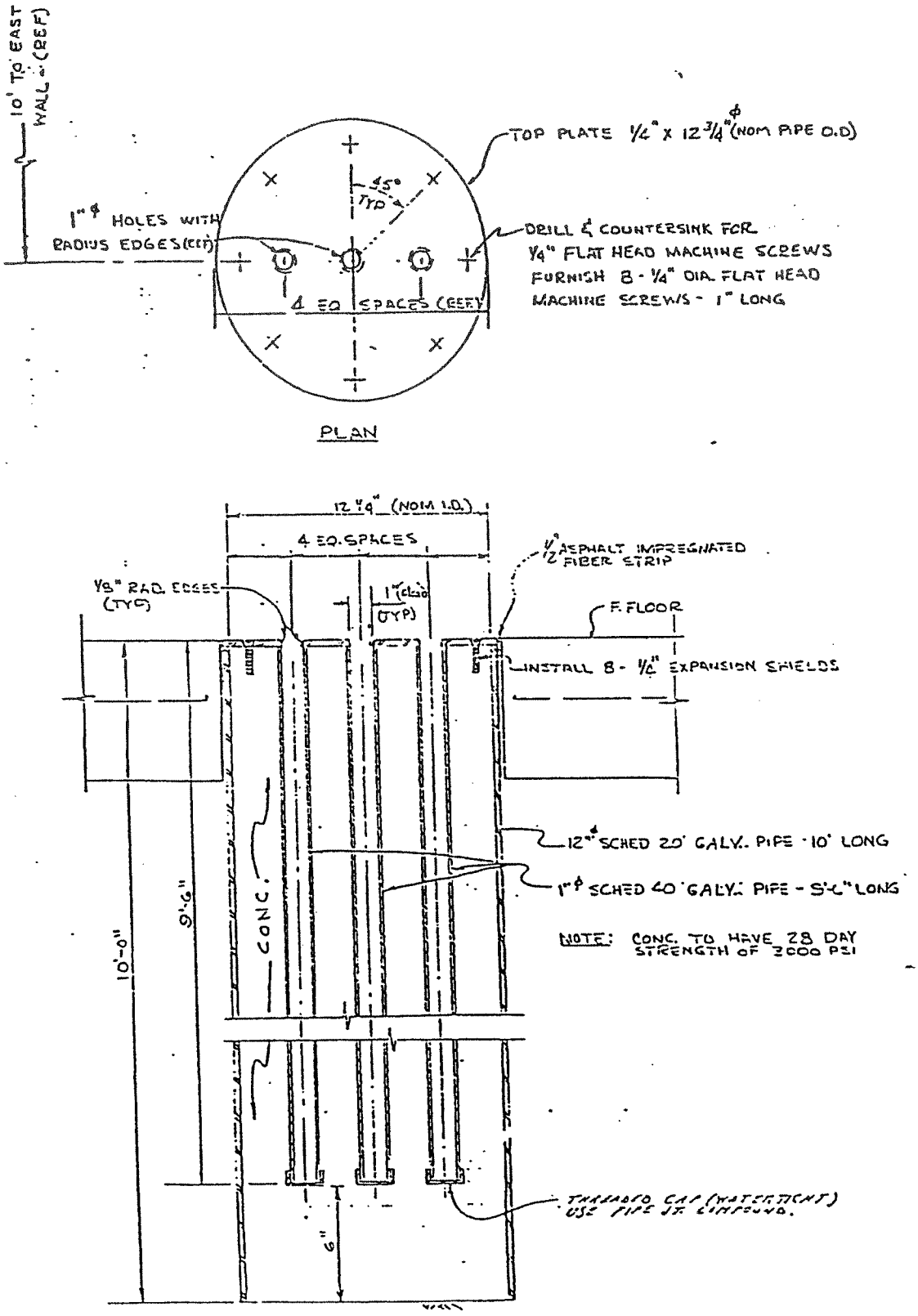


Figure 1–9. Ra–226 Source Storage Well Detail

encapsulated Co–60 sources were housed separately in a 12–in. diameter pipe which extended 10 ft below grade and 4 ft above grade. Above grade, the pipe was enclosed with lead shielding, and covered by a 77–in. square concrete rolling door. The PoBe and PuBe neutron sources were housed in a 3 ft x 3 ft x 2 ft–deep pit, with a graphite neutron exposure block, shown in Figure 1–8.

Table 1. Calibration Sources Used at T029

Source	Source Strength (mCi)	Date*
(1) Ra–226	24.8	1960
(2) Ra–226	132	1960
(3) Ra–226	930	1960
(4) Co–60	Unknown	
(5) PoBe	Unknown	
(6) PuBe	Unknown	
(7) Cs–137	5310	September 1963
(8) Cs–137	5260	September 1963
*Date source strength was measured.		

All of the sources were fully encapsulated, were leak–tested at least every six months in compliance with State of California Radiation Control Regulations, and subsequently removed from T029. The only known cause for radioactive contamination in the facility was one incident involving the dropping of a Ra–226 capsule (described below).

Radioactivity was released from one of the Ra–226 source capsules (Source No. 1) on March 23, 1964, when this source became detached from the nylon string and fell into the bottom of the source thimble. The 13–ft fall cracked the outer plastic encapsulation surrounding the inner capsule and released some loose Ra–226. Release of radioactivity was primarily confined to the well and the source thimble. An April 10, 1964, report describing the incident, the subsequent recovery of the source, and the decontamination of the area outside the well is found in Ref. 5, Appendix A.

Operation of the facility continued by replacing all the Ra–226 sources with two Cs–137 sources. On November 20, 1970, the 4.6 Ci Cs–137 source dropped 10 ft to the bottom of the well. No contamination release occurred. When all sources were removed from T029 in 1974, a radiation survey was performed which showed that the facility was radiologically clean except for the interior of the RA–226 storage well (Ref. 5).

All operations in Building T029 with radioactive materials had been in support of DOE's and its predecessor agency programs. The facility was transferred to the DOE's Energy Technology Engineering Center (ETEC) operating contract in September 1989.

2.0 PRIOR DECONTAMINATION EFFORTS

Partial decommissioning of building T029 was accomplished in April 1974 when all radioactive sealed sources were removed and transferred to another facility. Subsequently, T029 was redesignated as a nonradioactive hazardous waste storage facility for the storage of excess alkali metals and components containing alkali metals.

In 1985, building T029 was included in an overall survey plan for SSFL facilities (Ref. 1). A purpose of the survey plan was to inspect the facilities for residual radioactive contamination and recommend remedial actions.

3.0 SUMMARY

PURPOSE. This report documents work performed to remove residual radioactive contamination in certain relatively inaccessible areas of Building T029, located in Rockwell International's Santa Susana Field Laboratories (SSFL), and to demonstrate that the facility is acceptably free of radioactive contamination.

BACKGROUND. Between the late–50's and April 1974, several radioisotope sources (Ra–226, Cs–137, Co–60, PoBe, and PuBe) were stored and utilized in T029 for calibration of radiation detection instruments. In 1964, release of radioactivity from a Ra–226 sealed source caused localized contamination of the below–grade source storage well. Outside of this inaccessible area, radiation surveys performed in 1974 and 1988 showed that radiation levels in T029 correspond to normal background levels at SSFL. All sources had been removed by 1974, and the facility is now being used to store reactive metals (sodium and NaK) prior to disposal.

WORK PERFORMED. To further reduce contamination to levels that are as low as reasonably achievable, the Ra–226 source storage well was excavated along with the Ra–226 source holder and both were disposed of as low–level radioactive waste. At the same time, the housing used for the Co–60 source was also demolished and the resulting uncontaminated debris was disposed of as nonradioactive waste. In addition, the exhaust system outside the building was removed, surveyed and determined to be clean for reuse. Soil samples collected during these operations were analyzed for radioactivity and showed no activity above background. The excavated area was then refilled.

STATUS. Building T029 currently stores nonradioactive hazardous materials (principally metallic sodium and NaK) prior to their planned disposal.

CONCLUSION. Based on results of the comprehensive 1988 radiation survey and the subsequent work described here, radiation and contamination levels in Building T029 meet acceptable limits and hence the facility may be released for unrestricted use.

4.0 PROJECT ACTIVITIES/RESULTS

Based on the recommendation of the 1988 radiation survey, the Ra-226 source storage well was excavated and removed from Building T029. In addition, the structure that formerly stored the Co-60 sealed sources, and the building exhaust system located outside of T029 were also removed. Soil samples were collected and analyzed. The excavated areas were then refilled. These activities are described in this section.

4.1 PROCEDURE

Excavation and removal of the Ra-226 source storage well and other activities in T029 were performed under a documented procedure (Ref. 3). As specified in the procedure, a Controlled Work Permit was issued for monitoring and controlling radioactivity in the work area and exposures to personnel. Routine contamination surveys were performed to determine contamination levels and for segregation of contaminated material for subsequent disposal.

4.2 Ra-226 SOURCE STORAGE WELL REMOVAL

Following temporary removal of the material stored inside the building, a rectangular area of the floor surrounding the Ra-226 source storage well was excavated (see Figure 4-1) using concrete saws and jack-hammers. A back-hoe was used to dredge the soil from the cut-up area. A vacuum cleaner was then used to remove soil in the immediate vicinity of the 12-in.-diameter casing. Removal of the soil in this manner loosened the casing from the soil, with its inner contents of contaminated source thimble tubes (shown previously in Figure 1-9) still intact. A sling was attached to the casing and a fork-lift was used to move it to the floor where it was covered with plastic bags, tagged as radioactive material and transported to the Radioactive Material Disposal Facility (RMDF) at the SSFL. Figure 4-2 shows a photograph of the casing upon its arrival at the RMDF. A photograph of the excavated area of the well after removing the casing is shown in Figure 4-3. The Co-60 source cell and the pit where the PuBe and PoBe sources were formerly located are seen to the right and left side of the excavation respectively.

4.3 REMOVAL OF OTHER ITEMS

The Co-60 source cell was demolished, and its storage well was excavated partially to a depth of approximately 2 ft below grade in the same manner as the Ra-226 source storage well. Although, as noted previously, there was no contamination present in this location, the Co-60 structure was eliminated to an extent that provides an obstruction-free floor-space for future storage of nonradioactive materials. Routine smear surveys were performed at this location and the pit area to assure absence of contamination. Figures 4-4 and 4-5 show photographs taken during demolition of the Co-60 source cell and its storage well. The facility's exhaust blower was also removed.

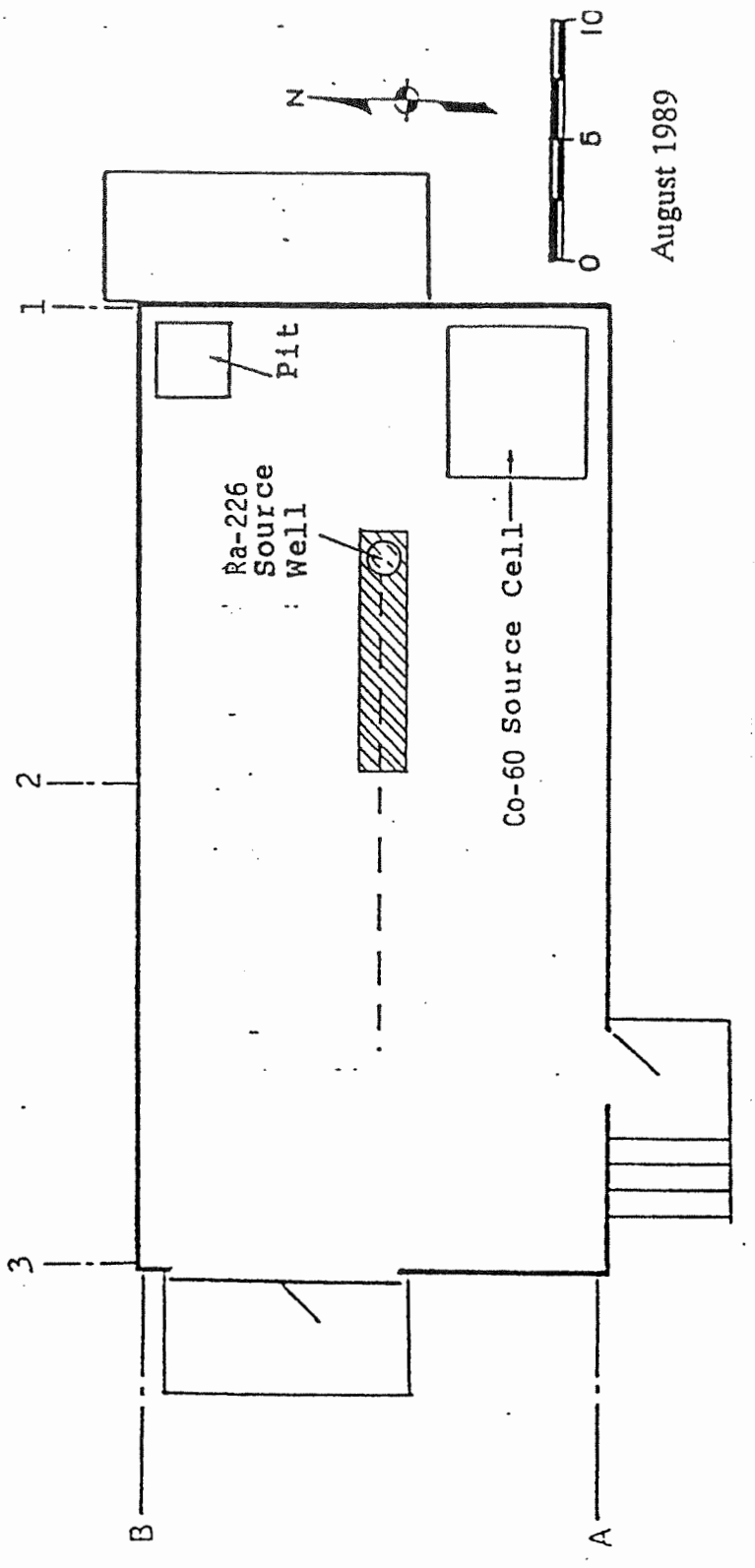


Figure 4–1. Ra–226 Source Well Floor Area (Shaded) Marked Up for Excavation

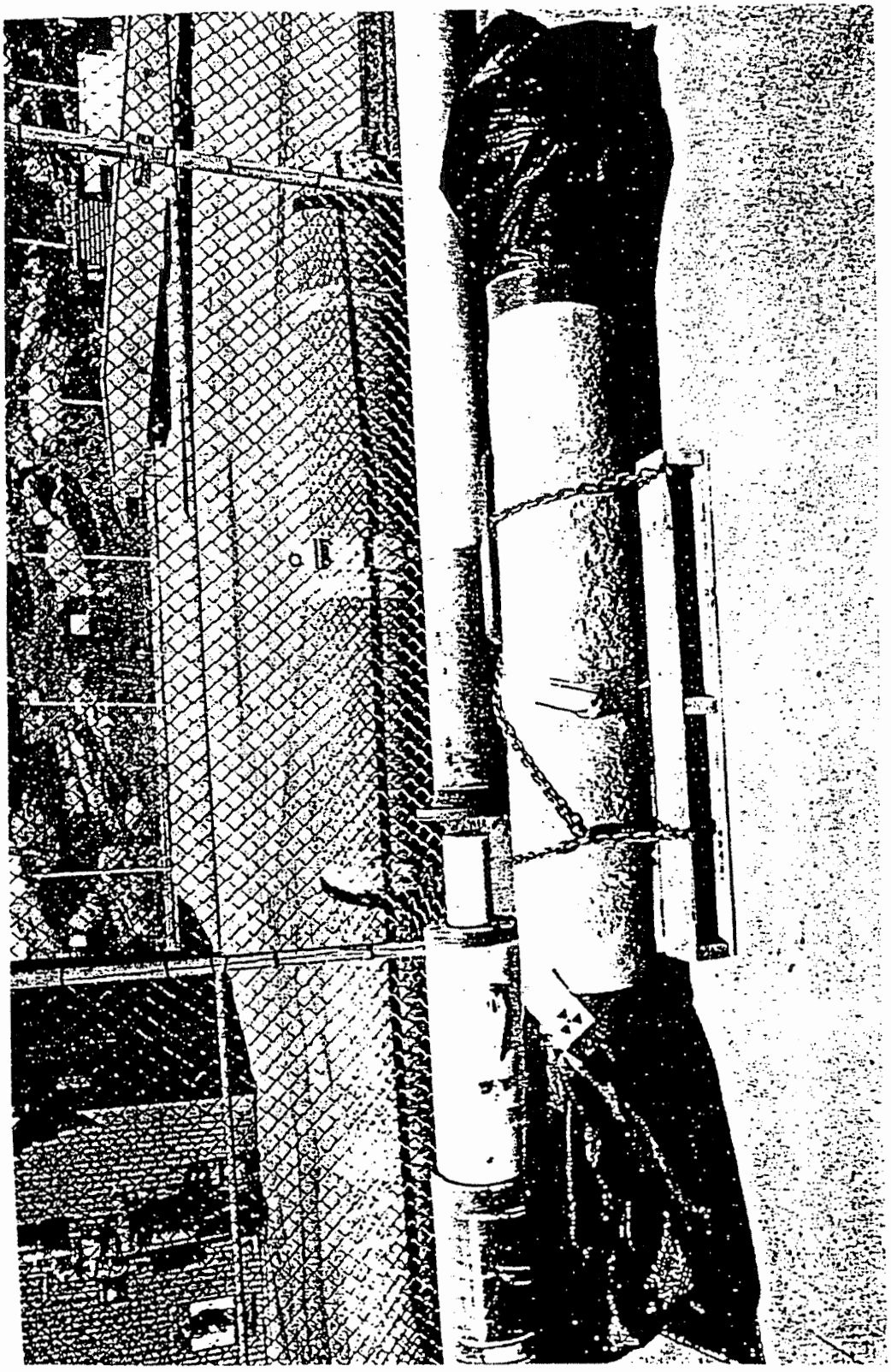


Figure 4–2. Photograph of Ra–226 Source Storage Well Upon Transfer to RMDF from T029 (front–most from fence)

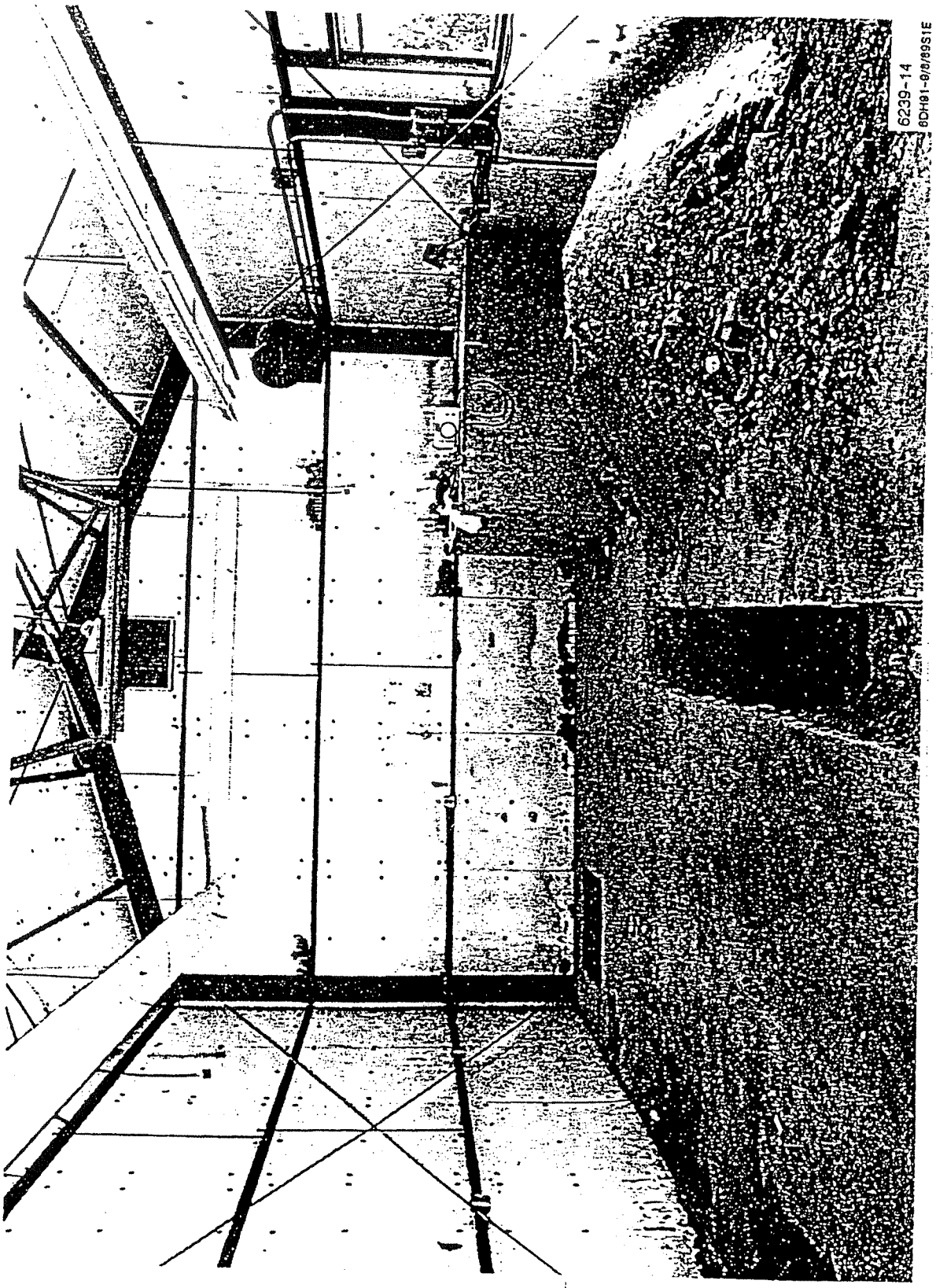


Figure 4–3. Photograph of Excavated Area of Ra–226 Source Storage Well in T029; Square Pit on Far Left at Floor Level is Former Location of PuBe, PoBe Sources. Former Co–60 Source Cell Block is to the Far Right

Figure 4–4. Co–60 Source Cell After Demolition of Surrounding Concrete

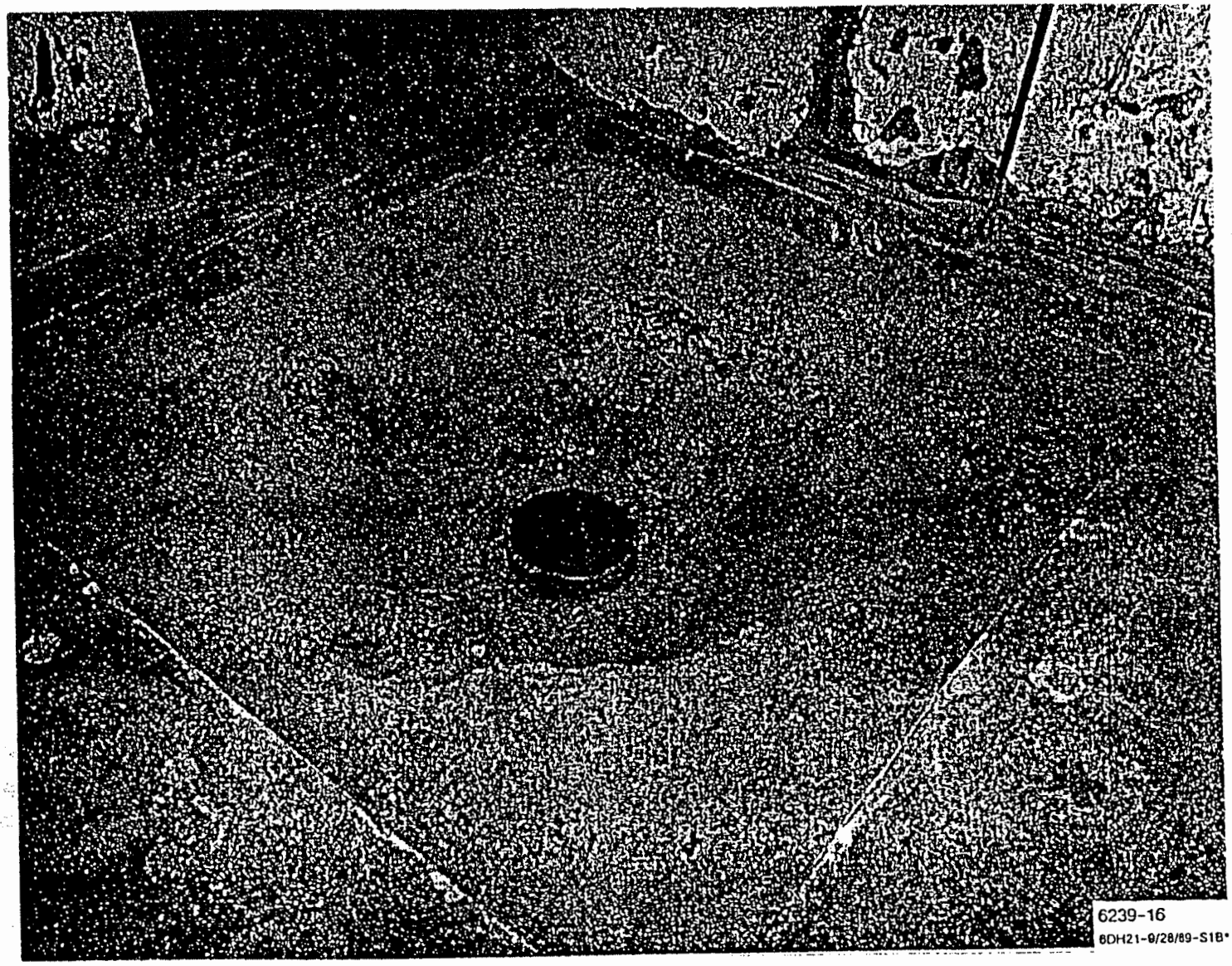


Figure 4–5. Photograph of Co–60 Source Cell Area in T029 After Partial Removal of Source Cell

4.4 DISPOSITION OF REMOVED ITEMS

4.4.1 Ra–226 Source Storage Well

Routine smear surveys were performed on the surfaces of the thimbles. Swabs were taken from within the interiors of the thimble tubes after the casing was excavated. Results of the smear survey showed normal background activity, while the swabs showed, as expected, alpha–contaminated interiors. Therefore, it was determined that the source storage well must be disposed of as low–level radioactive waste. Accordingly, to facilitate its packaging, the casing was cut longitudinally into two pieces and the concrete embedment was separated from the casing and the three inner tubes. Figure 4–6 shows a photograph of the disassembled casing. All of the components shown were then packaged for disposal as low–level radioactive waste at an authorized site.

4.4.2 Other Items

Routine smear survey data on the Co–60 source well components such as the concrete, and the removed and retained portions of the source well showed no activity above background and hence these items were disposed of as normal industrial waste; the lead shielding surrounding the source well was sold as scrap.

Routine smear survey of the exhaust blowers also showed no activity above background. These items were deemed reusable and hence were sent for refurbishment.

The survey data for all of the above items are maintained in the facility decommissioning file (Ref. 5, Appendix B).

4.5 SOIL ANALYSES

4.5.1 Soil Samples for Analysis

Soil samples were collected to determine if any Ra–226 (or Cs–137) isotopes had migrated from the source storage well casing into the adjacent soil and the extent of any such contamination. Four samples were collected in masses ranging from 227 g to 948 g for spectrometric analyses. The samples were collected from dirt adhering to the excavated source well casing (sample No. 1 and No. 3), the excavated pit (sample No. 2) and the excavated dirt pile (sample No. 4). As shown in Figure 4–7, sample No. 1 was from the side of the source well casing, while samples No. 2 and No. 3 were from its bottom. Sample No. 4, not shown in Figure 4–6, was a random sample taken from the excavated dirt pile.

Soil samples in the mass range of about 500 to 900 g are required for gamma spectrometric analysis using the standard Marinelli beaker (see Section 4.5.2 below) and three of the four samples had this desirable mass. However, one sample (sample No. 2 soil adhering to the bottom of the casing) weighed only 227 g which corresponded to all the dirt that was adhering to this area.

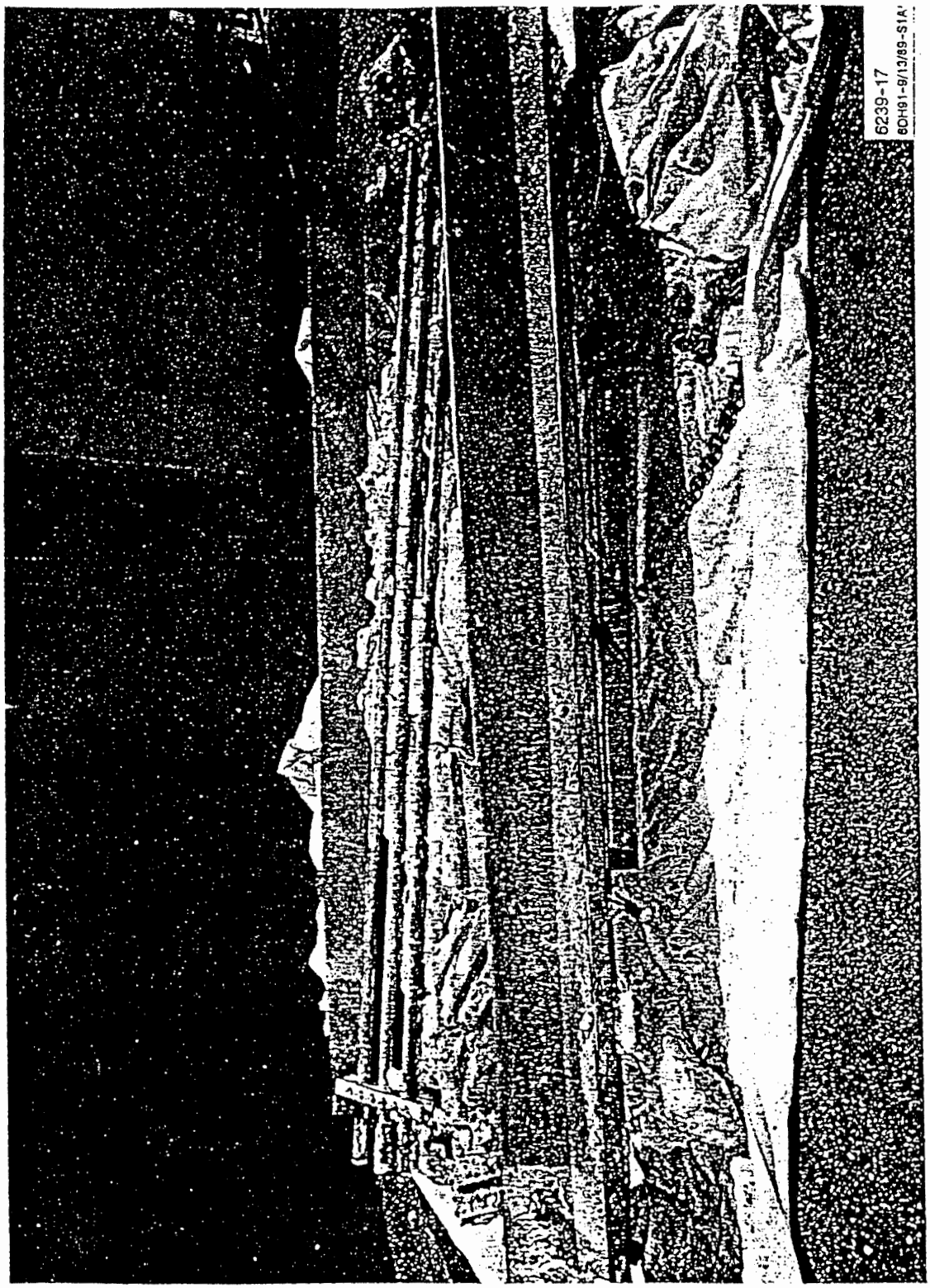


Figure 4–6. Photograph of Disassembled Ra–226 Source Well Casing in Preparation for Disposal

Sample No. 2 was nevertheless analyzed along with the other samples, and results are presented in Section 4.5.3.

4.5.2 Analysis Procedure

Gamma spectrometry of the soil samples was performed with a Canberra Industries, Inc. Series 80 Multichannel Analyzer (MCA). The MCA is coupled to a planar high purity germanium (HPGe) radiation detector having about a 10% relative sensitivity (relative to the sensitivity of 3 in. x 3 in. NaI detector for cesium–137 gamma radiation), and a photopeak resolution capability of about 2.5 keV for the higher energy line of cobalt–60. The instrument was calibrated for gamma energy and for radionuclide quantification with a Marinelli Beaker Standard Source (MBSS) as specified in the Standard, ANSI/IEEE Std 680–1978, "IEEE Standard Techniques for Determination of Germanium Semiconductor Gamma–Ray Efficiency Using a Standard Marinelli (re–entrant) Beaker Geometry."

The soil samples collected were dried in an oven and large chunks of rock were removed. A Marinelli beaker (450–ml volume) was then filled with the soil sample, weighed and counted for 30 min.

The MCA is programmable; for any unknown sample, it will calculate the activity in μCi of any isotope it identifies corresponding to the associated library. Typically, the instrument is used to measure U–238, U–235, Th–232, and their daughter products, K–40, Cs–137, Co–60, and Eu–152. Ra–226 (U–238 daughter) activity as well as the activities of its daughters (e.g., Pb–214 and Bi–214) are also measured. The MCA–calculated Ra–226 activity (and its daughters) includes the Ra–226 daughter from naturally occurring U–238 and any postulated Ra–226 that may have migrated from the source well.

A correction to the MCA–calculated activity is required because of the peak overlap at 185–186 keV from Ra–226 and U–235. Assuming that Ra–226 is in equilibrium with U–238 and that U–235 is 0.7% by weight of –238, it can be shown that the true Ra–226 activity is equal to the MCA–calculated activity multiplied by 0.5525. The stated assumption and the correction factor are valid because no enriched uranium was ever used at the facility.

Results from analysis of the soil samples in the above manner are presented in the next section. A statistical treatment of the type provided in the 1988 survey was not performed because of the narrow scope of this effort (namely removal of a relatively small contaminated item from an inaccessible area) and because of the limited number of samples.

4.5.3 Results and Discussion

MCA–calculated activities of selected radionuclides obtained from the gamma spectrometry of the soil samples are presented in Table 2 (Table 5 of Ref. 5). All values reported are concentrations in units of picocuries per gram (pCi/g). Concentration of Ra–226 and Cs–137 are reported because these are the suspect isotopes that could have migrated from the sources housed

Table 2. Results of Soil Sample Analysis

Sample No.	Soil Sample Location	Sample Weight (g)	Radioactivity Concentration (pCi/g)					Comment
			Ra–226	Cs–137	K–40	Pb–214*	Bi–214*	
Disposed								
1	Side of casing	938	ND	ND	24.2	0.33	0.36	Soil stuck to casing. Disposed of as radioactive waste
3	Bottom of casing	227	4.1	ND	35.7	1.69	1.60	Soil stuck to casing. Removed for analysis
4	Excavated dirt	920	ND	ND	23.1	0.28	0.40	Disposed of as ordinary dirt
Remainder								
2	Bottom of excavation	948	ND	ND	23.6	0.27	0.40	Soil in excavated area
Background								
	SSFL soil average	(average of three samples)	0.82	NM	22.2	0.84	NM	For comparison. Analyzed by U.S. Testing Company (Richland) for Groundwater Resources Consultants, Inc. (Ref. 9)
Acceptance Limit (DOE)	>15 cm below surface	—	15	—	—	—	—	Criterion from Table 2 (footnote**) of this report

ND: Not detected
NM: Not measured
*Daughter products of Ra–226

in the Ra–226 source storage well to the adjoining soil. Data on K–40 (naturally–occurring) and the two Ra–226 daughters, Pb–214, and Bi–214 are also shown; of these, the K–40 and Pb–214 data can also be compared with recently obtained background data for surface soils in SSFL (Ref. 4). In addition, background for Ra–226 activity reported in Ref. 4 is also included for comparison.

Referring to Table 2, no detectable activity is observed in regard to the suspect isotopes Ra–226 and Cs–137 for samples 1, 3, and 4. Also, for these samples, the values for K–40 are in a narrow range and are nearly the same as the background value elsewhere in SSFL for this naturally–occurring radionuclide.

The values for the Ra–226 daughters Pb–214 and Bi–214, are also in a narrow range for these three samples. However, the Pb–214 concentrations are a factor of about three lower than SSFL background data. Duplicate MCA analyses of the same samples confirm these values. The background value for Bi–214 is not available for a similar comparison, but its activity, as a daughter of Pb–214, should be equal to that of Pb–214. The presence of below detectable concentrations of the parent Ra–226 could be the reason for the relatively low concentrations of these two daughters. It is conceivable that a material with lower activity of Ra–226 (from U–238, its parent) than normal soil (e.g., construction sand) was mixed with the soil during installation of the source storage well resulting in Ra–226 concentrations which are lower than the background for SSFL. The results, nevertheless, show no contribution to the activities of Ra–226, its daughters, or Cs–137, that could have migrated from the source storage well.

The data shown in Table 2 with respect to sample No. 3 warrant some discussion. This sample shows a value of 4.1 pCi/g of Ra–226. Data from this sample for the other radionuclides are also not consistent with corresponding data for the other samples or with respect to the background data. This sample is of a lower mass value than that required for performing MCA analysis, and spurious data of this nature have been found in soil samples of low mass analyzed in other facility decontamination projects. However, for the present purpose, even if this value of 4.1 pCi/g is considered valid, it is still well below the 15 pCi/g DOE limit for Ra–226 for release of the facility "without radiological restrictions" (Ref. 2). The 15 pCi/g limit is also the remedial action standard used by regulatory agencies (for example, the U.S. Environmental Protection Agency and the Nuclear Regulatory Commission) for release with respect to "unrestricted use."

As shown in Figure 4–7, samples 2 and 3 were taken from locations that are immediately adjacent to each other. Thus, barring a highly localized spot (location of sample No. 3) to which the Ra–226 migrated, it would be reasonable to assume that Ra–226 activities would be the same for the two samples. If the migration of the Ra–226 was indeed localized, then it was contained in the 227 g of soil already removed from the facility, and hence, is of no future consequence. Given the consistency of the data from sample No. 2 with respect to samples No. 1 and No. 4, however, it is appropriate to conclude that the Ra–226 data for sample No. 3 is spurious, and that there is no actual Ra–226 in that location.

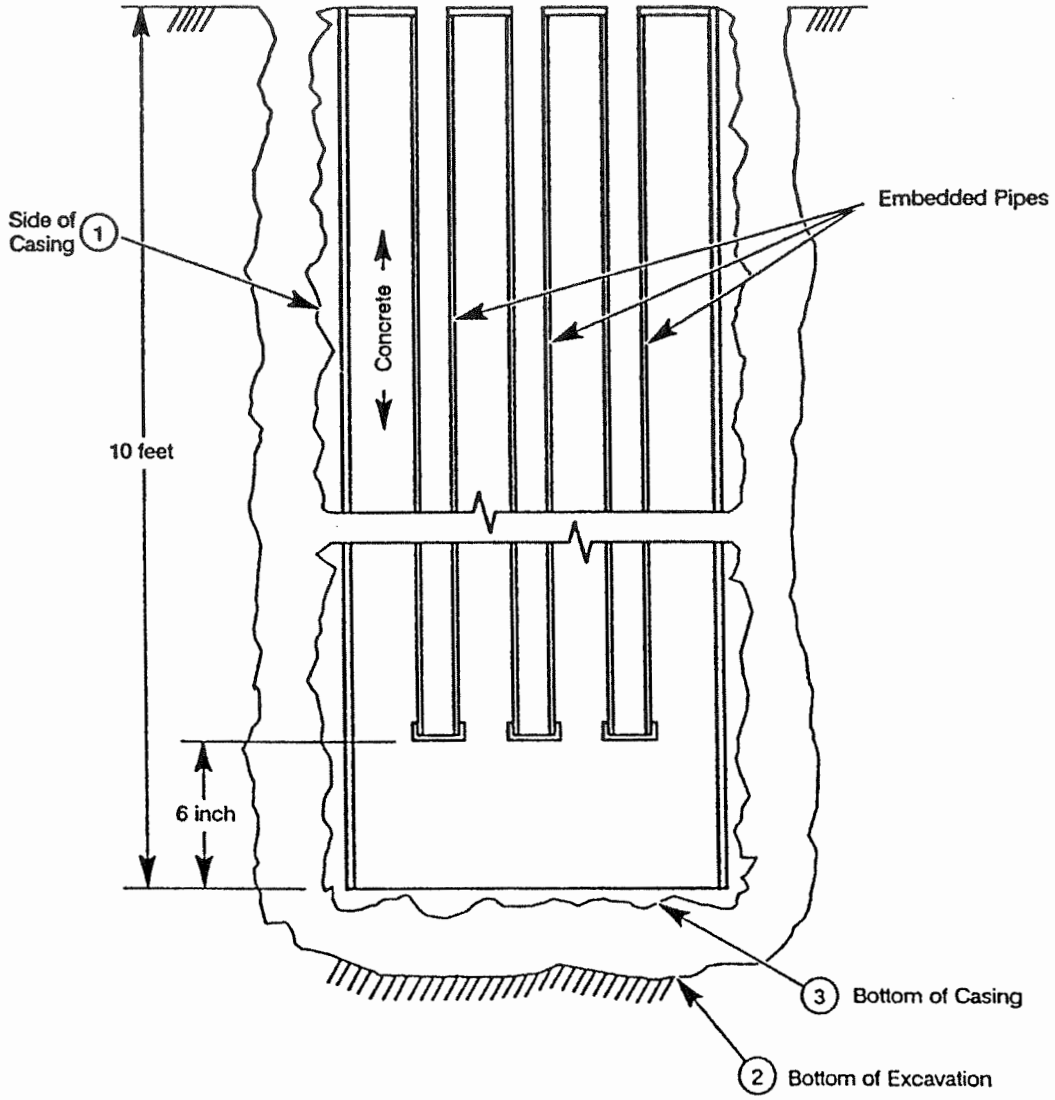


Figure 4–7. Schematic of Ra–22b Source Storage Well Showing Locations from where Soil Samples were taken for Analysis

4.6 FACILITY STATUS

Upon removal of the source storage wells and other equipment, the excavated area was refilled and re–surfaced. Figure 4–8 shows a photograph of the interior of the facility after completion of these restorations. Nonradioactive materials (principally metallic sodium in 55–gallon drums), which had been stored in the building and were temporarily stored outside during the removal operations, were returned to the reinstalled racks shown in the photograph. Building T029 continues as a nonradioactive hazardous materials storage facility.

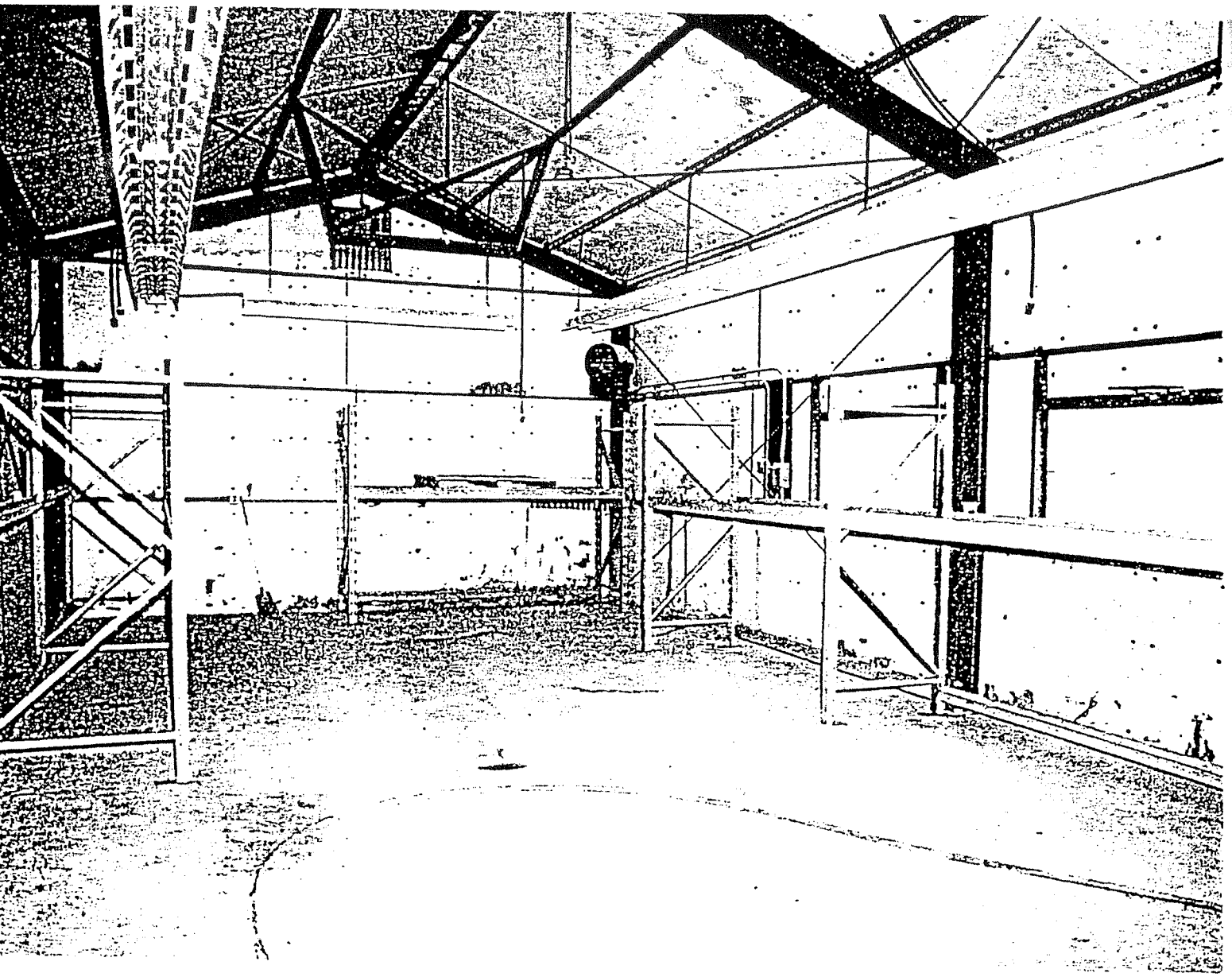


Figure 4–8. Interior of Building T029 Following Restoration

5.0 WASTE VOLUME GENERATED AND DISPOSAL

The volume of contaminated waste from the three source storage locations was approximately 40 ft^3. An additional 60 ft^3 of contaminated waste was generated from areas adjacent to the storage locations and soil and asphalt.

The housing used for the Co–60 source was disposed of as nonradioactive waste. In addition, the exhaust system outside the building was removed, surveyed, and determined to be clean for reuse. Soil samples collected during these operations were analyzed for radioactivity and showed no activity above background. The excavated area was then refilled.

6.0 PERSONNEL RADIATION EXPOSURE

No personnel radiation exposure was anticipated or encountered from the D&D activities for Building T029.

7.0 PROJECT COST EVALUATION

7.1 COST ESTIMATES

The removal of approximately 100 ft^3 of concrete, metal, and subsoil required the following man–hours for the decommissioning efforts of Bldg. T029.

Labor Classification	Expected No. EP Needed	Total Man–Hours	Man–Hours in Radiation Field
Dept. 635–123 Technician	3	360	360
Eng. & Supv.	1	120	60
Dept. 641 R&NS Technician	1	120	60

The decommissioning costs were funded by Rockwell International and complete records are unavailable.

8.0 REFERENCES

1. Badger, F. H. and Tuttle, R. J., "Radiological Survey Plan for SSFL," Rockwell International Report 154SRR000001, September 25, 1985.

2. "Guidelines for Residual Radioactivity at FUSRAP and Remote SFMP Sites," U.S., Department of Energy, February 1985.

3. "Investigation of Naturally Occurring Radionuclides in Rock, Soils and Groundwater Santa Susana Field Laboratory, Ventura County, California," Groundwater Resources Consultants, Inc., report 8640M-77, June 1, 1990.

4. "Health and Environmental Protection Standards for Uranium Mill Tailings," U.S. Environmental Protection Agency Regulations 40 CFR 192, March 7, 1983.

5. Final Decontamination and Radiological Survey of Building T029, N704SRR990029.

EXHIBIT V

FINAL RADIOLOGICAL SURVEY REPORT OF BUILDING 029

DD 903181 San 2.0D

Rockwell International
Rocketdyne Division

SUPPORTING DOCUMENT

GO NO.	S/A NO.	PAGE 1 OF	TOTAL PAGES	REV LTR/CHG NO SEE SUMMARY OF CHG	NUMBER
96110		56	56	New	N704SRR990029

PROGRAM TITLE

Building T029 Decontamination

DOCUMENT TITLE

Final Decontamination and Radiological Survey of Building T029

DOCUMENT TYPE

Safety Review Report

KEY NOUNS

Decontamination, unrestricted release

ORIGINAL ISSUE DATE

6-28-90

REL. DATE

6-28-90 C

PREPARED BY/DATE — DEPT — MAIL ADDR

G. Subbaraman 6/26/90 — 635 — NA02

IR&D PROGRAM? YES ☐ NO ☒
IF YES, ENTER TPA NO.

APPROVALS — DATE

H. Farrar IV 6/27/1990

R. J. Tuttle 6/22/90

P. D. Rutherford 6/27/90

DISTRIBUTION

*	NAME	MAIL ADDR
	*Baumeister, E. B.	HB15
	*Farrar IV, H.	NA02
	*Fujikawa, N. (2)	JA16
	*Gibbs, D. C.	HB13
	*Klein, A.	T020
	*Lafflam, S. R.	JA16
	*McCurnin, W. R.	T020
	*Oldenkamp, R. D.	T006
	*Oliver, B. M.	NA02
	*Rutherford, P. D.	HB07
	*Rozas, C. J.	CB01
	*Schrag, F. C.	T020
	*Subbaraman, G. (2)	NA02
	*Tuttle, R. J.	T100
	*D&D Files	T100
	*R&NS Library	T100

ETEC DISPOSITION

DTR. NO. 24909 DATE 8-28-90

LEVEL OF APPROVAL	APPROVAL AS SUBMITTED	APPROVED W/COMMENT	REVIEW (REPLY TO SUBMITTER)	DISAPPROVED W/COMMENT	RESUBMITTAL REQUIRED	RECORD ON CONFIG. SUM'Y	RECORD INFORMATION	ACCEPTED AS SUBMITTED
D635-0087/jah						X	X	

* COMPLETE DOCUMENT

NO ASTERISK, TITLE PAGE/SUMMARY OF CHANGE PAGE ONLY

ABSTRACT

A report on a comprehensive radiological survey of Building T029, performed in 1988, concluded that no residual radioactive contamination existed on the T029 floor or surrounding area, but recommended decontamination of a contaminated, below-floor-level Ra-226 source well. Accordingly, the source well and other equipment were removed from the facility and follow-up surveys were performed. Results of the two surveys show that all inspection tests were satisfactorily passed and that Building T029 is acceptably free of radioactive contamination.

The surveys demonstrate that the facility meets the requirements of "U.S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites (February 1985)," and is acceptable for release without radiological restrictions.

RESERVED FOR PROPRIETARY/LEGAL NOTICES

THIS REPORT MAY NOT BE PUBLISHED WITHOUT THE APPROVAL OF THE DOE OFFICE OF PATENT COUNSEL

FILE COPY

CONTENTS

TABLES

FIGURES

SUMMARY

PURPOSE. This report documents work performed to remove residual radioactive contamination in certain relatively inaccessible areas of Building T029, located in Rockwell International's Santa Susana Field Laboratories (SSFL), and to demonstrate that the facility is acceptably free of radioactive contamination.

BACKGROUND. Between the late-50's and April 1974, several radioisotope sources (Ra-226, Cs-137, Co-60, PoBe, and PuBe) were stored and utilized in T029 for calibration of radiation detection instruments. In 1964, release of radioactivity from a Ra-226 sealed source caused localized contamination of the below-grade source storage well. Outside of this inaccessible area, radiation surveys performed in 1974 and 1988 showed that radiation levels in T029 correspond to normal background levels at SSFL. All sources had been removed by 1974, and the facility is now being used to store reactive metals (sodium and NaK) prior to disposal.

WORK PERFORMED. To further reduce contamination to levels that are as low as reasonably achievable, the Ra-226 source storage well was excavated along with the Ra-226 source holder and both were disposed of as low-level radioactive waste. At the same time, the housing used for the Co-60 source was also demolished and the resulting uncontaminated debris was disposed of as nonradioactive waste. In addition, the exhaust system outside the building was removed, surveyed and determined to be clean for reuse. Soil samples collected during these operations were analyzed for radioactivity and showed no activity above background. The excavated area was then refilled.

STATUS. Building T029 currently stores nonradioactive hazardous materials (principally metallic sodium and NaK) prior to their planned disposal.

CONCLUSION. Based on results of the comprehensive 1988 radiation survey and the subsequent work described here, radiation and contamination levels in Building T029 do not exceed acceptable limits and hence the facility may be released for unrestricted use.

1. INTRODUCTION

Decontamination and decommissioning (D&D) of a number of formerly used radioactive material facilities is underway at Rockwell International's Santa Susana Field Laboratories (SSFL). During D&D of these facilities, efforts are taken to eliminate or reduce residual radioactive contamination to levels that are as low as reasonably achievable (ALARA). Upon completion of D&D, radiological surveys are performed to demonstrate that no residual radioactivity exceeds applicable limits.

This report documents the radiological D&D of Building T029 at SSFL in 1989 and supplements data obtained from a comprehensive radiation survey of this facility performed in 1988. Together, the 1988 survey data, and information and data presented in this report, demonstrate the current radiological cleanliness of this facility and its status for unrestricted release.

This report is organized as follows: A background discussion of the facility, including its location and operational history, is provided in Section 2. A detailed summary of the formal radiation survey performed in 1988 is provided in Section 3. The D&D efforts and the follow–up radiation survey data are described in Section 4. Conclusions are presented in Section 5. A list of items of record obtained during the D&D and the surveys, which are archived at Rockwell, are appended to this report.

2. BACKGROUND

2.1 FACILITY LOCATION

Building T029 is located within Rockwell International's Santa Susana Field Laboratories (SSFL) in the Simi Hills of southeastern Ventura County, California, adjacent to the Los Angeles County Line and approximately 29 miles northwest of downtown Los Angeles. Location of SSFL relative to Los Angeles and vicinities is shown in Figure 1. An enlarged map of neighboring SSFL communities is shown in Figure 2. Figure 3 shows relevant portions of a 1967 edition of the U.S. Geological Survey's (USGS) topographic map of the Calabasas Quadrangle where SSFL is located, with the author's markup of the location of Building T029. Using USGS terminology, the current USGS location description for Building T029 is: Township T2N; Range R17W; and, Section 30, Calabasas Quadrangle.

Figure 4 is a plot plan of the western portion of SSFL (known as "Area IV") where Building T029 is located. As shown in this figure, access to T029 is by way of 10th Street, which intersects "G" Street just southwest of building T064. An asphalt concrete roadway (10th Street) runs right up to the facility. A portion of the roadway is fenced in as part of the facility. Figure 5 is an old photograph of T029 and the surrounding area, looking south–southwest. Figure 6 shows the entrance gate on 10th Street and the west wall of T029, and Figure 7 shows a close–up view from the south.

2.2 BUILDING CHARACTERISTICS

Constructed in 1959, as an open bay facility, T029 is a Butler–type building with a steel frame, and corrugated metal siding and roofing. The building is 20 ft x 40 ft with a 12–ft eave height. It is a single room with no office, support laboratory, rest room areas or installed air conditioners. The ceilings and walls are insulated with 1–in. thick fiberglass mat. The floors were originally tiled with asphalt tile. The floor is now a bare concrete slab. Ventilation is provided by an exhaust blower, with the facility air exhausting through two HEPA filters. Figure 8 is a plot plan of T029.

2.3 FACILITY OPERATING HISTORY

From 1959 to 1974, Building T029 was used as a facility for calibrating radiation detection instruments. In 1959 and in subsequent years it was called the Radiation Measurements Facility and the Old Calibration Facility, respectively. The plot plan shows

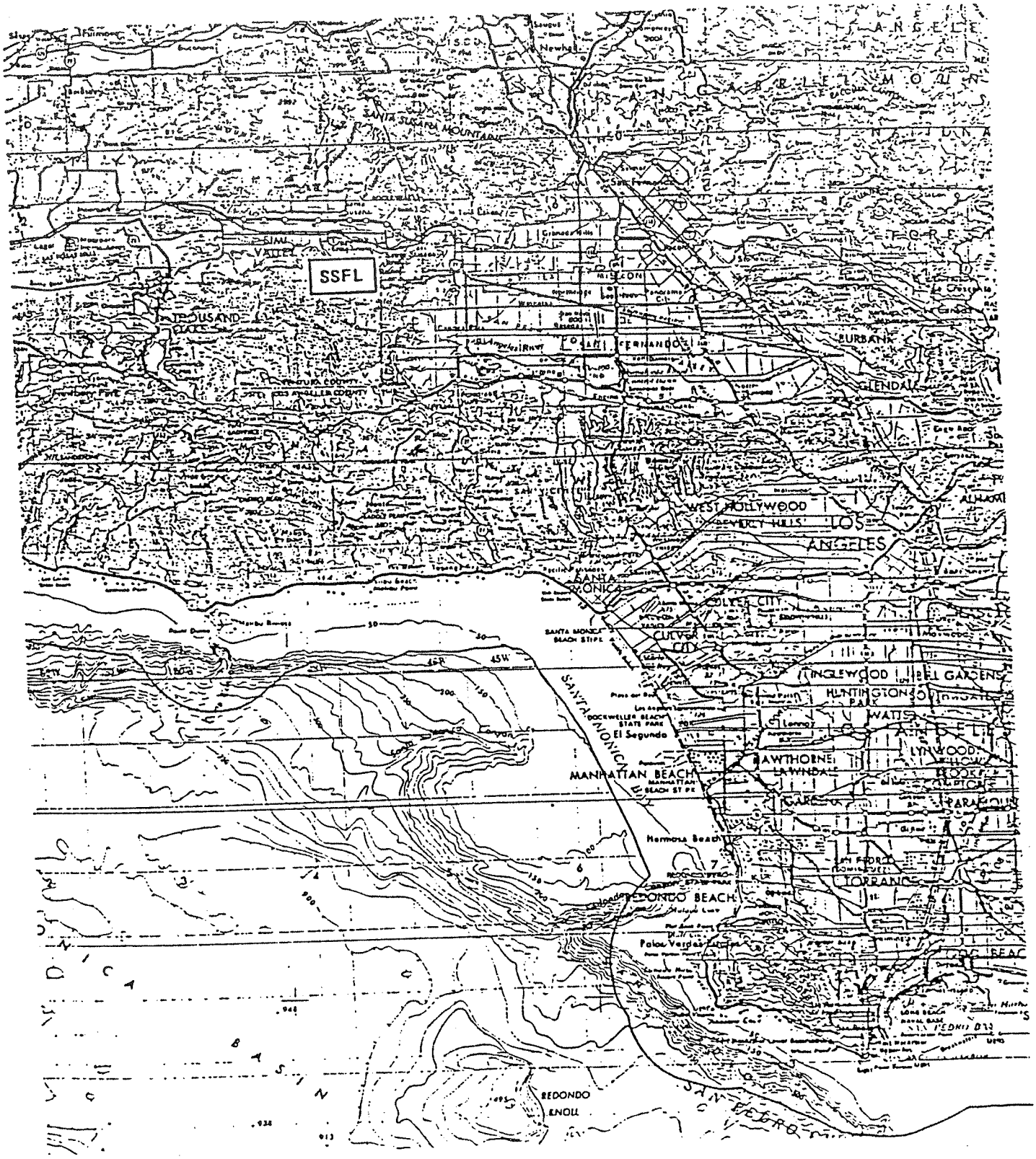


Figure 1. Map of Los Angeles Area

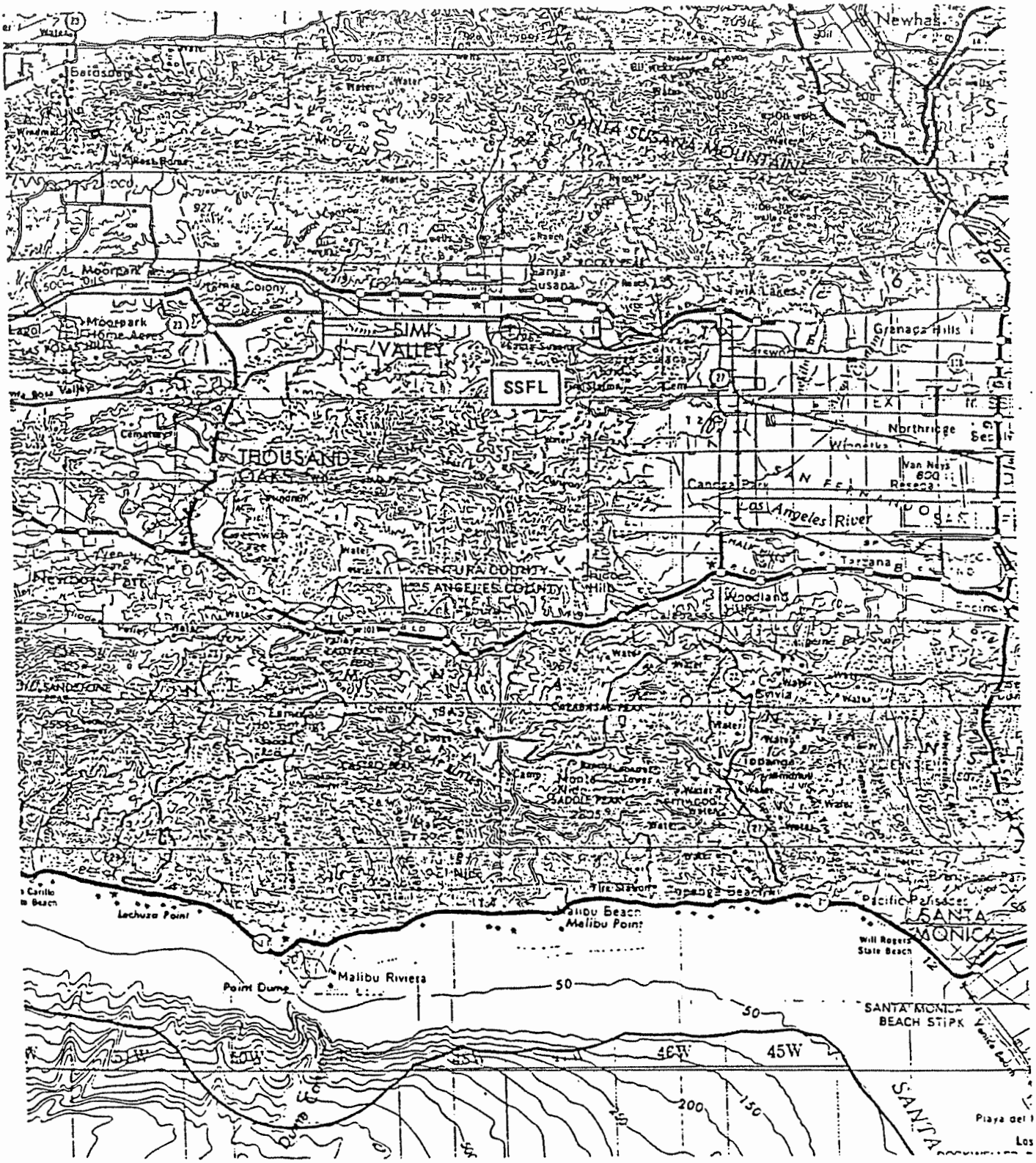


Figure 2. Map of Neighboring SSFL Communities

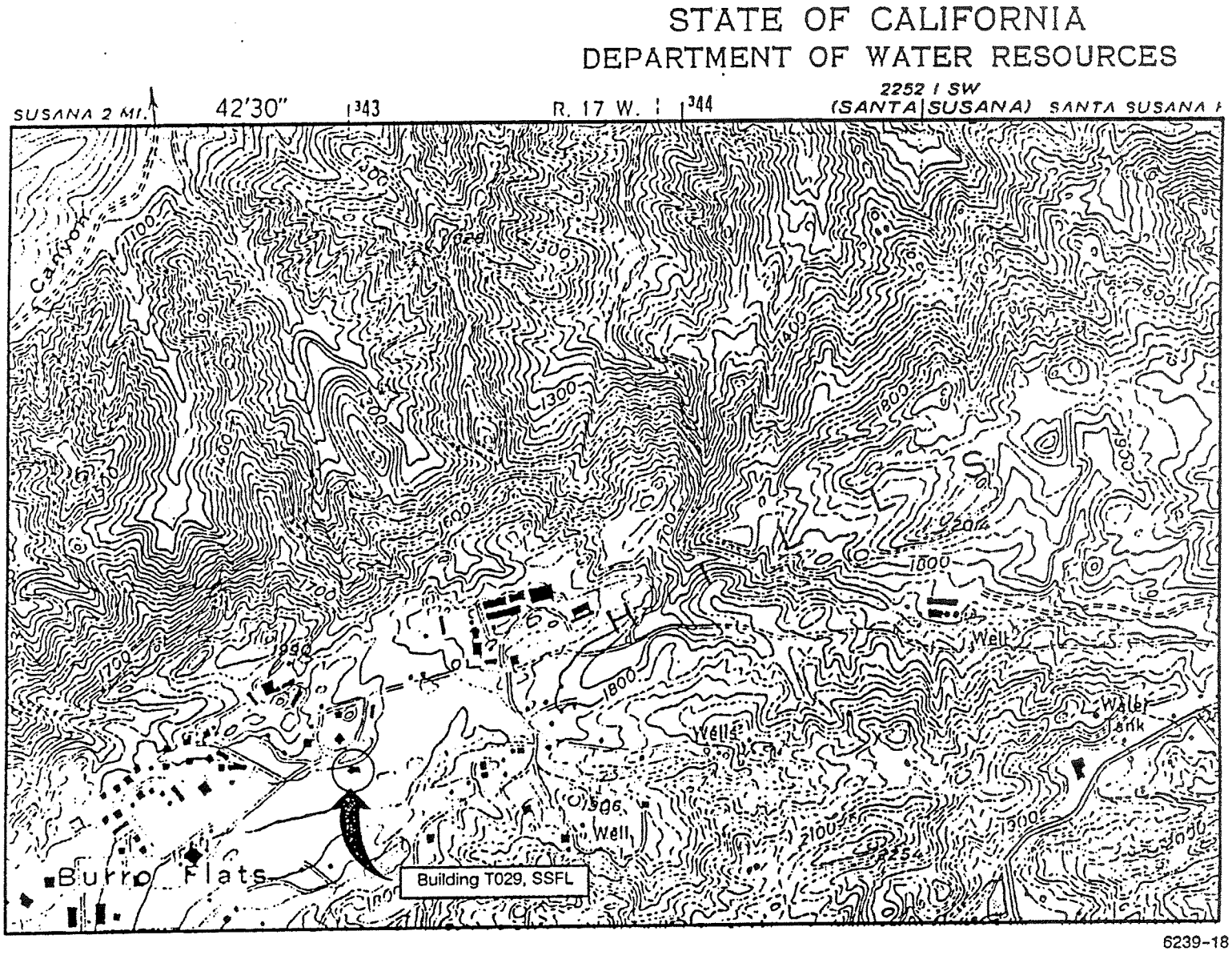


Figure 3. USGS Topographic Map of Portions of Calabasas Quadrangle; Bottom Left Area Corresponds to SSFL

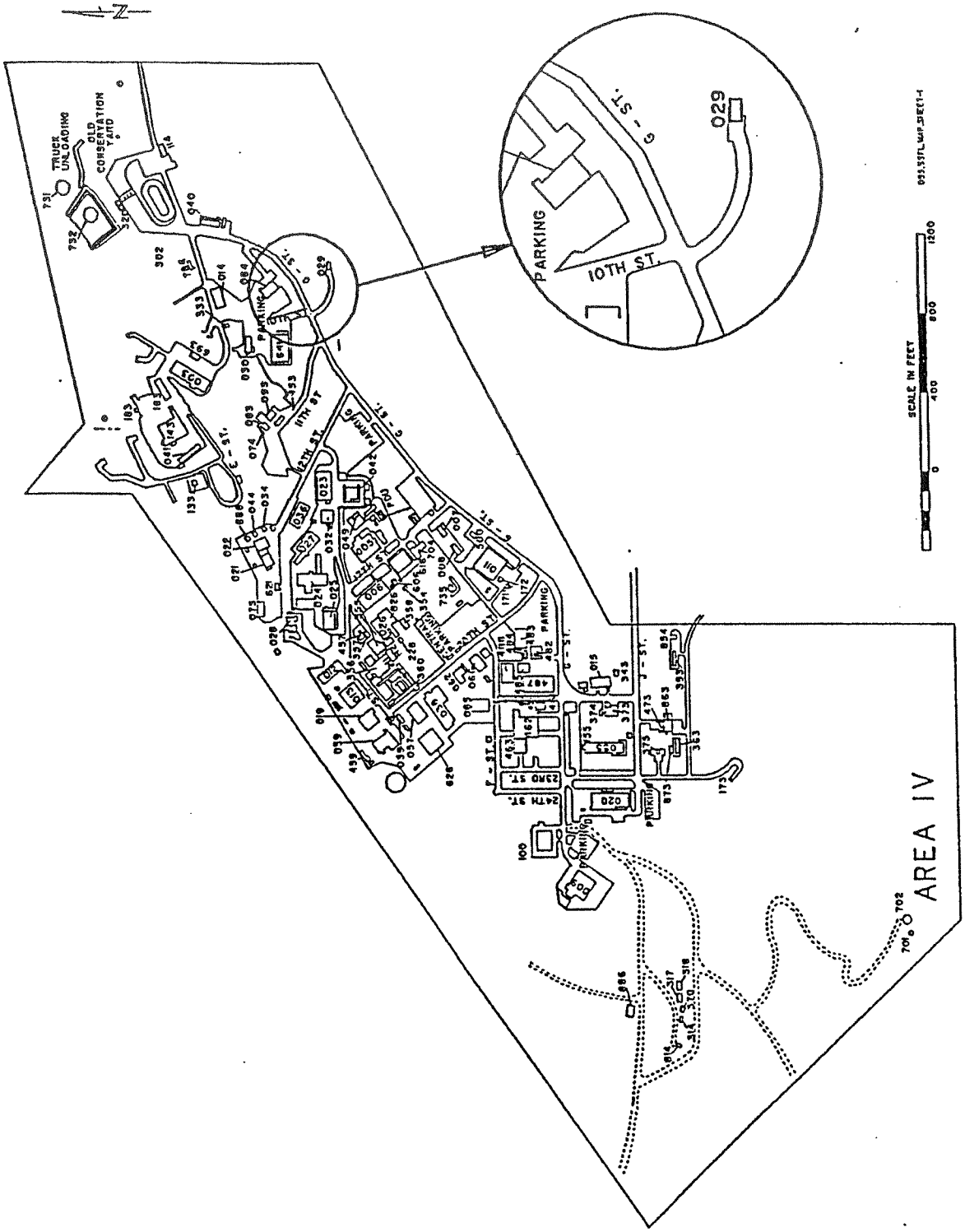


Figure 4. SSFL Layout, Showing the Location of Building T029

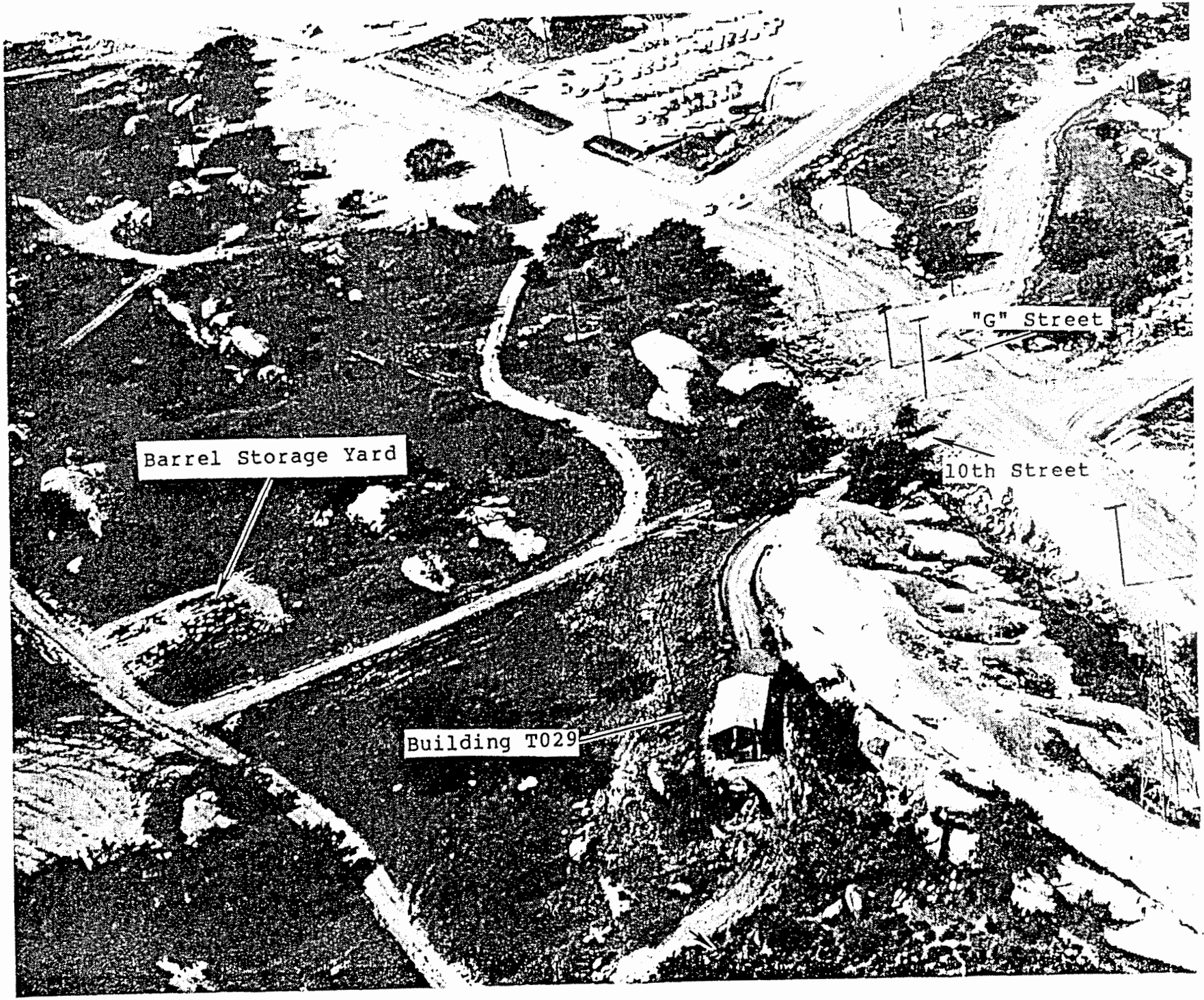


Figure 5. Photograph of T029 Looking South Southwest

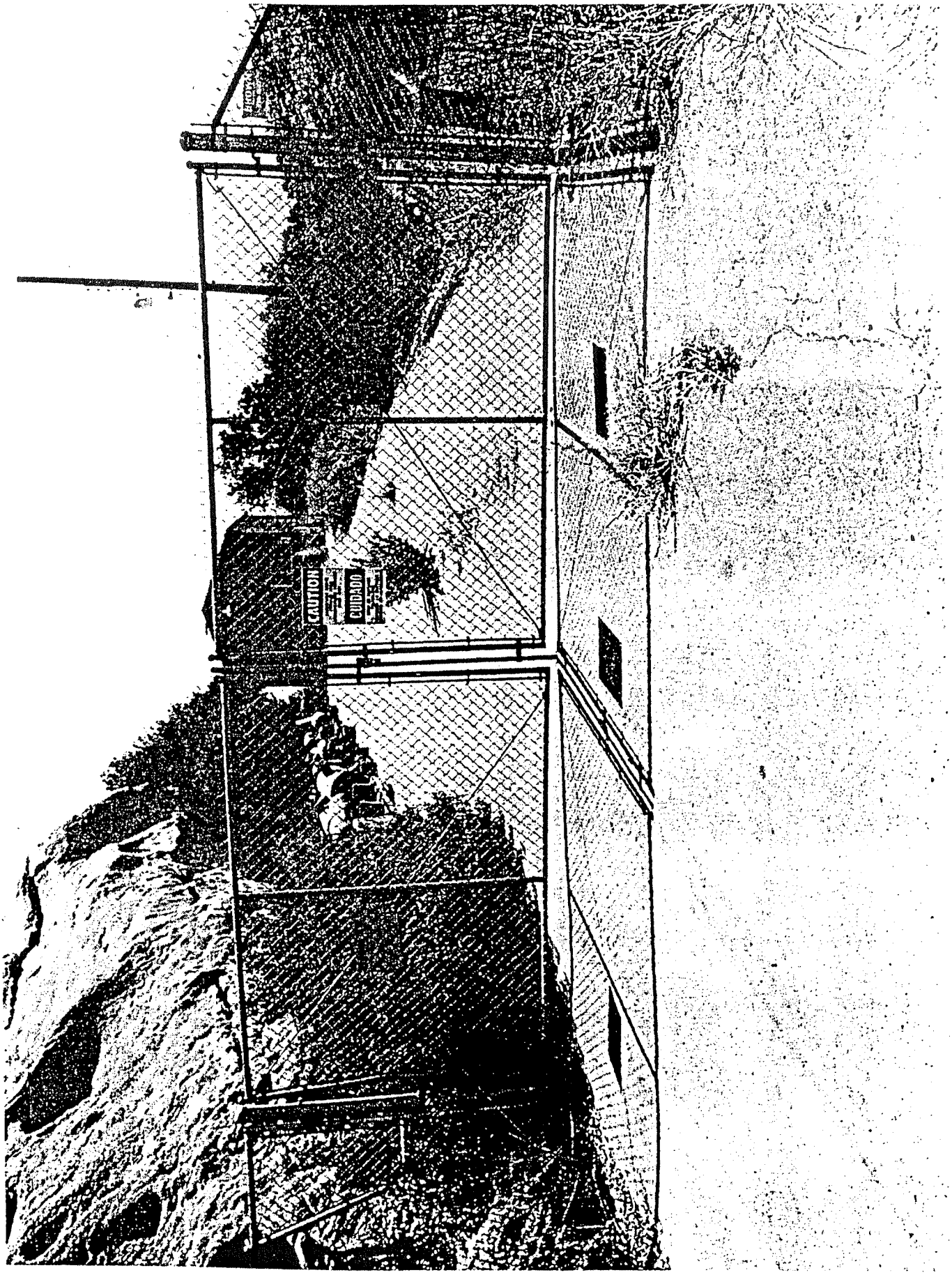


Figure 6. Entrance Gate to Building T029, From the West

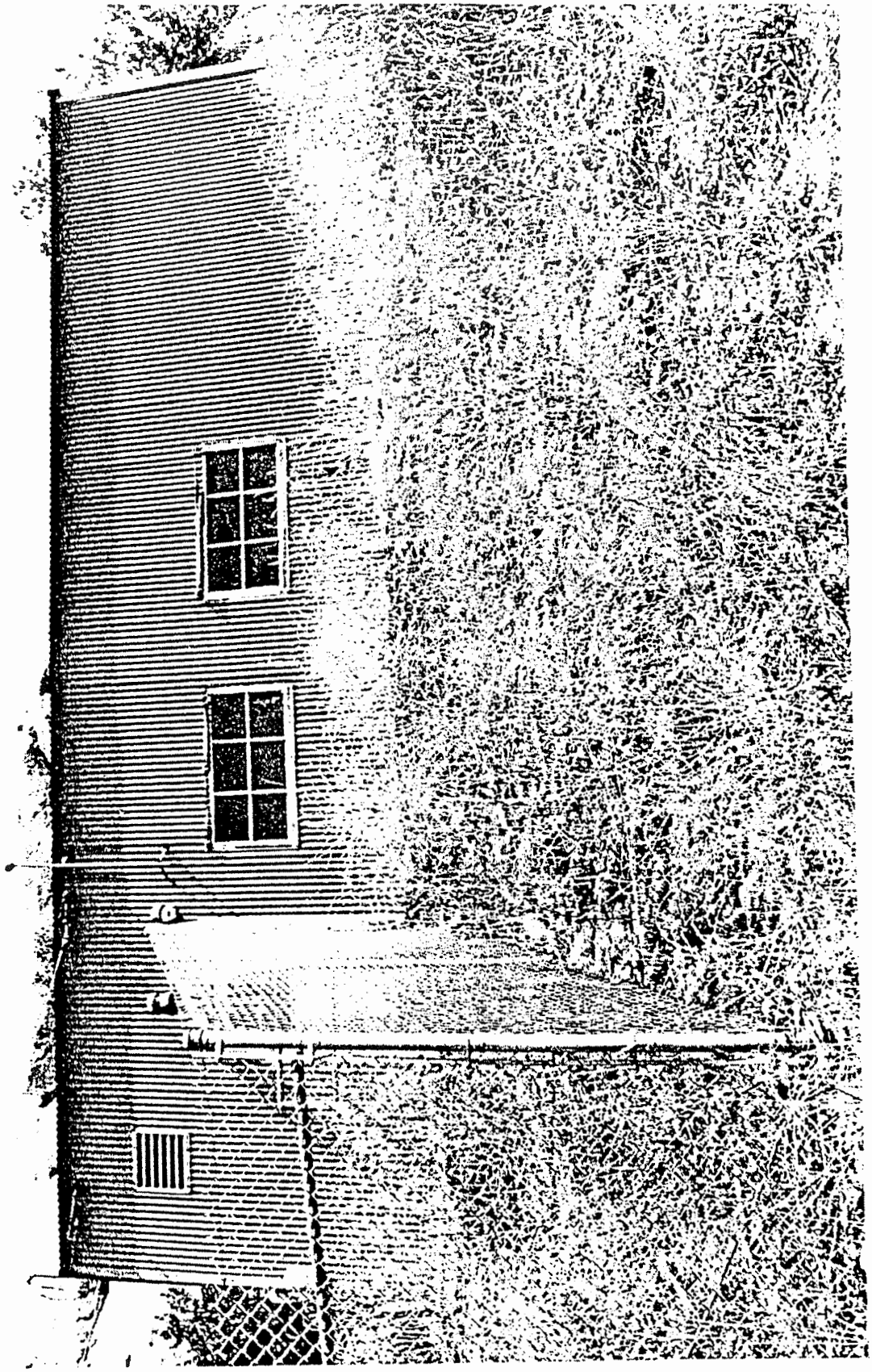


Figure 7. Building T029 View From the South (close-up)

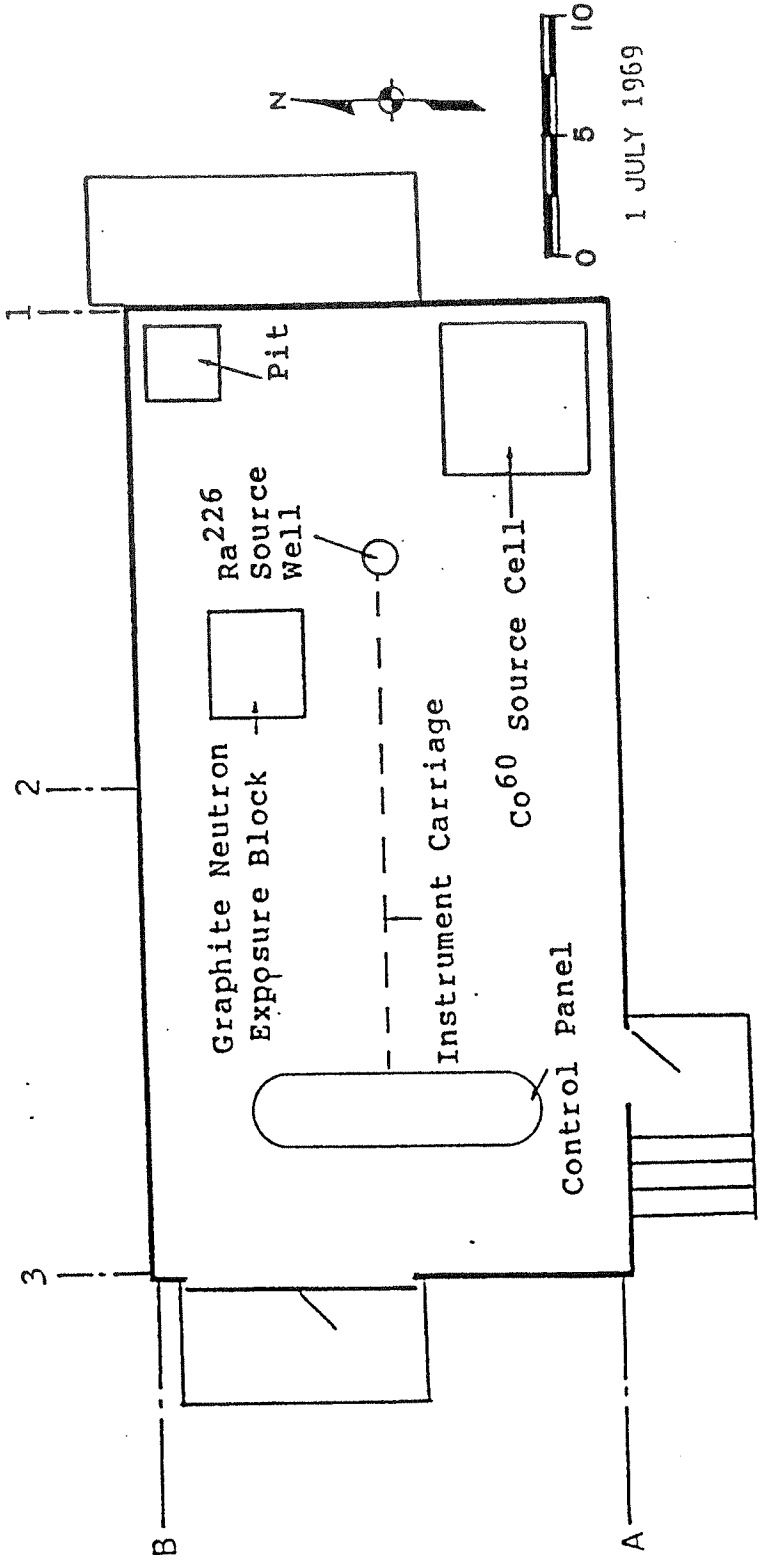


Figure 8. Plot Plan of the Radiation Measurements Facility, Building T029

locations within the building where the calibration sources were housed. Table 1 lists the calibration sources used in the facility, their source strengths and the measurement dates of their strengths. Of these, the three Ra-226, and subsequently the Cs-137 sources were housed inside a source storage well made from a 12-in. diameter, 10 ft long, Schedule-20 galvanized pipe casing which was installed below grade. Figure 9 shows details of the Ra-226 source storage well. The sources were attached to nylon strings and were guided through three 1-in. diameter pyrex tube thimbles within coaxial, Schedule-40 galvanized pipes which were embedded evenly within the casing, with concrete as embedment. The encapsulated Co-60 sources were housed separately in a 12-in. diameter pipe which extended 10 ft below grade and 4 ft above grade. Above grade, the pipe was enclosed with lead shielding, and covered by a 77-in. square concrete rolling door. The PoBe and PuBe neutron sources were housed in a 3 ft x 3 ft x 2 ft-deep pit, with a graphite neutron exposure block, shown in Figure 8.

All of the sources were fully encapsulated, were leak-tested at least every six months in compliance with State of California Radiation Control Regulations, and subsequently removed from T029. Thus, apart from one incident involving the dropping of a Ra-226 capsule (described below), there is no known cause for radioactive contamination in the facility.

Radioactivity was released from one of the Ra-226 source capsules (Source No. 1) on March 23, 1964 when this source became detached from the nylon string and fell into the bottom of the source thimble. The 13-ft fall cracked the outer plastic encapsulation

Table 1. Calibration Sources Used at T029

Source	Source Strength (mCi)	Date*
(1) Ra-226	24.8	1960
(2) Ra-226	132	1960
(3) Ra-226	930	1960
(4) Co-60	Unknown	
(5) PoBe	Unknown	
(6) PuBe	Unknown	
(7) Cs-137	5310	September 1963
(8) Cs-137	5260	September 1963

*Date Source Strength was measured

D635-0087

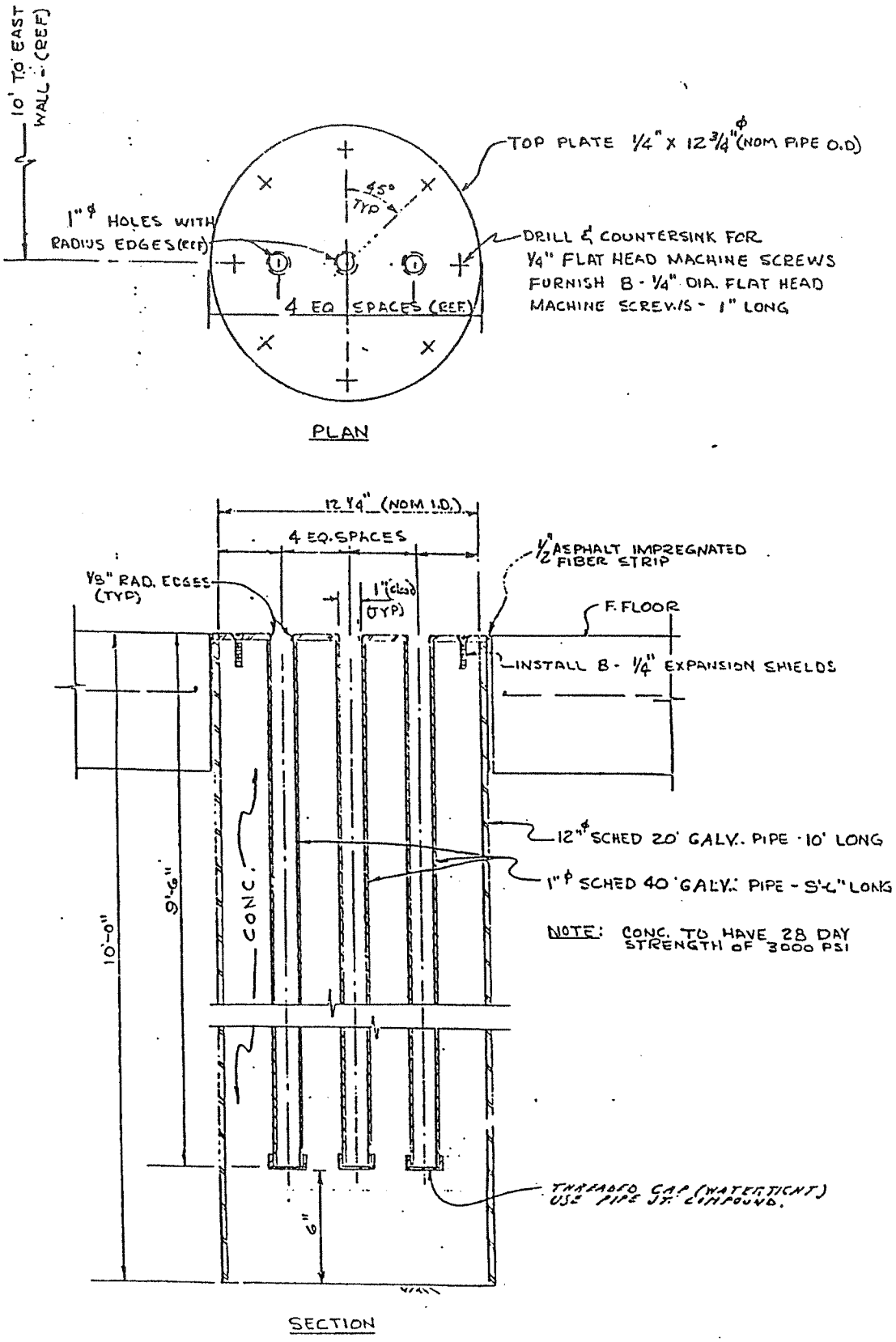


Figure 9. Ra–226 Source Storage Well Detail

surrounding the inner capsule and released some loose Ra-226. Release of radioactivity was primarily confined to the well and the source thimble. An April 10, 1964 report describing the incident, the subsequent recovery of the source, and the decontamination of the area outside the well is attached as Appendix A to this report.

Operation of the facility continued by replacing all the Ra-226 sources with two Cs-137 sources. Although two other operational incidents were experienced (the first involving dropping another Ra-226 source into the well in 1961, and the second involving dropping one of the Cs-137 sources into the well in 1970), neither of these incidents caused release of radioactivity, and hence were of no radiological consequence.

All operations in Building T029 with radioactive materials had been in support of DOE's predecessor agency programs. The facility was transferred to the DOE's Energy Technology Engineering Center (ETEC) operating contract in September 1989.

2.4 DECOMMISSIONING OPERATIONS AND RADIATION SURVEYS

Partial decommissioning of T029 was accomplished in April 1974 when all radioactive sealed sources were removed and transferred to another facility. Subsequently, T029 was redesignated as a nonradioactive hazardous waste storage facility for the storage of excess alkali metals and components containing alkali metals.

In 1985, building T029 was included in an overall survey plan for SSFL facilities (Ref. 1). A purpose of the survey plan is to inspect the facilities for residual radioactive contamination and recommend remedial actions.

In accordance with the plan described in Ref. 1, the interior of building T029, its surrounding areas, and the entrance roadway were surveyed in 1988 for gamma-emitting contamination. The Ra-226 source storage well was also surveyed for alpha contamination, with the source thimble in a raised position. The survey methods, results, and analyses are described in Ref. 2. A summary of this 1988 survey follows in Section 3.

The 1988 survey (Ref. 2) concluded that no residual contamination existed on the T029 floor surface or the surrounding area. The survey report also concluded that some alpha contamination existed on the source thimble and recommended further investigation, decontamination, and disposition of the well.

Accordingly, in the present effort, the source storage well was excavated and other equipment was removed using controlled procedures. The Ra-226 source storage well

was disposed of as low-level radioactive waste. Follow-up smear surveys and soil activity measurements in the affected areas showed no residual radioactivity. The affected areas were then refilled and the floor was resurfaced. The remainder of this report, commencing in Section 4, provides details of this effort.

3. SUMMARY OF 1988 RADIATION SURVEY

3.1 OVERVIEW

Upon decontamination and decommissioning (D&D) of its radioactive constituents, releasing a facility for other unrestricted uses requires a radiation survey to demonstrate that the applicable regulatory limits for such a release are met. The survey is performed in accordance with an established plan, and a statistical interpretation of the data is performed to demonstrate that the numerical regulatory release criteria have been met. Together, the 1988 radiation survey of Building T029 (Ref. 2) and the follow-up work reported in this document fulfill the requirements for such a survey. For the sake of completeness, and for ease of future reference, a summary of the 1988 survey is provided in this section.

3.2 SCOPE OF SURVEY

The interior of Building T029, the surrounding area, and entrance roadway were surveyed for gamma-emitting contamination. The Ra-226 source well was surveyed for alpha contamination by raising the source thimble from the bottom of the well. An area south of T029 which was used in the early 1960s for storing barrels was also surveyed for indications of residual radioactive material. For purposes of comparison, natural background radiation data were also taken at about the same time at the three following SSFL locations where no radioactive materials were ever used, handled, or stored: Building 309 area, Well No. 13 Road (Dirt), and Incinerator Road (Dirt).

3.3 SURVEY METHOD

3.3.1 Criteria and Their Implementation

Acceptable contamination limits and gamma exposure rates for unrestricted use of a decommissioned facility are prescribed in Department of Energy (DOE) guidelines (Ref. 3), the Nuclear Regulatory Commission's (NRC) Regulatory Guide 1.86, NRC license SNM-21, and other references. Table 2 shows the composite of conservative limits derived from these references and adopted by Rocketdyne. Of these, the ambient gamma exposure rate criterion (5 μR/h above background) was first applied at SSFL during the decommissioning of the NRC-licensed L-85 reactor. Three specific "action levels" were

Table 2. Maximum Acceptable Contamination and Gamma Exposure Rate Limits (1988 Survey)

No.	Parameter	Limit, in Unit Specified	Reference
1	Total surface contamination (averaged over 1 m^2)	a) Alpha: 100 dpm/100 cm^2 b) Beta: 5,000 dpm/100 cm^2	3
2	Maximum surface contamination (in 1 m^2)	a) Alpha: 300 dpm/100 cm^2 b) Beta: 15,000 dpm/100 cm^2	3
3	Removable surface contamination (averaged over 100 cm^2)	a) Alpha: 20 dpm/100 cm^2 b) Beta: 1,000 dpm/100 cm^2	3
4	Gamma exposure rate* (at 1 m from surface)	5 μR/h above background	4
5	Soil activity concentration**	a) Alpha: 21 pCi/g (for depth ≤ 15 cm below surface) b) Alpha: 31 pCi/g (for depth > 15 cm below surface) c) Beta: 100 pCi/g	3, 5 & 6

* Although DOE Guide (Ref. 3) recommends a value of 20 μR/h above background for gamma exposure rate, the NRC Dismantling Order for the L–85 reactor decommissioning (Ref. 4) required 5 μR/h above background. For conservatism, 5 μR/h above background is used at Rocketdyne to compare survey results.

** Alpha activity concentration limits for Ra–226 are 5 pCi/g (Ref. 3) plus that contribution from naturally occurring radioactivity (about 16 pCi/g from Ref. 5, p. 93) averaged over the first 15 cm of soil below the surface. At a depth greater than 15 cm below the surface, 15 pCi/g averaged over 15–cm–thick layers of soil plus "background" is the limit. The total beta activity concentration limit is 100 pCi/g (Ref. 6), including background which is about 24 pCi/g.

established and initiated if the surveyor detected radiation according to the following criteria:

1. Characterization Level – That level of exposure rate which is below 50% of the maximum acceptable limit. This level is typical of natural background levels, or slightly above, and requires no further action.

2. Reinspection Level – That level of exposure rate which is above 50% of the maximum acceptable limit. A further survey of the area and additional samples are required in this case.

3. Investigation Level – That level of exposure rate which exceeds 90% of the maximum acceptable limit. Specific investigation of the occurrence is required in this case.

Results of the Building T029 survey showed no exposure rates requiring reinspection or investigation (see Section 3.4). Thus, none of the additional criteria listed in Table 2 (e.g., surface soil activity or alpha and beta contamination measurements of the general area) warrant further consideration.

3.3.2 Survey Procedures

For purposes of the T029 radiation survey, the building and surrounding area were treated as a single sample lot for characterization and data interpretation. Figure 10 shows the survey sampling lot plan, made of 6–m by 6–m grids superimposed on the building plot. As shown, points within the grids (marked with "."), corresponding to the interior areas of T029, the roadway (10th street), and the fenceline (marked with "X") were surveyed for gamma exposure rates. In all, a total of 40 gamma exposure rate measurements were made. Direct alpha contamination measurements were made for "indication only" on an as needed basis, such as the case of the raised source thimble.

Measurements of gamma exposure rates were obtained from a 1 in. by 1 in. NaI scintillation crystal coupled to a Ludlum Model 2220–ESG portable scaler. The scaler was mounted on a tripod so that the sensitive NaI crystal was 1 m above the ground. The detector is equally sensitive in all directions (i.e., 4π geometry), and can detect variations in exposure rates down to 0.5 μR/h, on the basis of counts obtained during 1 minute. The count rate (cpm) obtained from the NaI crystal is readily converted to exposure rate (μR/h) by means of an efficiency factor for the device. The detector is calibrated quarterly using Cs–137 as the calibration source, in the mR/h range and cross–calibrated against a Reuter Stokes High–Pressure Ion Chamber in the μR/h range. Count rates were converted to exposure rates using the relationship that 215 cpm = 1 μR/h at background

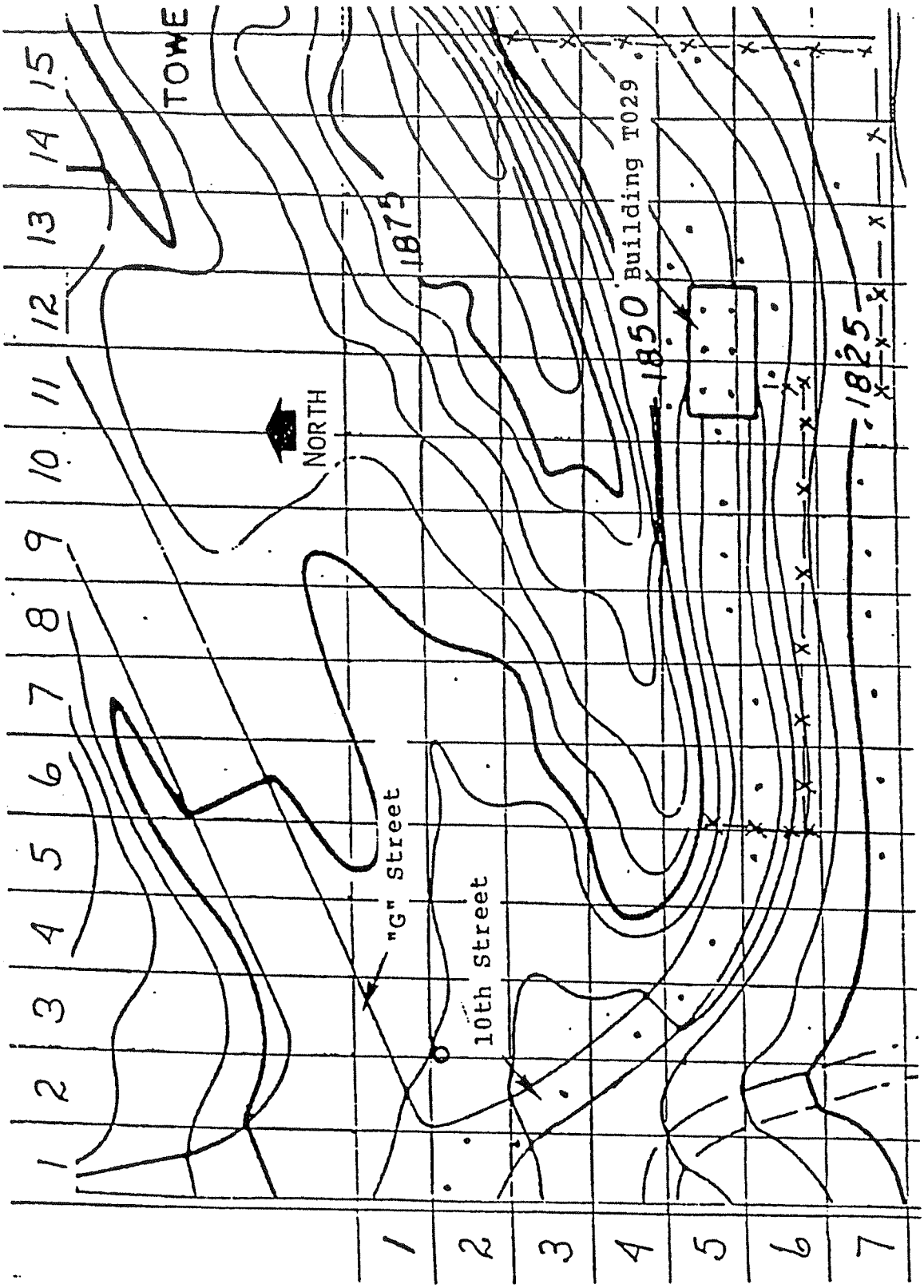


Figure 10. Building T029 Sampling Lot Plan (1988 Survey)

exposure rates. The instrument response was also checked three times daily using a Ra-226 calibration source.

Direct alpha contamination measurements were made using a Ludlum Model 43-5 alpha probe connected to a Ludlum Model 12 countratemeter.

3.3.3 Data Analyses

A statistical procedure is required to interpret the applicability of the exposure rate data collected at the 40 selected random locations to the entire facility. A statistical method known as "sampling inspection by variables" was used to analyze data from the Building T029 radiation survey (Ref. 2). The method has been widely applied in industry and the military, and is essential where destructive tests must be performed (e.g., in quality control) or where the lot size is impracticably large.

In sampling inspections by variables, the number of data points on which measurements are obtained is first chosen to be large so that the distribution of the data is normal (i.e., gaussian). The mean of the distribution, $\overline{X}$, and its standard deviation, s, are then related to a "test statistic," TS, as follows:

$$TS = \overline{X} + ks.$$

TS and $\overline{X}$ are then compared with the applicable limit (5 μR/h above background, in this case), to determine acceptance or other plans of actions, including rejection of the area. The value of k is determined from the sample size and two other statistical sampling coefficients which are related to a consumer's risk of accepting a lot, given that a fraction of the lot has rejectable items in it. These sampling coefficients, and use of the resulting calculated value of TS for comparison against the applicable limit and establishing action plans are further discussed in Ref. 2. It suffices to say here that the values chosen for the coefficients correspond to assuring, with 90% confidence, that 90% of the facility has residual contamination below 100% of the applicable limit (a 90/90/100 test). Also, the choice of values for the coefficients is consistent with industrial sampling practices and the State of California regulations (Ref. 7).

Data obtained from the T029 radiation survey were treated using this statistical approach. The reduced data were plotted against the cumulative probability for the gaussian with the cumulative values shown on a probability grade scale. Display of data in this

manner permits clear identification of values with significantly greater exposure rates (and thus contamination) than expected for the lot.

3.4 RESULTS

Ambient gamma exposure rates obtained from the 40 measurements at the Building T029 grid locations shown in Figure 10 are provided in Table 3. The ambient exposure rates range from 10.45 μR/h to 16.50 μR/h, the lowest being at a point within the building. Figure 11 shows the data plotted against a probability-grade scale for the cumulative probability (x-axis). The average for the 40 measurements (14.4 μR/h) is at the 50% cumulative probability.

Six of the 40 survey locations were inside of the building and the remainder were outdoors. Table 4 provides averages, standard deviations and ranges (i.e., maximum - minimum) for the the entire set, the indoor set and the outdoor set. Also included for comparison are corresponding data from measurements taken at the three other SSFL locations where no radioactive materials were ever handled, stored or used.

Alpha measurements at the source storage well, with the source thimble in the raised position, showed 200 cpm, which corresponds to about 2800 α-dpm per 100 cm2. The thimble was lowered back in position after this "indication only" measurement was made.

The area south of T029 where barrels of unknown materials were stored in the '60s showed no detectable activity.

3.5 DISCUSSION

Data shown in Table 4 clearly demonstrate that the ambient gamma exposure rates measured in Building T029 are similar to the background exposure rates measured in the general vicinity and are a result of natural radioactivity present at SSFL.

The mean of the three background average exposure rates shown in Table 4 is 15.3 μR/h which is slightly higher than the 14.4 μR/h average for the entire set of Building T029 measurements. To compare against the 5 μR/h-above-background limit (Table 2), the 15.3 μR/h background average is subtracted from the individual ambient exposure rates shown in Table 3. Application of the statistical criteria, discussed in Section 3.3.3, for the background-subtracted data for Building T029 is shown in Figure 12 which is plotted in the same manner as Figure 11. Figure 12 also shows the horizontal

Table 3. Ambient Gamma Exposure Rates in Building T029

	Number	Grid Name	Exposure Rate (μR/h)
	1	2–1	14.48
	2	2–1	13.85
	3	3–1	14.30
	4	3–2	14.14
	5	4–3	14.54
	6	5–3	13.89
	7	5–4	14.20
	8	6–5	14.78
	9	6–6	14.83
	10	6–7	14.79
	11	5–8	14.50
	12	5–9	14.70
	13	5–10	14.37
	14	5–11	13.39
	15	5–11	15.21
	16	5–12	14.19
	17	5–13	15.23
Highest ➧	18	5–13	16.50
	19	4–15	16.00
	20	5–15	15.71
	21	6–15	15.50
	22	7–14	15.60
	23	7–12	15.61
	24	7–12	15.59
	25	7–11	15.50
	26	7–10	15.85
	27	7–9	15.60
	28	7–8	15.84
	29	7–7	16.32
	30	7–6	15.80
	31	7–5	16.02
	32	6–11	13.15
	33	6–12	13.68
	34	6–13	14.81
	35	5–11*	12.17
	36	5–12*	10.51
	37	5–12*	10.95
	38	5–12*	12.77
Lowest ➧	39	5–12*	10.45
	40	5–11*	11.52

Average = 14.4 μR/h

*Locations inside Building T029

D635-0087

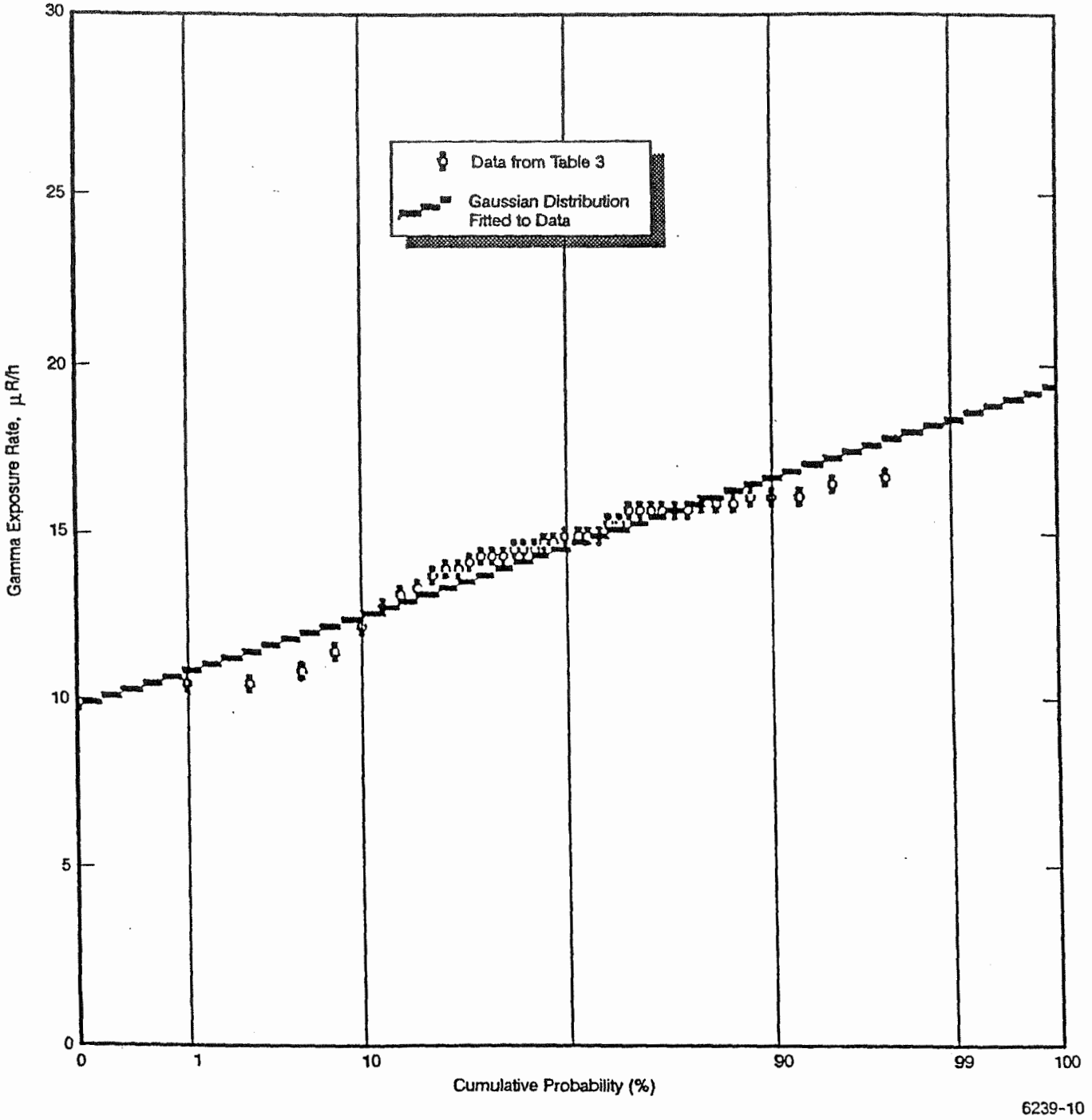


Figure 11. Ambient Gamma Radiation at Building T029 and Surrounding Areas

Table 4. Ambient Gamma Radiation at SSFL Compared to T029 Measurements

Location	Number of Measurements	Average Exposure Rate (μR/h)	Standard Deviation (μR/h)	Range (μR/h)
T029 Entire Data Set	40	14.4	1.55	6.05
T029 Indoor Data Set	6	11.4	0.94	1.32
T029 Outdoor Data Set	34	14.9	0.87	3.35
Bldg 309 Area (1/19/88)	36	15.6	0.82	3.4
Well No. 13 Road (Dirt) (4/29/88)	43	16.2	0.49	2.2
Incinerator Road (Dirt) (4/29/88)	35	14.0	0.36	1.4

D635-0087

line corresponding to the background-subtracted Test Statistic at a value of 1.628 μR/h; the cumulative probability corresponding to this test statistic is 93%. As shown, the entire population of the 40 background-subtracted Building T029 exposure rate measurements lies below the test statistic and the maximum acceptance limit (5 μR/h). In fact, all of the data, and the test statistic, are below the 50% characterization level (2.5 μR/h). Thus, the area was found acceptably free of radioactivity by this inspection technique.

The single "indication only" data obtained on the raised source thimble confirmed that additional alpha contamination was likely to exist below the T029 floor level where the dropped Ra-226 source was originally located.

3.6 CONCLUSIONS

Based on the results obtained, the 1988 radiation survey concluded that the gamma exposure measurements showed that no residual contamination existed on the inspected areas of Building T029 facility floor or its surroundings. Accounting for the variations in the natural background, and subtracting a value best representing the natural background, the survey further concluded, through the sampling inspection by variables method, that the the area is generally clean of any residual radioactive contamination. The same conclusion applies to the barrel storage yard.

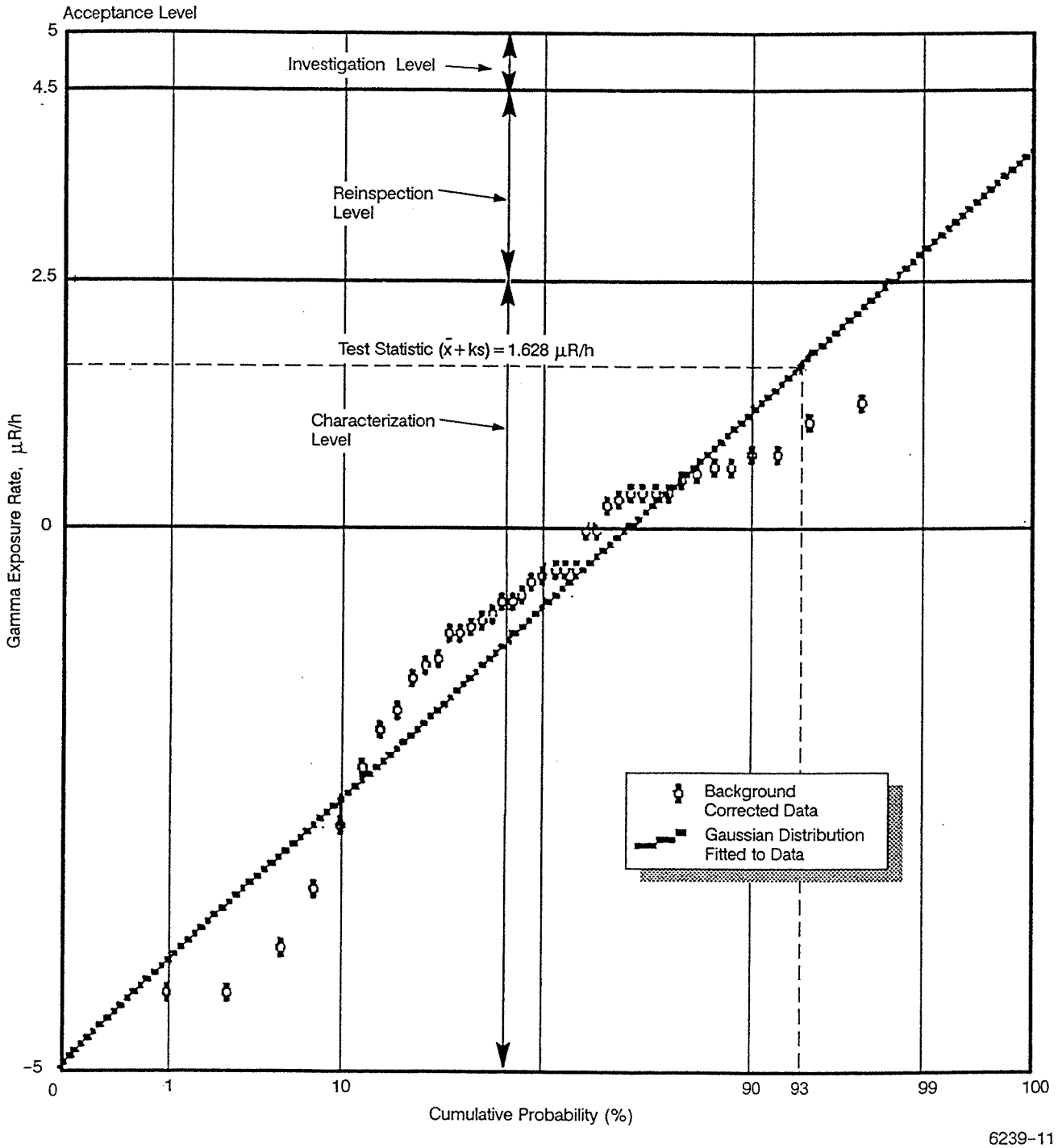


Figure 12. Ambient Gamma Radiation at Building T029 (Corrected for Background)

The 1988 radiation survey, at the same time, concluded that the Ra–226 storage well inside T029 was still contaminated.

3.7 RECOMMENDATION

The 1988 radiation survey recommended further investigation, decontamination, and disposition of the Ra–226 storage well.

3.8 IMPLEMENTATION OF THE RECOMMENDATION

The recommendation of the 1988 radiation survey was carried out in 1989. The source storage well and additional equipment were removed and appropriately disposed of, and follow–up analyses were performed. Details of this effort are discussed in the following sections of this report.

4. WORK PERFORMED

Based on the recommendation of the 1988 radiation survey, the Ra–226 source storage well was excavated and removed from Building T029. In addition, the structure that formerly stored the Co–60 sealed sources, and the building exhaust system located outside of T029 were also removed. Soil samples were collected and analyzed. The excavated areas were then refilled. These activities are described in this section.

4.1 PROCEDURE

Excavation and removal of the Ra–226 source storage well and other activities in T029 were performed under a documented procedure (Ref. 8). As specified in the procedure, a Controlled Work Permit was issued for monitoring and controlling radioactivity in the work area and exposures to personnel. Routine contamination surveys were performed to determine contamination levels and for segregation of contaminated material for subsequent disposal.

4.2 Ra–226 SOURCE STORAGE WELL REMOVAL

Following temporary removal of the material stored inside the building, a rectangular area of the floor surrounding the Ra–226 source storage well was marked up for excavation (see Figure 13) using concrete saws and jack–hammers. A back–hoe was used to dredge the soil from the cut–up area. A vacuum cleaner was then used to remove soil in the immediate vicinity of the 12–in.–diameter casing. Removal of the soil in this manner loosened the casing from the soil, with its inner contents of contaminated source thimble tubes (shown previously in Figure 9) still intact. A sling was attached to the casing and a fork–lift was used to move it to the floor where it was covered with plastic bags, tagged as radioactive material and transported to the Radioactive Material Disposal Facility (RMDF) at the SSFL. Figure 14 shows a photograph of the casing upon its arrival at the RMDF. A photograph of the excavated area of the well after removing the casing is shown in Figure 15. The Co–60 source cell and the pit where the PuBe and PoBe sources were formerly located are seen to the right and left side of the excavation respectively.

4.3 REMOVAL OF OTHER ITEMS

The Co–60 source cell was demolished, and its storage well was excavated partially to a depth of approximately 2 ft below grade in the same manner as the Ra–226 source storage well. Although, as noted previously, there was no contamination present in this

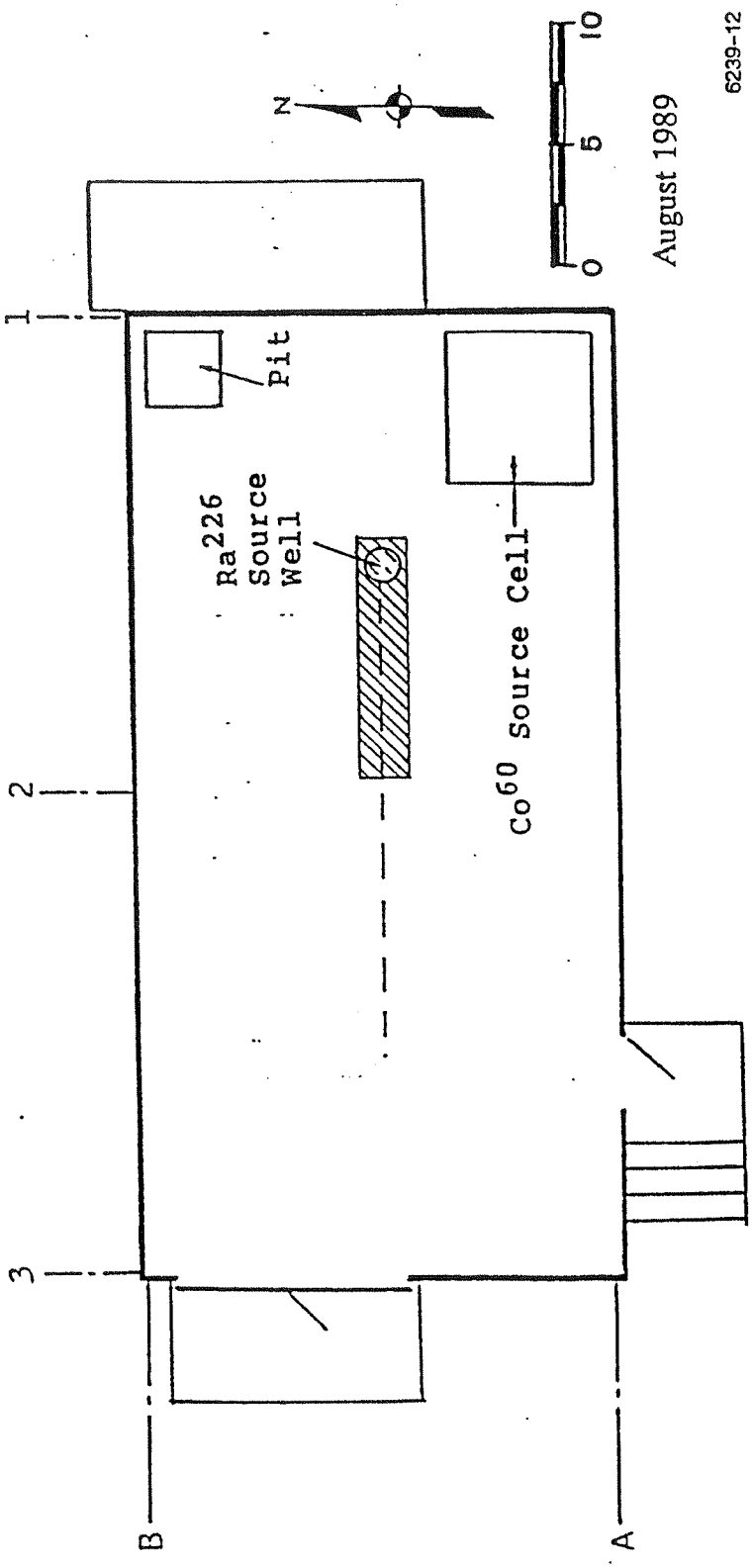


Figure 13. Ra-226 Source Well Floor Area (Shaded) Marked Up for Excavation

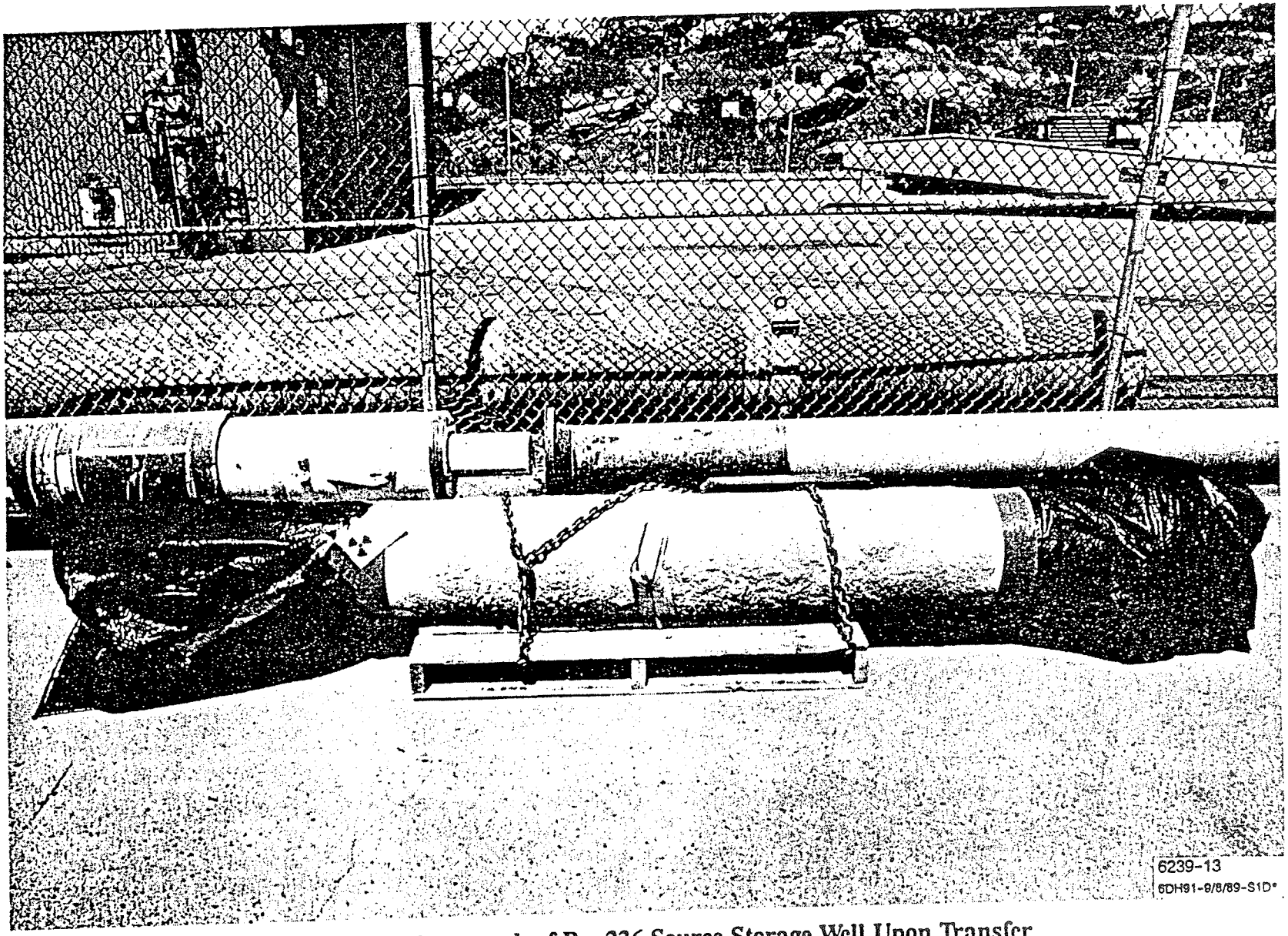


Figure 14. Photograph of Ra-226 Source Storage Well Upon Transfer to RMDF from T029 (front-most from fence)

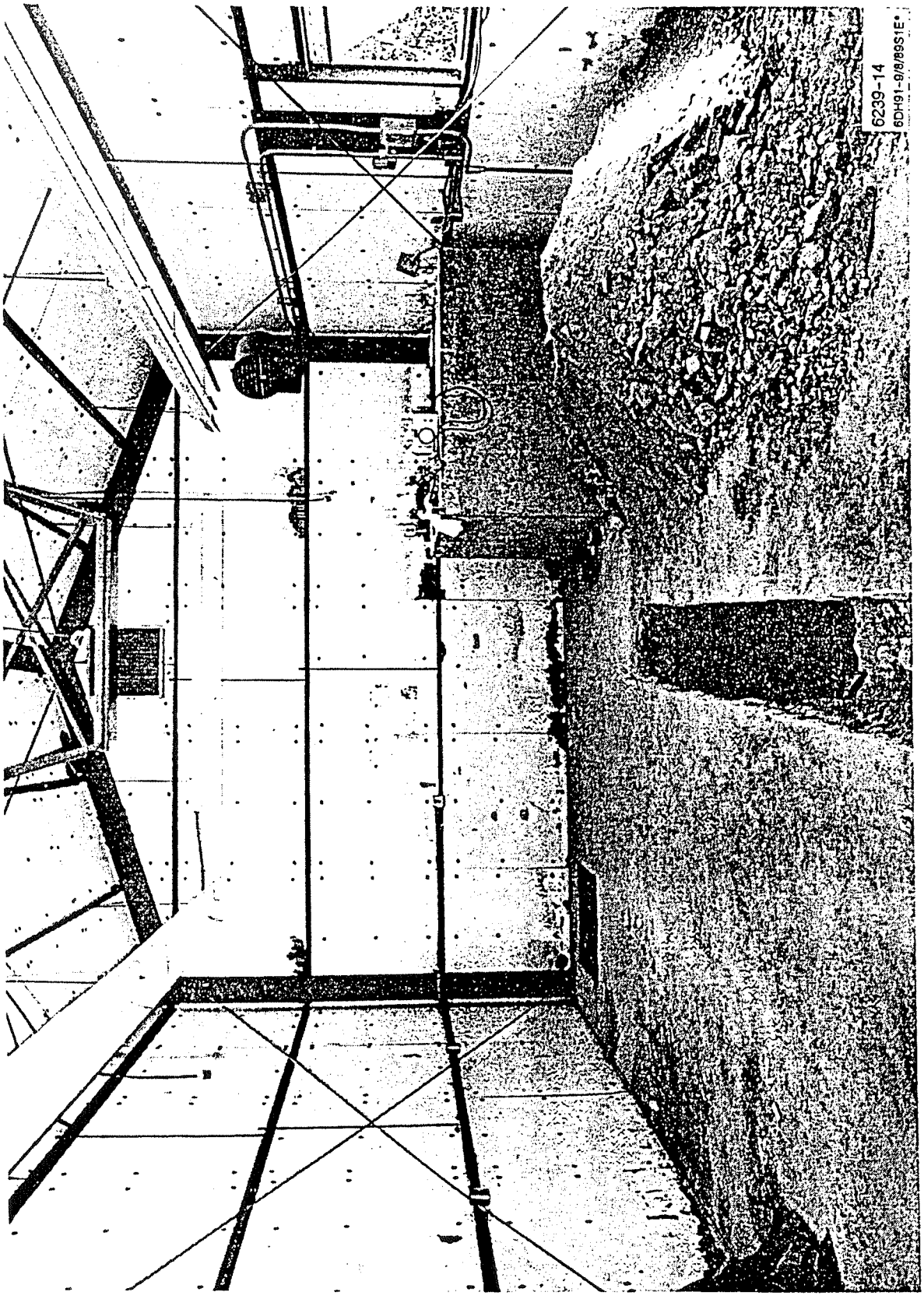


Figure 15. Photograph of Excavated Area of Ra-226 Source Storage Well in T029; Square Pit on Far Left at Floor Level is Former Location of PuBe, PoBe Sources. Former Co-60 Source Cell Block is to the Far Right

location, the Co-60 structure was eliminated to an extent that provides an obstruction-free floor-space there for future storage of nonradioactive materials. Routine smear surveys were performed at this location and the pit area to assure absence of contamination. Figures 16 and 17 show photographs taken during demolition of the Co-60 source cell and its storage well.

The facility's exhaust blower was also removed.

4.4 DISPOSITION OF REMOVED ITEMS

4.4.1 Ra-226 Source Storage Well

Routine smear surveys were performed on the surfaces of the thimbles. Swabs were taken from within the interiors of the thimble tubes after the casing was excavated. Results of the smear survey showed normal background activity, while the swabs showed, as expected, alpha-contaminated interiors. Therefore, it was determined that the source storage well must be disposed of as low-level radioactive waste. Accordingly, to facilitate its packaging, the casing was cut longitudinally into two pieces and the concrete embedment was separated from the casing and the three inner tubes. Figure 18 shows a photograph of the disassembled casing. All of the components shown were then packaged for disposal as low-level radioactive waste at an authorized site.

4.4.2 Other Items

Routine smear survey data on the Co-60 source well components such as the concrete, the removed and retained portions of the source well showed no activity above background and hence these items were disposed of as normal industrial waste; the lead shielding surrounding the source well was sold as scrap.

Routine smear survey of the exhaust blowers also showed no activity above background. These items were deemed reusable and hence were sent for refurbishment.

The survey data for all of the above items are maintained in the facility decommissioning file (see list shown in Appendix B).

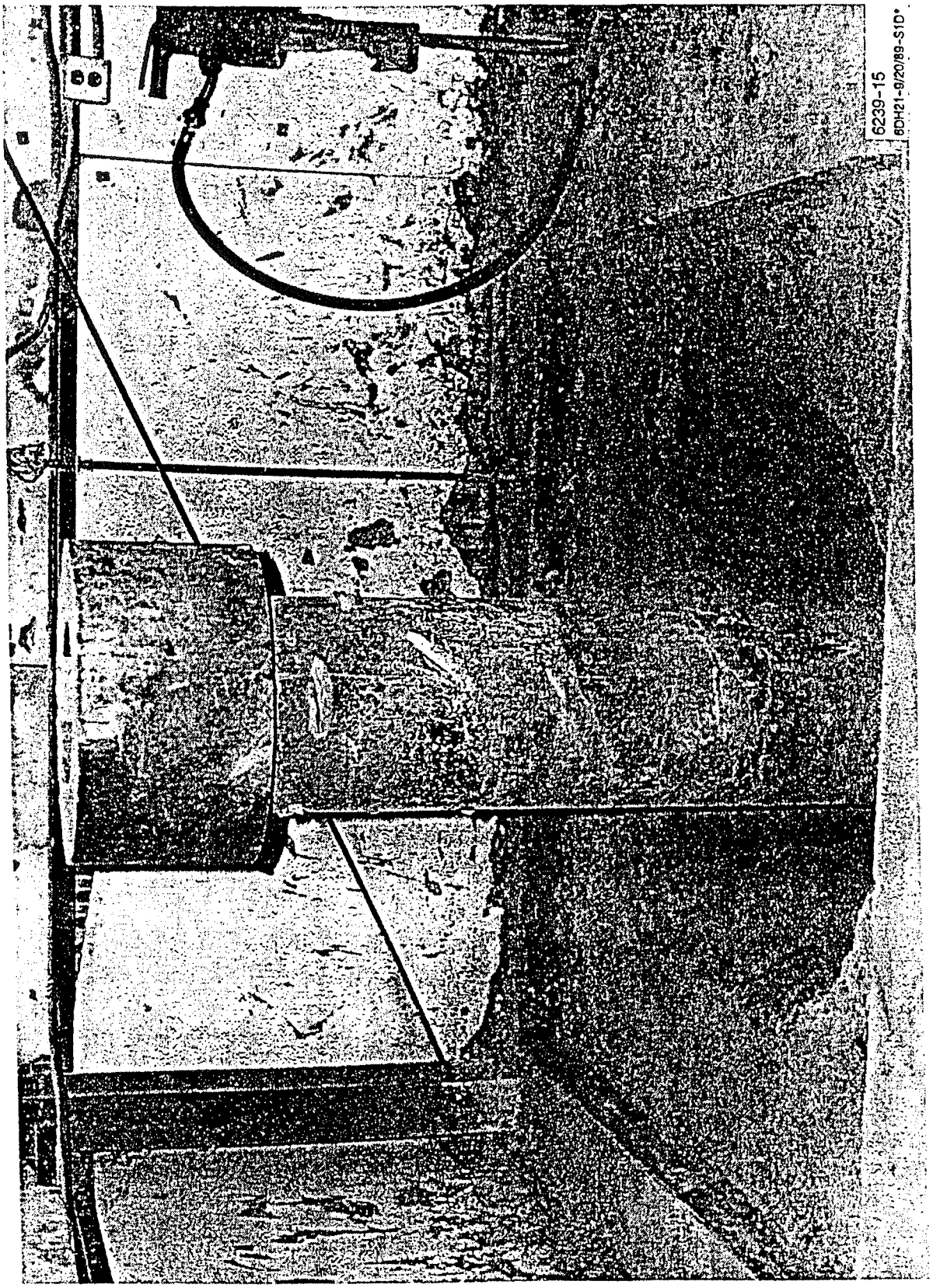


Figure 16. Co-60 Source Cell After Demolition of Surrounding Concrete

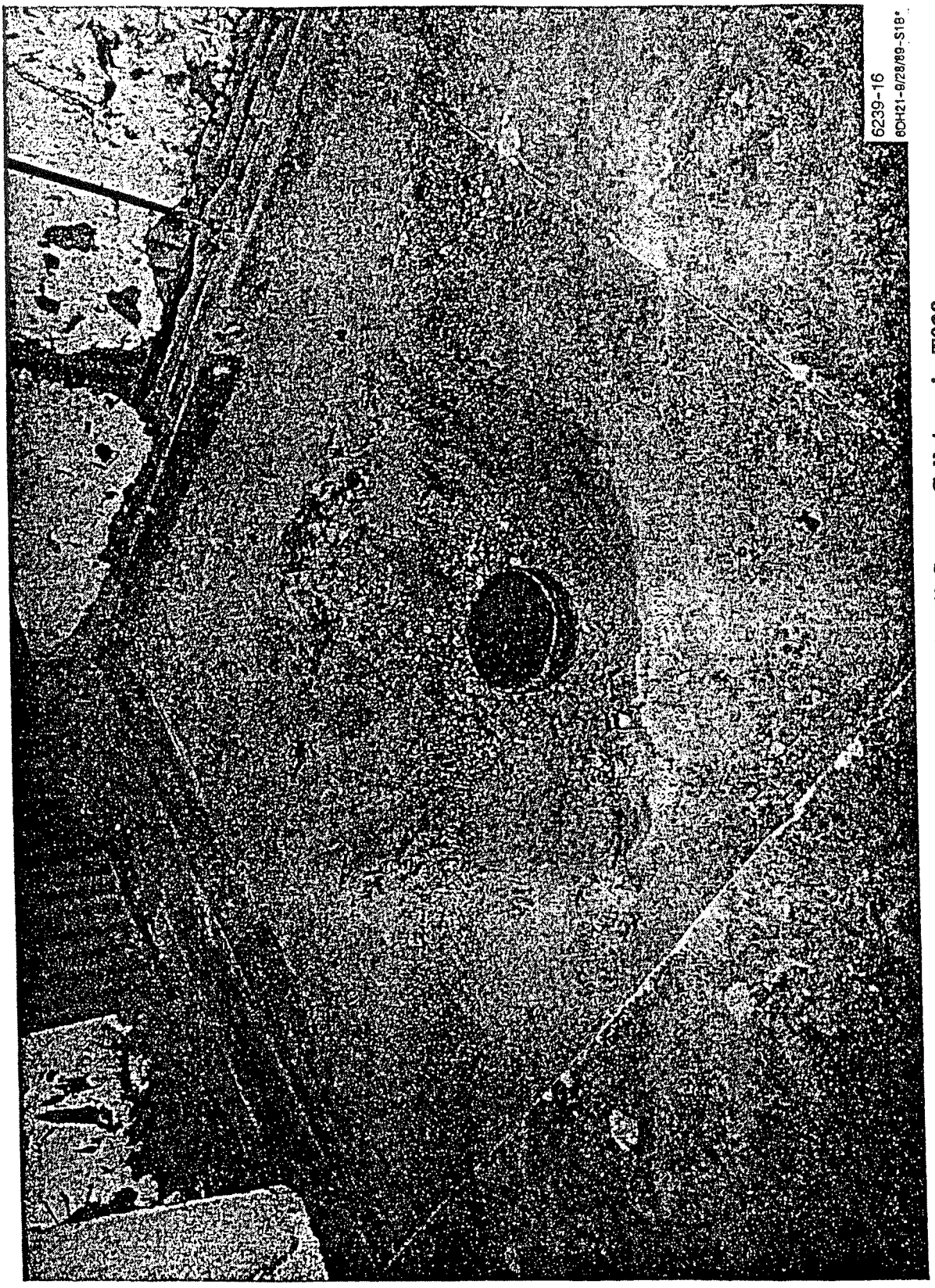


Figure 17. Photograph of Co-60 Source Cell Area in T029
After Partial Removal of Source Cell

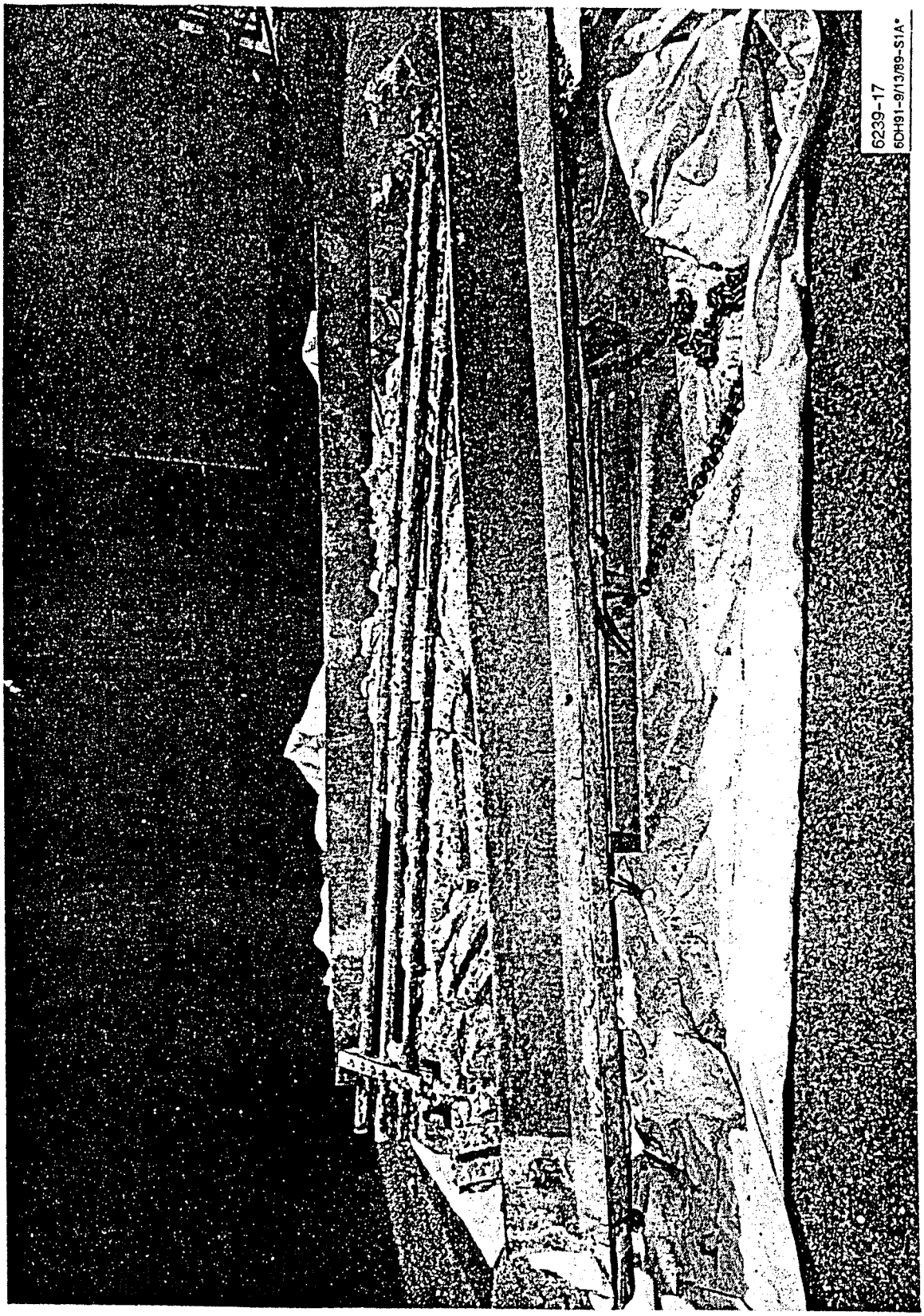


Figure 18. Photograph of Disassembled Ra-226 Source Well Casing in Preparation for Disposal

4.5 SOIL ANALYSES

4.5.1 Soil Samples for Analysis

Soil samples were collected to determine if any Ra-226 or Cs-137 isotopes had migrated from the source storage well casing into the adjacent soil and the extent of any such contamination. Four samples were collected in masses ranging from 227 g to 948 g for spectrometric analyses. The samples were collected from dirt adhering to the excavated source well casing (sample No. 1 and No. 3), the excavated pit (sample No. 2) and the excavated dirt pile (sample No. 4). As shown in Figure 19, sample No. 1 was from the side of the source well casing, while samples No. 2 and No. 3 were from its bottom. Sample No. 4, not shown in Figure 18, was a random sample taken from the excavated dirt pile.

Soil samples in the mass range of about 500 to 900 g are required for gamma spectrometric analysis using the standard Marinelli beaker (see Section 4.5.2 below) and three of the four samples had this desirable mass. However, one sample (sample No. 2 soil adhering to the bottom of the casing) weighed only 227 g which corresponded to all the dirt that was adhering to this area. Sample No. 2 was nevertheless analyzed along with the other samples, and results are presented in Section 4.5.3.

4.5.2 Analysis Procedure

Gamma spectrometry of the soil samples was performed with a Canberra Industries, Inc. Series 80 Multichannel Analyzer (MCA). The MCA is coupled to a planar high purity germanium (HPGe) radiation detector having about a 10% relative sensitivity (relative to the sensitivity of 3 in. x 3 in. NaI detector for cesium-137 gamma radiation), and a photopeak resolution capability of about 2.5 keV for the higher energy line of cobalt-60. The instrument was calibrated for gamma energy and for radionuclide quantification with a Marinelli Beaker Standard Source (MBSS) as specified in the Standard, ANSI/IEEE Std 680-1978, "IEEE Standard Techniques for Determination of Germanium Semiconductor Gamma-Ray Efficiency Using a Standard Marinelli (re-entrant) Beaker Geometry."

The soil samples collected were dried in an oven and large chunks and rock were removed. A Marinelli beaker (450-ml volume) was then filled with the soil sample, weighed and counted for 30 min.

The MCA is programmable; for any unknown sample, it will calculate the activity in μCi of any isotope it identifies corresponding to the associated library. Typically, the

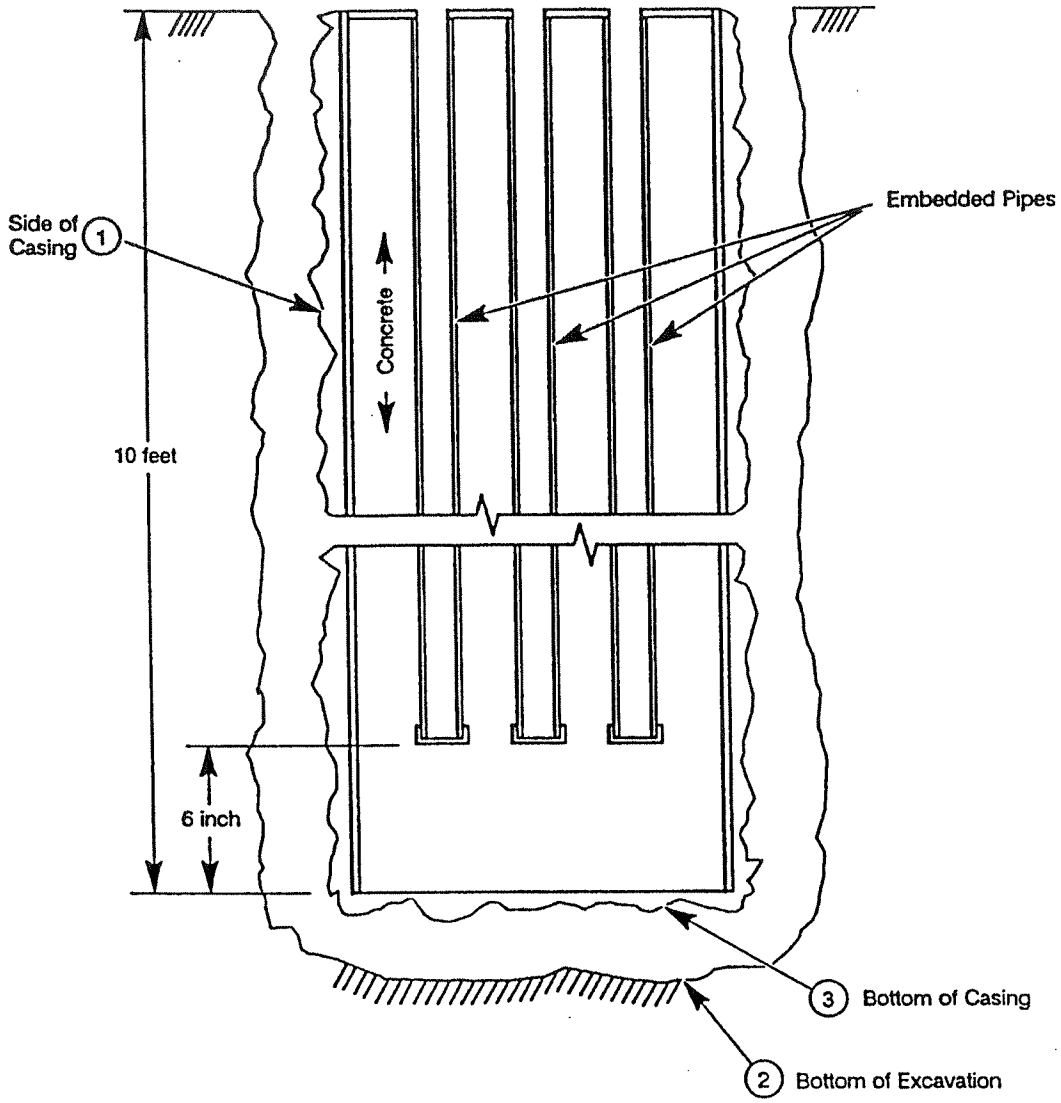


Figure 19. Schematic of Ra-22b Source Storage Well Showing Locations from where Soil Samples were taken for Analysis

instrument is used to measure U–238, U–235, Th–232, and their daughter products, K–40, Cs–137, Co–60, and Eu–152. Ra–226 (U–238 daughter) activity as well as the activities of its daughters (e.g., Pb–214 and Bi–214) are also measured. The MCA–calculated Ra–226 activity (and its daughters) includes the Ra–226 daughter from naturally occurring U–238 and any postulated Ra–226 that may have migrated from the source well.

A correction to the MCA–calculated activity is required because of the peak overlap at 185–186 keV from Ra–226 and U–235. Assuming that Ra–226 is in equilibrium with U–238 and that U–235 is 0.7% by weight of U–238, it can be shown that the true Ra–226 activity is equal to the MCA–calculated activity multipled by 0.5525. The stated assumption and the correction factor are valid because no enriched uranium was ever used at the facility.

Results from analysis of the soil samples in the above manner are presented in the next section. A statistical treatment of the type provided in the 1988 survey was not performed because of the narrow scope of this effort (namely removal of a relatively small contaminated item from an inaccessible area) and because of the limited number of samples.

4.5.3 Results and Discussion

MCA–calculated activities of selected radionuclides obtained from the gamma spectrometry of the soil samples are presented in Table 5. All values reported are concentrations in units of picocuries per gram (pCi/g). Concentration of Ra–226 and Cs–137 are reported because these are the suspect isotopes that could have migrated from the sources housed in the Ra–226 source storage well to the adjoining soil. Data on K–40 (naturally–occurring) and the two Ra–226 daughters, Pb–214, and Bi–214 are also shown; of these, the K–40 and Pb–214 data can also be compared with recently obtained background data for surface soils in SSFL (Ref. 9). In addition, background for Ra–226 activity reported in Ref. 9 is also included for comparison.

Referring to Table 5, no detectable activity is observed in regard to the suspect isotopes Ra–226 and Cs–137 for samples 1, 3, and 4. Also, for these samples, the values for K–40 are in a narrow range and are nearly the same as the background value elsewhere in SSFL for this naturally–occurring radionuclide.

The values for the Ra–226 daughters Pb–214 and Bi–214, are also in a narrow range for these three samples. However, the Pb–214 concentrations are a factor of about

Table 5. Results of Soil Sample Analysis

Sample No.	Soil Sample Location	Sample Weight (g)	Radioactivity Concentration (pCi/g)					Comment
			Ra-226	Cs-137	K-40	Pb-214*	Bi-214*	
Disposed								
1	Side of casing	938	ND	ND	24.2	0.33	0.36	Soil stuck to casing. Disposed of as radioactive waste
3	Bottom of casing	227	4.1	ND	35.7	1.69	1.60	Soil stuck to casing. Removed for analysis
4	Excavated dirt	920	ND	ND	23.1	0.28	0.40	Disposed of as ordinary dirt
Remainder								
2	Bottom of excavation	948	ND	ND	23.6	0.27	0.40	Soil in excavated area
Background								
	SSFL soil average	(average of three samples)	0.82	NM	22.2	0.84	NM	For comparison. Analyzed by U.S. Testing Company (Richland) for Groundwater Resources Consultants, Inc. (Ref. 9)
Acceptance Limit (DOE)	> 15 cm below surface	--	15	--	--	--	--	Criterion from Table 2 (footnote **) of this report

ND: Not detected
NM: Not measured
*Daughter products of Ra-226

D635-0087

three lower than SSFL background data. Duplicate MCA analyses of the same samples confirm these values. The background value for Bi–214 is not available for a similar comparison, but its activity, as a daughter of Pb–214, should be equal to that of Pb–214. The presence of below detectable concentrations of the parent Ra–226 could be the reason for the relatively low concentrations of these two daughters. It is conceivable that a material with lower activity of Ra–226 (from U–238, its parent) than normal soil (e.g., construction sand) was mixed with the soil during installation of the source storage well resulting in Ra–226 concentrations which are lower than the background for SSFL. The results, nevertheless, do not show any contribution to the activities of Ra–226, its daughters, or Cs–137, that could have migrated from the source storage well.

The data shown in Table 5 with respect to sample No. 3 warrant some discussion. This sample shows a value of 4.1 pCi/g of Ra–226. Data from this sample for the other radionuclides are also not consistent with corresponding data for the other samples or with respect to the background data. However, as mentioned earlier, this sample is of a lower mass value than that required for performing MCA analysis, and spurious data of this nature have been found in soil samples of low mass analyzed in other facility decontamination projects. However, for the present purpose, even if this value of 4.1 pCi/g is considered valid, it is still well below the 15 pCi/g DOE limit for Ra–226 for release of the facility "without radiological restrictions" (Ref. 3). The 15 pCi/g limit is also the remedial action standard used by regulatory agencies (for example, the U. S. Environmental Protection Agency and the Nuclear Regulatory Commission) for release with respect to "unrestricted use" (Ref. 10).

As shown in Figure 19, samples 2 and 3 were taken from locations that are immediately adjacent to each other. Thus, barring a highly localized spot (location of sample No. 3) to which the Ra–226 migrated, it would be reasonable to assume that Ra–226 activities would be the same for the two samples. If the migration of the Ra–226 was indeed localized, then it was contained in the 227 g of soil already removed from the facility, and hence, is of no future consequence. Given the consistency of the data from sample No. 2 with respect to samples No. 1 and No. 4, however, it is appropriate to conclude that the Ra–226 data for sample No. 3 is spurious, and that there is no actual Ra–226 in that location.

4.6 FACILITY STATUS

Upon completion of the removal operations associated with the source storage wells and other equipment, the excavated area was refilled and re-surfaced. Figure 20 shows a photograph of the interior of the facility after completion of these restorations. Nonradioactive materials (principally metallic sodium in 55-gallon drums), which were temporarily stored outside during the removal operations, were returned to the reinstalled racks shown in the photograph. Building T029 thus currently remains as a nonradioactive hazardous materials storage facility.

Figure 20. Interior of Building T029 Following Restoration

5. CONCLUSIONS

1. Based on a review of the 1988 radiological survey, all of the surface and above-surface areas of Building T029 and areas in its immediate vicinity are acceptably free of radioactive contamination.

2. As recommended by the 1988 survey, the Ra-226 source storage well was excavated and disposed of. Based on the analysis of soil samples collected during the removal operation, it is concluded that the subsurface soil surrounding the source storage well area is also free of radioactive contamination.

3. Results from the 1988 survey and the work reported here demonstrate that the current radiological cleanliness of Building T029 meets the DOE requirements for release without radiological restrictions and equivalent regulatory requirements with respect to release for unrestricted use.

6. REFERENCES

1. Badger, F. H. and Tuttle, R. J., "Radiological Survey Plan for SSFL," Rockwell International Report 154SRR000001, September 25, 1985.

2. Chapman, J. A., "Radiological Survey of the Old Calibration Facility – Building T029," Energy Technology Engineering Center Report GEN–ZR–0006, August 19, 1988.

3. "Guidelines for Residual Radioactivity at FUSRAP and Remote SFMP Sites," U.S, Department of Energy, February 1985.

4. "Order Authorizing Dismantling of Facility and Disposition of Component Parts," U.S. Nuclear Regulatory Commission, Docket 50–375, February 22, 1983.

5. Chapman, J. A., "Radiological Survey of the Sodium Disposal Facility – Building T886," Energy Technology Engineering Center Report GEN–ZR–0004, June 3, 1988.

6. Swanson, V.A. and Conners, C.C., "Action Description Memorandum for Decontamination and Decommissioning of the Surplus Facilities at the ESG Santa Susana Field Laboratory," Rockwell International Report ESG–DOE–13421, Rev. 2, June 30, 1984.

7. "State of California Guidelines for Decontaminating Facilities and Equipment Prior to Release for Unrestricted Use," DECON–1, Revised, March 24, 1983.

8. Frazier, R. S. "Radiological Decontamination of Building 029," Rockwell International Detailed Working Procedure N001DWP000024, August 24, 1989.

9. "Investigation of Naturally Occurring Radionuclides in Rock, Soils and Groundwater Santa Susana Field Laboratory, Ventura County, California," Groundwater Resources Consultants, Inc., report 8640M–77, June 1, 1990.

10. "Health and Environmental Protection Standards for Uranium Mill Tailings," U.S. Environmental Protection Agency Regulations 40 CFR 192, March 7, 1983.

APPENDIX A

COPY OF INTERNAL LETTER
"Report of Radioactive Contamination Incident of the Radiation Measurements Facility Building 029 - March 24, 1964"

INTERNAL LETTER

NORTH AMERICAN AVIATION, INC.

DATE: April 10, 1964

TO: E. M. Hill
ADDRESS: 779-21, Building 040, Santa Susana

FROM: D. D. Busick and W. D. Hansen
ADDRESS: 779-21, Building 040, Santa Susana
PHONE: 6301

SUBJECT: Report of Radioactive Contamination Incident of the Radiation Measurements Facility - Building 029 - March 24, 1964

Summary

At 1045 hours, March 24, 1964, a call was received at Building 040, (Health and Safety) from personnel in Building 029, reporting a probable rupture of one of the Ra^{226} calibration sources. This source is one of three containing 24.78 mgm of Ra^{226} as a bromide salt. The other sources contain 132 and 930 mgms of Ra^{226} also in the bromide chemical form. All three sources are incapsulated in platinum iridium alloy of 1.0 mm wall thickness except for the 930 mgm source which has a wall thickness of 1.5 mm of platinum alloy.

Follow-up investigation revealed that three Instrumentation Applications unit personnel were contaminated with alpha activity, primarily on their hands - 1000 c/m (2500 d/m) maximum as determined by a portable alpha survey meter. The personnel were evacuated to Building 020 hot change room for decontamination. Cleaning was easily accomplished after the first soap and water treatment.

Bioassay specimens were collected, submitted and proved negative for radium content.

The facility was surveyed thoroughly for removable and fixed radioactive contamination. What was found, was largely confined to a small area surrounding the source storage wells, along with some low level removable alpha contamination elsewhere in the building. Decontamination of the facility reduced fixed and removable contamination below detectible levels with one exception, the source storage well at the floor level was (6 d/m/100cm^2 wd).

The offending source was believed to be at the bottom of the storage well. Efforts to locate it elsewhere in the facility were negative. The α activity at the top of the storage well was approximately 1.5 α/hr, indicating that the source was at the bottom. (North well). A high volume air sample should permit background alpha activity, 2.5×10^{-14} uc/cm^3.

Building 020, the instrument shop, was also surveyed and found to be free of removable and fixed alpha and beta-gamma contamination.

To: R. M. Hill
From: D. D. Busick and W. D. Hanson
Subject: Report of Radioactive Contamination Incident of the Radiation Measurements Facility - Building 029 - March 24, 1964

On March 25, 1964, the offending source was recovered from its source well, apparently intact, by Health and Safety personnel. The source was placed in its lead shipping container to await disposition after first being placed in a sealed stainless steel tube to contain Rn^{222} generated by the decay of Ra^{226}.

The source evidently is not leaking badly since smears are reasonably free of removable alpha contamination of Rn^{222} and other short lived daughters of Ra^{226}. For this reason, the magnitude of the incident was limited. Surface and personnel contamination (internal and external) would have been several orders of magnitude greater had the source ruptured to the extent that the $RaBr_2$ had been released.

Sequence of Events

Monday afternoon, March 23, 1964, D. E. Van Dyke, Department 744-42, Clock #53 and J. W. Dodd, Jr., Department 744-42, Clock #9, were in the process of calibrating radiation survey instruments. This work was being accomplished at the Radiation Measurements Facility (RMF), Building 029, Santa Susana. At the present time, the facility is equipped with three radium sources, 24.78, 132, and 990 mgms, which are stored inside individual "wells". Each well is approximately 9.5 feet deep by 1 inch diameter. The sources are raised and lowered using nylon string. Over each well is pyrex tube 10 feet long, which is used to prevent lateral motion of the individual source during calibration. The two smaller sources are inside plastic capsules which are attached to the nylon string. The larger source is in a metal source holder.

At approximately 1500, March 25, 1964, the plastic capsule which contained the 24.78 mg source, became lodged and fractured allowing the source to fall an estimated 13 feet to the bottom of the well. Since the primary container for the source is made of platinum, Van Dyke and Dodd did not feel a hazard existed, and did not notify either Health and Safety nor the Control Center. No attempt was made at that time to recover the source.

The next day, March 24, 1964, R. W. Sloncomb, Department 744-42, Clock #47 and D. J. Dunlavy, Department 744-42, Clock #30, accompanied Van Dyke to the facility to assist in the recovery of the source. A 12 foot long piece of copper tubing, with a piece of duct tape on the end, was inserted inside the well in an attempt to retrieve the source. After several futile attempts one of the employees discovered that the tape on the end of the tubing indicated 1.5 mrad/hr according to a Nuclear Chicago CDV-700 survey meter which they were using to monitor the operation. At that time they became concerned that the source had ruptured and notified Health and Safety at Building 020 at 1015.

W. D. Hanson from Health and Safety was instructed to evaluate the problem and monitor the personnel involved. Another Nuclear Chicago CDV-700 survey instrument was used to monitor the employees indicating only

IL To: R. M. Hill
From: D. D. Busick and W. D. Hanson
Subject: Report of Radioactive Contamination Incident of the Radiation Measurements Facility - Building 029 - March 24, 1964

background radiation. Smears were taken inside to determine the magnitude and extent of the R/A contamination. The smear nearest the well in question showed 600 d/m $\beta\gamma$ and 200 d/m α. An Eberline portable monitor PAC-3G was borrowed from NRDF to determine if additional alpha contamination was present. All three employees showed up to 1000 c/m (2500 d/m α) on their hands. Shoes were contaminated up to 100 c/m (250 d/m α). D. D. Busick of Health and Safety was notified of the personnel contamination and was requested to send protective clothing for the three employees, sufficient to allow transportation to another area for decontamination and more extensive monitoring. Due to the implications of a ruptured radium source, Mr. Busick classed this condition as an emergency and requested assistance from Traffic and Industrial Security. The personnel in question were taken to the CDHC for decontamination. Nasal smears were taken on the suspects indicating $<$.2d/m alpha and $<$30d/m $\beta\gamma$. The personnel were thoroughly monitored, and successfully decontaminated including all personal effects. They were then requested to submit a 24 hour bioassay with one sample to be submitted for immediate analysis. J. W. Dodd was also included in the bioassay since he was present when the source was dropped. He was also monitored for clothing, skin, and nasal contamination. Nothing above background was detected.

While the decontamination of personnel was progressing, other members of the Health and Safety Emergency Team were making a more extensive survey of Building 029. An air sample taken showed 2.5×10^{-11} uc/cc alpha which is normal for this site. Smear results of Building 029 showed almost all of the contamination to be concentrated around the well with a maximum of 90 d/m/100cm^2 $\beta\gamma$ and 120 d/m/100cm^2 α. A smear survey of Building 383 and also the pickup truck used by Department 744 showed nothing above background.

A portion of the broken plastic capsule and a piece of duck tape that had been used in attempt to retrieve the source were taken to Building 028 for analysis on the multi-channel analyzer. The gamma scan demonstrated the presence of the daughters of Ra^{226}.

Decontamination of the floor of Building 029 was accomplished by Maintenance, and restrictions for entry were lifted at 1545, March 24, 1964. The well was plugged with a rubber stopper. A 2500 cc ion chamber was used to withdraw a sample of atmosphere from the well after a period of 24 hours. The sample was taken inside the well 5 feet from the top. Analysis showed 6.7×10^{-4} uc/cc of Rn^{222} as determined by Health and Safety Laboratory Unit. Rn^{222} has an eight hour MPC of 1×10^{-8} uc/cc, a half-life of 3.8 days and is the first radioactive daughter of Ra^{226}. The total volume of Building 029 is $\sim 3 \times 10^{8}$ cm^3. The concentration of radon in the building from the accumulated radon in the source well will raise the airborn alpha activity from $\sim 2 \times 10^{-11}$ uc/cm^3 to 1.7×10^{-9} uc/cm^3.

IL To: R. M. Hill
From: D. D. Busick and W. D. Hanson
Subject: Report of Radioactive Contamination Incident of the Radiation Measurements Facility - Building 029 - March 24, 1964

The exhaust system for Building 029 is rated at 1540 ft^3/min producing 8.5 air-changes-per hour in the building. The atmosphere is exhausted from the building through two absolute filters and dumped immediately outside. This many air-changes-per hour will clear the building of radon in the above stated concentration in approximately 40 minutes.

The recovery of the source was accomplished at 1600 on March 26, 1964. This was done after a light was lowered into the well and a visual observation thru a telescope proved the source to be in one piece. The source removal was accomplished by dropping a small weight with a piece of tuck tape attached to one end.

The source was placed inside a lead shielded container. The equipment used was assumed to be contaminated, and after decontamination, ~50 smears taken showed no removable contamination above background. The offending source has been sealed in a 3 inch length of stainless steel pipe 1/2" in diameter to prevent the continuous release of Rn^{222} from contaminating the immediate environment.

Discussion and Recommendations

On or about September 2, 1961, the intermediate range radium source (132 mgm) plastic source holder was dropped in a similar manner from the top of its source wall. This incident did not result in a release of radioactive material. However, like the incident of March 25, 1964, an immediate report was not made to Health and Safety, Industrial Security or to facility supervision. The situation was discovered 10 days following the 1961 incident. While the most recent incident was reported within eighteen hours after the source was dropped, an immediate report would have limited the emergency response. Also, we do not know if the source was leaking before or as the result of the initial recovery attempts.

The total body burden for Ra^{226} is 0.1 ug. The 24.78 mg source represents ~250,000 body burdens. The ingestion and subsequent tissue fixation of 4×10^{-4}% of the radium content of this capsule could result in an employee sustaining a single body burden of radium. Bone tumors have been reported to develop with 0.5 ug of radium fixed in bony tissue.

Radium has chemical properties very similar to barium. Halogen salts of barium and radium are extremely soluble in body fluids. The solubilities of $BaBr_2$ and $RaBr_2$ are 104 and 2.4×10^{-2} gm/100 gm of H_2O. Radium salts having similar chemical properties also will exhibit similar solubility properties. The halogen salts of radium then are more hazardous by many orders of magnitude than the sulphate radium compounds. Therefore, a very large portion of $RaBr_2$ ingested by personnel would be fixed in body tissue.

The personnel involved treated this incident with a great deal of casualness. Also, since a similar type of incident occurred on at least

TO: R. M. Hill
From: D. D. Busick and W. D. Hanson
Subject: Report of Radioactive Contamination Incident of the Radiation Measurements Facility - Building 029 - March 24, 1964

one other occasion by different personnel of the same unit, a greater supervisory effort by Department 744 seems in order. Although similar radium sources are handled safely every day in many places by many different people, unusual or atypical situations must be reported to operations supervision and Health and Safety immediately. The consequences of a single mistake resulting in the release of radium to uncontrolled environments are both costly and extremely hazardous to personnel.

The need for additional and continuing training of both supervisory and non-supervisory personnel is clear. These people are well indoctrinated in the control of external radiation problems. However, an understanding of the more serious problem of ingestion seems to be lacking.

Written procedures for use of this facility has been submitted to Health and Safety for approval. No recommendations pending the review of these procedures will be made at this time.

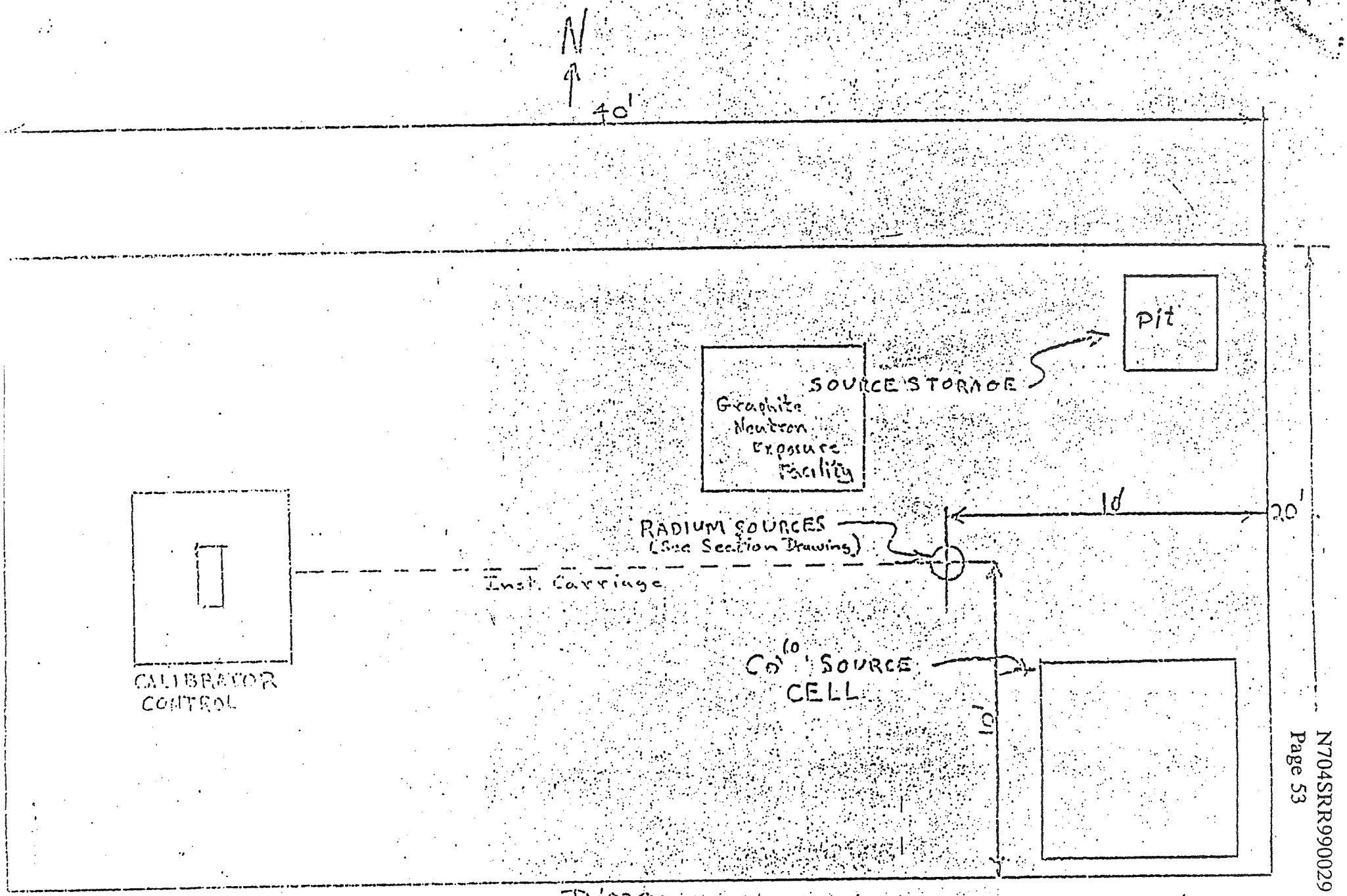
Finally we would recommend that the radium sources be replaced with Co-60 or Cs-137. The maximum permissible body burdens are 100 and 300 times that of Ra-226. Encapsulation problems are also minimal and have a long history of use under severe conditions with a correspondingly low incident of failure.

D. D. Busick
Health and Safety Assistant
Santa Susana Operations
Health and Safety Section

W. D. Hanson
Associate - Health Physics
Santa Susana Operations
Health and Safety Section

DDB:WDH:ap

cc: J. C. Lang
E. E. Healey
D. K. Shoemaker
E. O. Anderson
S. L. Jones

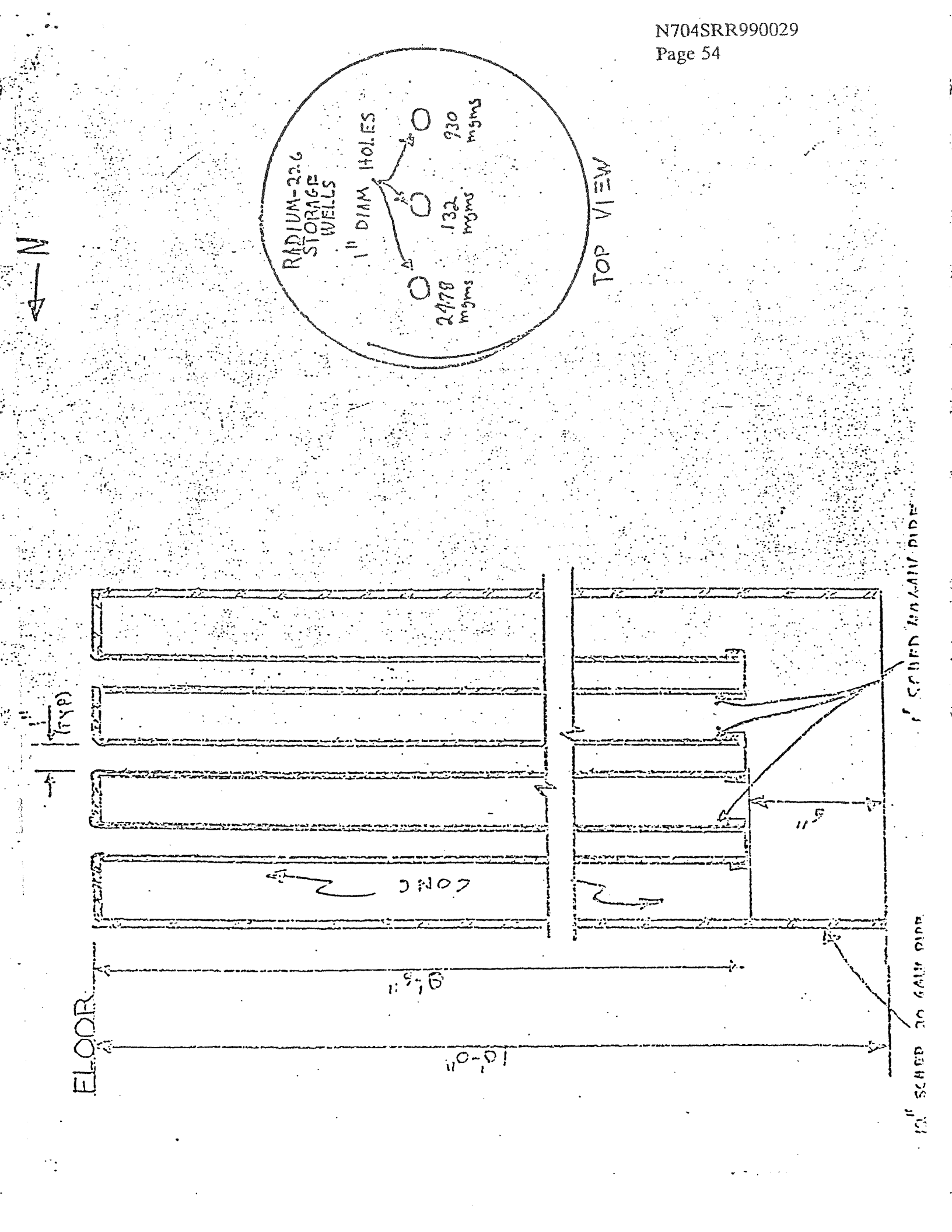


B1029

FLOOR PLAN

1/4" = 1'-0"

Personnel Door


RADIUM-226
STORAGE
WELLS
1" DIAM HOLES
930
mgms
132
mgms
2478
mgms
TOP VIEW
N
CONC
FLOOR

APPENDIX B

CONTENTS OF BUILDING T029 DECOMMISSIONING FILE

CONTENTS OF BUILDING T029 DECOMMISSIONING FILE

JUNE 1990

The following is an annotated list of documents in the Building T029 Decommissioning file.

1. Chapman, J. A., "Radiological Survey of the Old Calibration Facility – Building T029," Energy Technology Engineering Center Report, GEN-ZR-0006, August 19, 1988.

   - is the primary document reporting the comprehensive radiological survey of the facility and the surroundings; concludes that the facility is acceptably clean of radioactive materials and recommends further investigation of a below-grade Ra-226 source storage well.

2. Frazier, R. S., "Radiological Decontamination of Building 029," Rockwell International Detailed Working Procedure N001DWP000024, August 23, 1989.

   - sets forth the operational procedures to decontaminate and/or remove the Ra-226 and Co-60 source storage wells in Building T029.

3. Two drawings showing details of the Ra-226 and Co-60 source storage wells in Building T029.

4. Twenty one photographs taken during the decommissioning operations in Building T029.

5. Four "Health and Safety Analysis Report" forms of routing radiation and smear surveys performed as part of the Building T029 decommissioning operations.

6. Nine gamma spectrometry print-outs from the Multichannel Analyzer (MCA) on the four soil samples collected during Building T029 decommissioning operations; of these, four are initial MCA analysis print-outs, and four are duplicate analysis print-outs of the same four samples. The ninth is a third analysis performed on the sample with the lowest weight.

7. Subbaraman, G., "Final Decontamination and Radiological Survey of Building T029," Rockwell International Safety Review Report N704SRR99029, June 1990.

   - A released copy of the report containing this list.

EXHIBIT VI

NATIONAL ENVIRONMENTAL POLICY ACT DOCUMENTATION FOR DECONTAMINATION AND DECOMMISSIONING OF BUILDING 029 AT ENERGY TECHNOLOGY ENGINEERING CENTER

ERWM
LIDDLE
4/15/92

ERWM
CULLEN
4/15/92

AMEMS
DAVIS
4/16/92

OCC
BRECHBILL
4/22/92

DAMA
LAMBERT
4/24/92

DM
VAETH
4/27/92

MC
DAVIS
92

4-29-92

APR 29 1992

DOE San Francisco Field Office (ERWM)

Categorical Exclusion (CX) Determination for Environmental Remediation of Buildings and Work Areas by Decontamination and Removal and Disposal of Hazardous and Radioactive Waste

Susan Brechbill, Acting AMEMS

In accordance with DOE NEPA Guidelines, Section D, and SEN-15-90, I have determined that the subject project satisfies the requirements for exclusion from further NEPA review based on the following:

CX DETERMINATION

NEPA Document Number: ET-EM-92-12

Proposed Action: Environmental Remediation of Buildings and Work Areas by Decontamination and Removal and Disposal of Hazardous and Radioactive Waste

Location: Energy Technology Engineering Center (ETEC), Santa Susana Field Laboratory, Ventura County, CA

Description: Remove stored equipment, decontaminate facilities and adjacent grounds to remove low level radioactivity contamination, and restore them to conditions suitable for use without radiological restrictions. Also, excavate, as needed, adjacent grounds to remove hazardous and radioactively contaminated soil and debris. Package the hazardous and radioactively contaminated fixtures, surplus equipment and debris, and ship it to an approved radioactive waste disposal facility.

Buildings and Work Areas to be Remediated

Radioactive Materials Disposal Facility (ADS 4005-AC):
- Building 022, RA Materials Storage Vault
- Building 021, Decontamination and Packaging
- Building 034, Offices
- Building 044, Health-Physics Services
- Four peripheral storage structures & the storage yard

Building 023, Liquid Metals Chemistry Laboratory (ADS 5002-AC)

Buildings and Work Areas to be Remediated (Continued)

SSFL Work Areas Decontamination (ADS 4006-WC):
Sodium Reactor Experiment (SRE) Moderator Shipping Cask stored in:
Building 012, SNAP Critical Facility
Building 100 Area, Construction Work Trenches
Old Conservation Yard Packaged Waste Disposal

CX To Be Applied (from Section D, DOE NEPA Guidelines):

CX as identified in Federal Register Volume 55, Number 174, dated September 7, 1990, for "1. The removal actions and other actions described below, if it is determined that such an action would not threaten a violation of applicable statutory, regulatory or permit requirements, including requirements of DOE Orders; would not require siting and construction or major expansion of waste disposal, recovery, or treatment facilities (including incinerators and facilities for treating waste water, surface water, or ground water); and would not adversely affect environmentally sensitive areas.... c. Removal actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (including those taken as final response actions and those taken before remedial action) and actions similar in scope under the Resource Conservation and Recovery Act (RCRA) and other authorities (including the Atomic Energy Act, as amended) and those taken as partial closure actions and those taken before corrective action.... (12) Use of chemicals and other materials to retard the spread of the release or to mitigate its effects, where the use of such chemicals would reduce the spread of, or direct contact with, the contamination; (and).... (16) Treatment (including incineration), recovery, storage or disposal of wastes at existing facilities permitted for the type of waste resulting from the removal action, where needed, to reduce the likelihood of human, animal, or food chain exposure."

The project will not affect historic, archaeological, or architecturally significant properties; will not impact environmentally sensitive areas or critical habitats; is not located in a floodplain, wetland, or prime agricultural land; and will not utilize special sources of water, sole source aquifers, well heads, or other resources vital to the region.

I have determined that the proposed action meets the requirements for the CX referenced above. Therefore, I have determined that the proposed action may be categorically excluded from further NEPA review and documentation.

/S/

James T. Davis
Acting Manager

cc: D. Williams, EM-443
A. Kluk, EM-443
C. Borgstrom, EH-25